

A SURVEY OF THE WESTERN MESARA PLAIN IN CRETE: PRELIMINARY REPORT OF THE 1984, 1986, AND 1987 FIELD SEASONS

(PLATES 44–55)

THIS ARTICLE is a preliminary report of the regional archaeological survey project focused on the Western Mesara Plain (the modern eparchies of Pyrgiotissa and Kainourgio) in southern Crete (Fig. 1; Pl. 44) during 1984, 1986, and 1987.¹

A Greek-American *synergasia*, the project included archaeologists, geologists, botanists, historians, and ethnographers who each season documented (1) a complete history of settlement in the region; (2) the interaction of the local inhabitants with the environment through time; and, ultimately, (3) how these factors affected the establishment and subsequent development of a complex society in the region. Two archaeological teams intensively surveyed 22 square kilometers immediately around Phaistos (Fig. 7). In this paper we discuss the research background and methods of the project; the character and extent of the Western Mesara region; its geology, geomorphology, and changing coastal configuration; the modern vegetation; the history of settlement from the Neolithic period through the present day; Byzantine through Ottoman historical sources and monuments; and aspects of traditional life in the region.

¹This project was supported by grants from the National Endowment for the Humanities (grant #150-2843A), the Institute for Aegean Prehistory, the National Geographic Society (grants 2659-83, 2833-84, 3108/9-85, and 3529/30-87), and generous contributions from Mrs. Mary Chambers and Dr. and Mrs. Harold Conlon. Work took place under a *synergasia* permit from the Greek Ministry of Culture to the American School of Classical Studies at Athens in 1984, 1986, and 1987. Fieldwork was supervised by the two co-directors, L. Vance Watrous and Despoina Vallianou, and by John Bennet. We acknowledge here the excellent fieldwork of our many archaeology students from the Universities of Thessalonike, Athens, Crete, and Ioannina who made up the survey teams. In 1986 John Frankish and Tracey Cullen helped with the field survey. We thank the staff of the Herakleion Museum and the guards at Phaistos for their kind assistance.

A preliminary report on the 1984 and 1986 field seasons in the Western Mesara was read by Mrs. Vallianou at the Fifth International Cretological Congress (1986) in Chania; see Vallianou and Watrous 1991.

For this article, project members wrote their own sections, which were then coordinated and edited by L. Vance Watrous and Harriet Blitzer. We thank Vincenzo La Rosa for his helpful comments on a draft of this article.

Photo credits: Plates 44 and 45, Satellite image processed by Charles Duller, NASA, Ames Research Center. Landsat data courtesy of EOSAT Company, Lanham, Maryland. Plates 46:a, b; 47:a, b; 48:a; 49:c; 52:c, d; 53:b–d; 54 by L. V. Watrous. Plates 47:c, d by K. Pope. Plates 48:b–d; 49:a, b, d; 50; 51; and 52:a, b by J. and T. Shay. Plate 53:a by D. Vallianou. Plate 55 by C. Vallianos, courtesy of the Museum of Cretan Ethnology, Voro.

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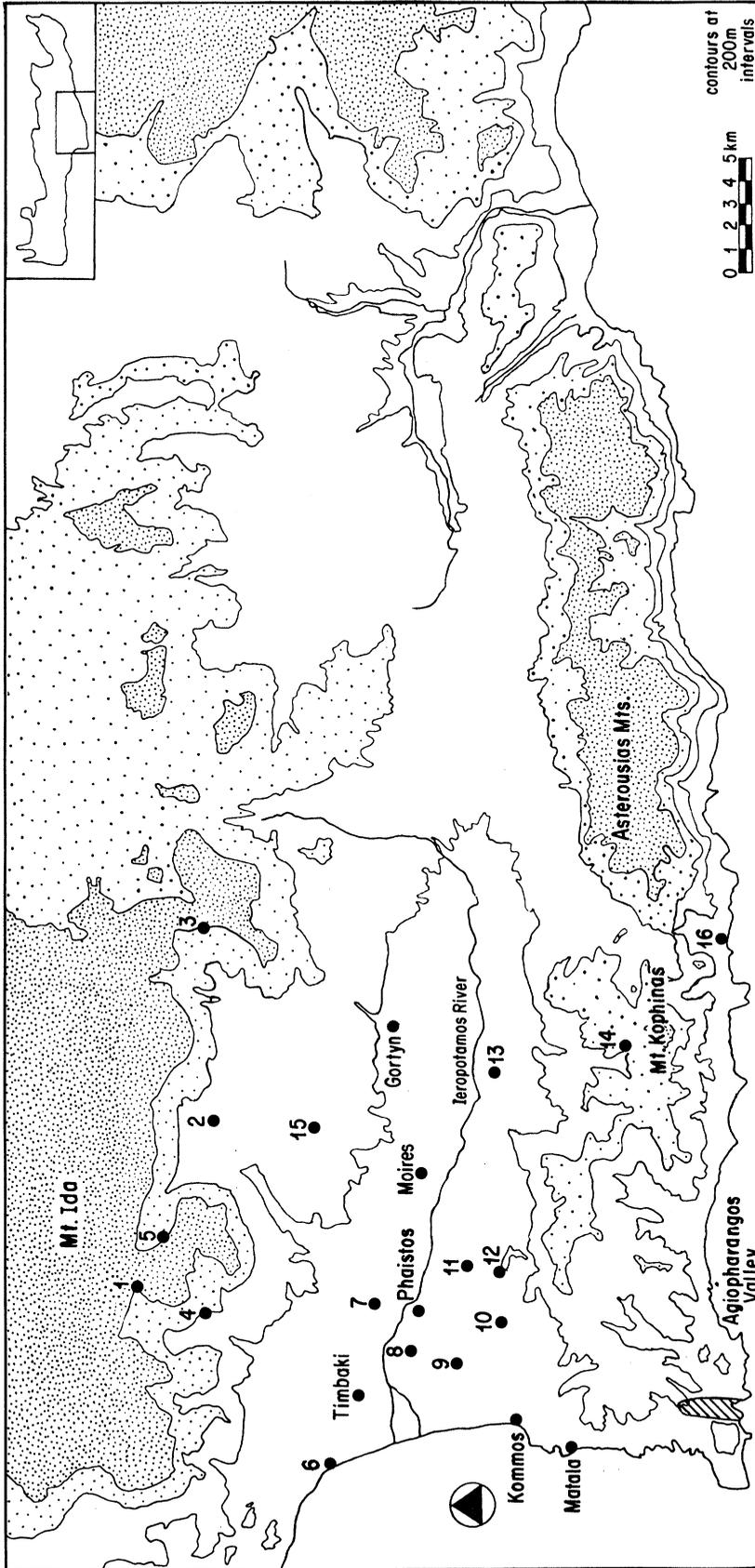


FIG. 1. Map of the Mesara Plain. 1. Kamares Cave, 2. Zaros, 3. Agia Varvara, 4. Grigorias, 5. Voriza, 6. Kokkinos Pyrgos, 7. Voroi, 8. Agia Triada, 9. Kamiliari, 10. Sivas, 11. Petrokephali, 12. Kouses, 13. Platanos, 14. Miamou, 15. Moroni, and 16. Lebena.

This project was organized in 1983 by the co-directors, L. Vance Watrous and Despoina Xatzi-Vallianou. At that time, Mrs. Vallianou was the Epimelitria responsible for archaeological activities in the Western Mesara, and she had spent a number of years collecting data for a projected register of local sites.² Watrous, who had been a member of the Kommos excavations, was interested in bringing survey techniques to bear on the specific problem of the rise and subsequent development of complex society in Crete. The Western Mesara was an ideal area for the project because it formed the heartland of the territory controlled by the city of Phaistos *ca.* 1900–150 B.C. Through survey we hoped to trace the rise of the Phaistian state and its regional structure as well as to identify the local ecological and cultural factors that might have contributed to its development.

The field methods can be traced back to the first regional survey in the Aegean, the interdisciplinary and problem-oriented Minnesota Messenia Expedition directed by William McDonald.³ Other survey projects in the Old and New Worlds which addressed a central problem, such as the origins of agriculture or the rise of complex society, had suggested that these questions are closely related to regional geomorphological, ecological, and historical processes.⁴ Since the Western Mesara survey had a similar focus, it was organized as an interdisciplinary project meshing cultural and scientific concerns.

An important advantage in tackling the Western Mesara was that previous excavations there provided an archaeological framework for our research. Consequently, we could address complex historical questions relatively quickly, rather than spending much time worrying about basic chronological or ceramic problems or struggling to define the regional settlement structure. Earlier excavation also yielded a rich harvest of information on the Bronze Age region: settlements at Phaistos, Agia Triada, and Kommos; the Minoan palace at Phaistos; tombs at Agia Triada, Phaistos, Kamilari, and Kalyvia; villas at Agia Triada; rural farmsteads at Kannia and Kouses; a harbor complex at Kommos; a cave sanctuary at Kamares and a peak sanctuary on Mt. Kophinas (Fig. 1).⁵ For the Classical–Roman periods, cities at Phaistos and Gortyn, Hellenistic and Roman tombs at Matala and Phaistos, temples at Gortyn and Kalamaki, sanctuary complexes at Kommos and Lebena, port towns at Matala and Lebena, and many farmsteads had been explored.⁶ For

²For a preliminary notice of Despoina Vallianou's earlier work in the Western Mesara, see Vallianou 1987.

³McDonald and Rapp 1972. The techniques of the Messenia survey have been refined by subsequent projects in the southern Argolid and Kea: Jameson 1976, pp. 74–91 and van Andel and Runnels 1987 (southern Argolid); Cherry, Davis, and Mantzourani 1991 (Kea).

⁴On the development of early farming and complex societies, see, for example, Braidwood and Howe 1960; Flannery *et al.* 1967; Sanders, Parsons, and Santley 1979; Adams 1981; Renfrew and Wagstaff 1982. For a recent synopsis of fieldwork on the question of early state societies, see Wright 1988.

⁵A recent synopsis of the Italian excavations at Phaistos, Agia Triada, Kamilari, Kalivia, Kannia, Gortyn, and Lebena appear in DiVita, La Rosa, and Rizzo 1984. For the excavations at Kommos, see the preliminary reports by Joseph Shaw in *Hesperia* (Shaw 1979, 1980, 1981, 1984, 1986). For Kouses, see Marinatos 1924–1925. Kamares: Dawkins and Laistner 1912–1913 and Rutkowski 1986, pp. 48–49, 53, 69. Mt. Kophinas: Rutkowski (1986, p. 97) gathers the scattered references.

⁶See Sanders 1982. For Matala, see *PECS*, p. 558.

more recent periods, the Byzantine–Ottoman city at Gortyn, Agioi Deka, churches at Agios Ioannis, Gortyn and elsewhere, the monastery at Vrondisi, and graves in and around Gortyn had also been the subject of extensive research.⁷ There also exists a published pollen sequence from the region.⁸

THE WESTERN MESARA REGION

The Mesara, the largest plain on the island (362 sq. km.), is located in the south-central portion of Crete (Fig. 1; Pl. 44). Separated from the north coast by the elevated central spine of the island, the Mesara region historically faced southward toward North Africa.⁹ Bounded on the north by the massif of Mt. Ida (elev. 2453 m.) and on the south by the Asterousias Mountains (Pl. 45), the Western Mesara is drained down its center by the Ieropotamos River, which runs westward into the Libyan Sea. More than two-thirds of the best arable soil (40,485+ ha.) on the entire island is located in the Mesara Plain.¹⁰ Throughout history the western end of the Mesara has been the most densely settled part of the plain because of its rich, alluvial bottomland, ample groundwater, and open coastline. The Bronze Age center at Phaistos and the Roman capital at Gortyn were both located there. Today the Western Mesara is divided into two county-sized *eparchias*, Pyrgiotissa (pop. 8,370) along the west coast and Kainourgio (pop. 20,346) to the east (Fig. 2).

The broad alluvial floor of the Mesara opens out into a wide coastal plain at its western end (Pl. 45). Watered by the Ieropotamos River and numerous irrigation channels, this lowland consists chiefly of orchards, meadows for grazing, and garden plots. The largest settlements in the Western Mesara, the towns of Moires and Timbaki and the villages of Voroi, Pobia, and Petrokephali, are located along the edge of this lowland (Fig. 1). Rising out of the center of the Western Mesara is the steep, three-kilometer-long ridge of Phaistos with the Minoan palace at its eastern end (Pl. 46:a). To the north of the Ieropotamos River the land rises gradually toward the foothills of Mt. Ida. This long, dry, eroded slope is planted largely in olives, except for the area around Timbaki, which has been transformed into a vast jungle canopy of *thermokipia* (hothouses). In contrast, the high foothills (elev. 350+ m.) along the base of the Idaean Range have an abundance of springs and support a number of large villages (e.g. Zaros, Kamares, and Grigorias).

South of Phaistos, rolling hills and valleys planted mainly in grain, legumes, and olives extend to the rocky base of the Asterousias Mountains. The poorer villages of Kamilari, Pitsidia, Kouses, and Listaros are located on these hilltops next to small springs. At the southwest corner of the plain lies the Minoan harbor town of Kommos. Two kilometers south of Kommos is the bay of Matala, where the main harbor

⁷Gortyn: *PECS*, pp. 362–363 and DiVita 1988. Agios Ioannis: Borboudakis, Gallas, and Wessel 1983, pp. 325–328. Monastery at Vrondisi: Curuni and Donati 1988, p. 391; Spanakis 1984, pp. 162–164, with bibliography. See also Tsoungarakis 1988.

⁸Bottema 1980.

⁹This section on the Western Mesara region was written by L. Vance Watrous.

¹⁰Allbaugh 1953, p. 48.

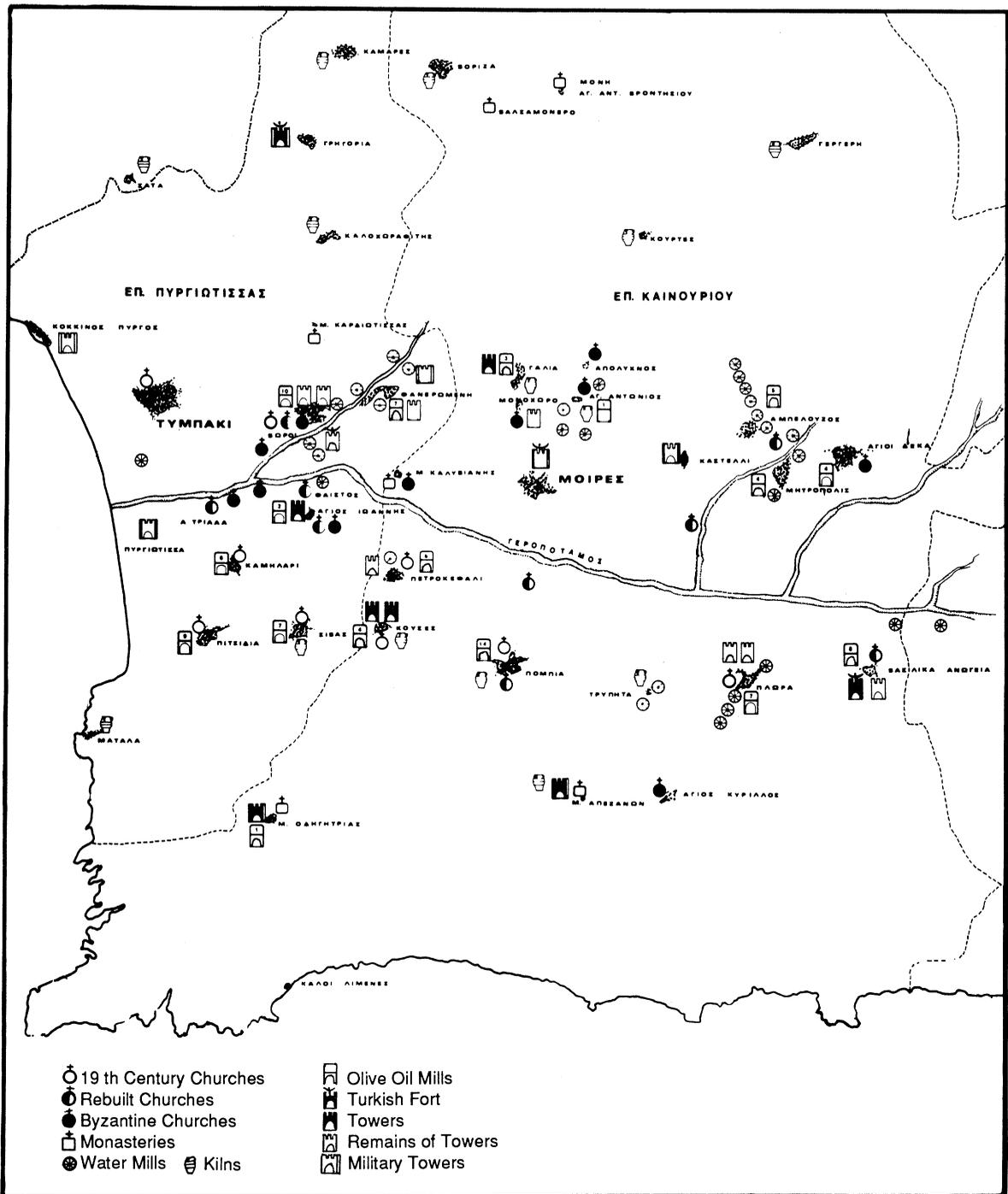


FIG. 2. Map of Principal Monuments of the Byzantine-Ottoman period in the Western Mesara. After Vallianos and Kokkore 1987, p. 29.

town of the Hellenistic–Roman Mesara was located (Pl. 46:b). Further south and east, the Asterousias Range rises to an elevation of 1,231 m. (Mt. Kophinas), a barren landscape of limestone broken by small valleys, which descends abruptly to the south coast. Along this dry, narrow coast there are only two small harbors, at Lebena and Kaloi Limenes, each inhabited primarily by a few fishermen during the summer.

Average temperatures in the Western Mesara are in the 50's F. (10–15° C.) during the winter months and in the 80's (25–30° C.) the rest of the year. It is not unusual for the temperature to reach 100° F. during the summer. Annual rainfall, confined to October through March, averages 25.6 inches (650 mm.) as measured in the foothills of Mt. Ida; it is less on the plain. Much of the rain is channeled down the mountain slopes in small tributaries to the Ieropotamos River at the center of the valley. Villages in the region are often located at the base of the foothills, at points where up-slope streams or springs converge on the fertile bottomland. Earlier this century, such locations off the floor of the plain were also considered healthier in the face of widespread malaria.¹¹ While the tributaries in the Western Mesara are seasonal, the Ieropotamos River flows perennially, and in the early years of this century it often flooded during the winter, creating an extensive, shallow lake between Phaistos and Petrokephali. Today, with the construction of channels (Pl. 49:c), the river is used for irrigation of the plain during the dry season.

The Western Mesara itself is a diverse region. For example, the population functions within different socioeconomic levels. Within each *eparchia*, there is a single large town. According to the 1981 census, Tymbaki (in Pyrgiotissa) had a population of 3,864 and Moires (in Kainourgio) had 3,501 (Fig. 1). All national and regional public services (the post office, hospital, police station, agricultural unions, telephones/telegram, and social security offices) are located in these towns, as are most private commercial services and businesses (banks, agricultural supply stores, mechanics, books and stationery supplies, lumber). As in the past (see *History of Settlement*, pp. 222–233 below), however, the majority of the population lives in villages across the rural countryside; these villagers must earn their livelihood from the land. Life in the villages (see *Traditional Life and Land Use*, pp. 240–243 below) follows a different routine from that in the towns. Furthermore, life within these individual villages is heterogenous, reflecting the physical diversity (see *Geology and Soils* and *Human Use and Impact on Vegetation*, pp. 197–204 and 210–214 below) of the Western Mesara itself. Zaros, for example, situated near a spring high in the foothills (elev. 340 m.) of Mt. Ida is a large village (pop. 2,266) grown prosperous through shepherding. In contrast, the next largest village, Pobia (pop. 1,114), is a low-lying agricultural community located at the southern edge of the plain. On the coast, Matala and Kaloi Limenes (pop. 75) were seasonal villages until the middle of this century. A number of smaller villages such as Kalyvia (pop. 19), Listaros, Kouses, and Miamou (pop. 213) subsist primarily on a combination of farming and shepherding. Most (but not all) of these present-day villages in the Western Mesara were established during the Byzantine–Ottoman period (see *The Western*

¹¹ Allbaugh 1953, pp. 145–148.

Mesara during the Byzantine through Ottoman Periods: A.D. 400–1894 and Settlements and Monuments of the Western Mesara: A.D. 961–1900, pp. 233–237 and 237–240 below).

GEOLOGY AND SOILS

This study of the landscape, carried out in 1984 and 1987,¹² had the following objectives: (1) to characterize the geomorphology and soils of the region and develop a stratified sampling procedure for the archaeological survey; (2) to reconstruct the Holocene environmental history of the Western Mesara; and (3) to determine the environmental impact of prehistoric and historic settlement and land use, the last two in conjunction with the botanical and ethnographic research. Because of our interest in the development of the Minoan palatial system, the geological research concentrated on the Bronze Age environmental history. The methods employed were those developed by Pope and others in the southern Argolid.¹³

With the aid of aerial photographs, geological maps, and intensive fieldwork, five physiographic land units within the region were defined (Fig. 3). These units, each with their unique geomorphic and soil characteristics, formed the basis for the archaeological sampling strategy used by the project. In tandem with botanical and land-use data, they will define the environmental zones of the region in our final analyses. Fieldwork within each of these units helped determine the history of soil development and erosion in the Holocene and related alluvial, colluvial, and aeolian cycles of deposition. The fieldwork focused on natural and man-made exposures of soil and sediment stratigraphy. Most of the exposures examined were in the banks of seasonal streams; aeolian depositional cycles in sand quarries near the villages of Matala, Pitsidia, and Kalamaki were also found. Fieldworkers used a hand-operated soil auger with a seven-centimeter diameter to examine subsurface deposits in critical areas.

In our investigation of the entire Western Mesara, over thirty stratigraphic profiles were described in detail, and many more were examined for comparative purposes. These descriptions included the thickness, color, and character of sediments, soil horizons (especially for buried and relict soils), and the presence of archaeological materials and their associations. Artifacts, primarily sherds, were collected from exposures and auger tests to determine the maximum age of the deposits. Relationships between archaeological sites and geologic surfaces were also recorded to provide minimum ages for associated soils and underlying sediments. Using these two methods, we were able to assign ages to most of the soils examined (Fig. 4), although not always as precisely as desired.

A limited program of detailed mapping of Pleistocene and Holocene soils and deposits, especially in areas adjacent to Neolithic and Bronze Age sites, was also carried out. The techniques used included recording and mapping colluvial and alluvial terraces associated with the banks of seasonal streams and tracing paleosoils

¹²This section on the Geology and Soils was written by Kevin Pope.

¹³Pope and van Andel 1984; van Andel, Runnels, and Pope 1986.

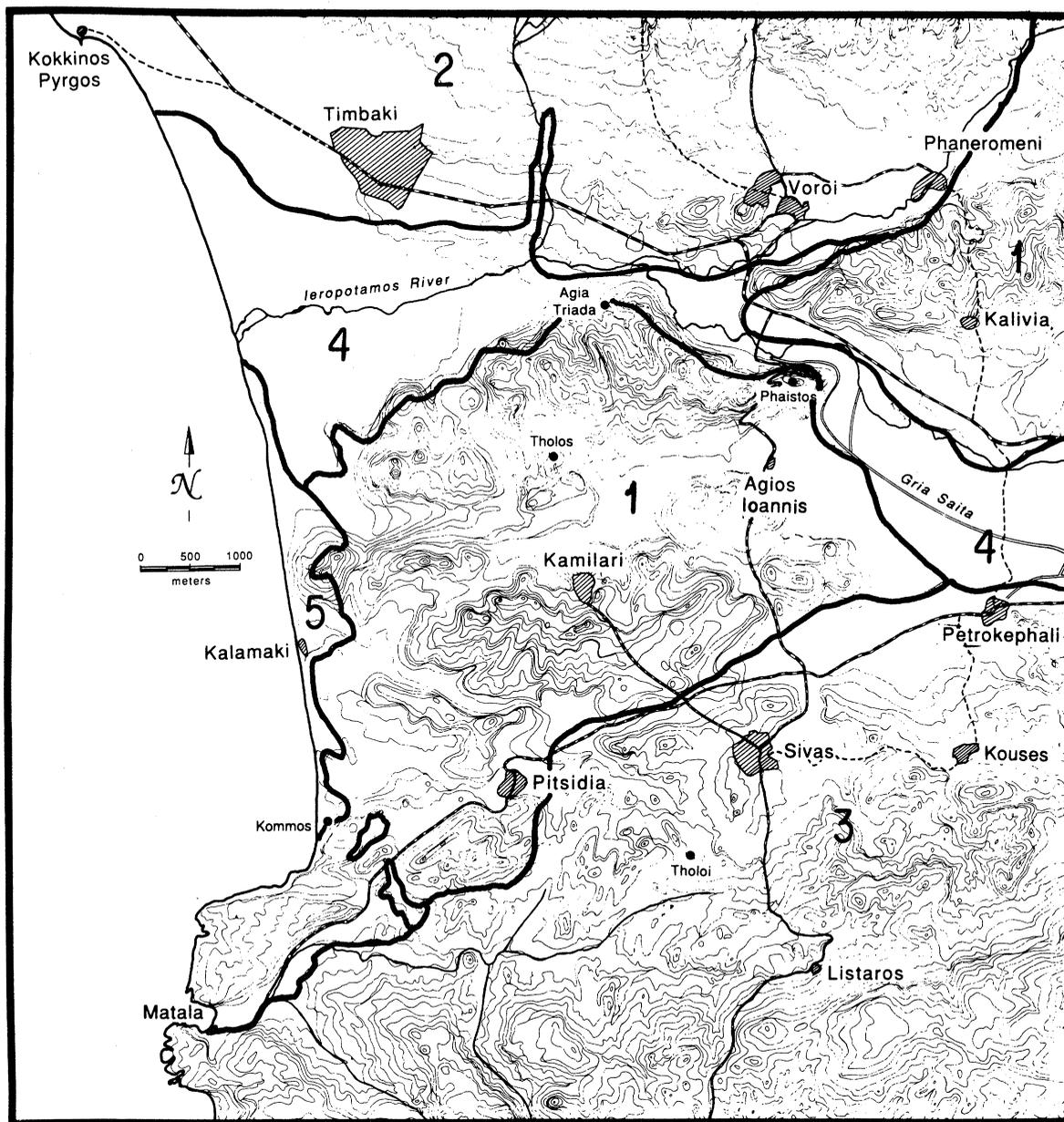


FIG. 3. Physiographic zones in the Western Mesara

(and ancient soils) to the surface and defining their extent on the surface. The latter was often possible because the paleosoils (Pl. 47:a) are usually redder in color than their younger equivalents (Pl. 47:b), due to the longer period for oxidation of ferrous minerals. Relict paleosoils (soils found on old land surfaces), which probably date to the Middle or Early Pleistocene, were mapped. The detailed mapping program, coupled with our stratigraphic studies, enabled us to quantify the magnitudes of erosional and depositional cycles.

Alluvial Stratigraphy

Aeolian Stratigraphy

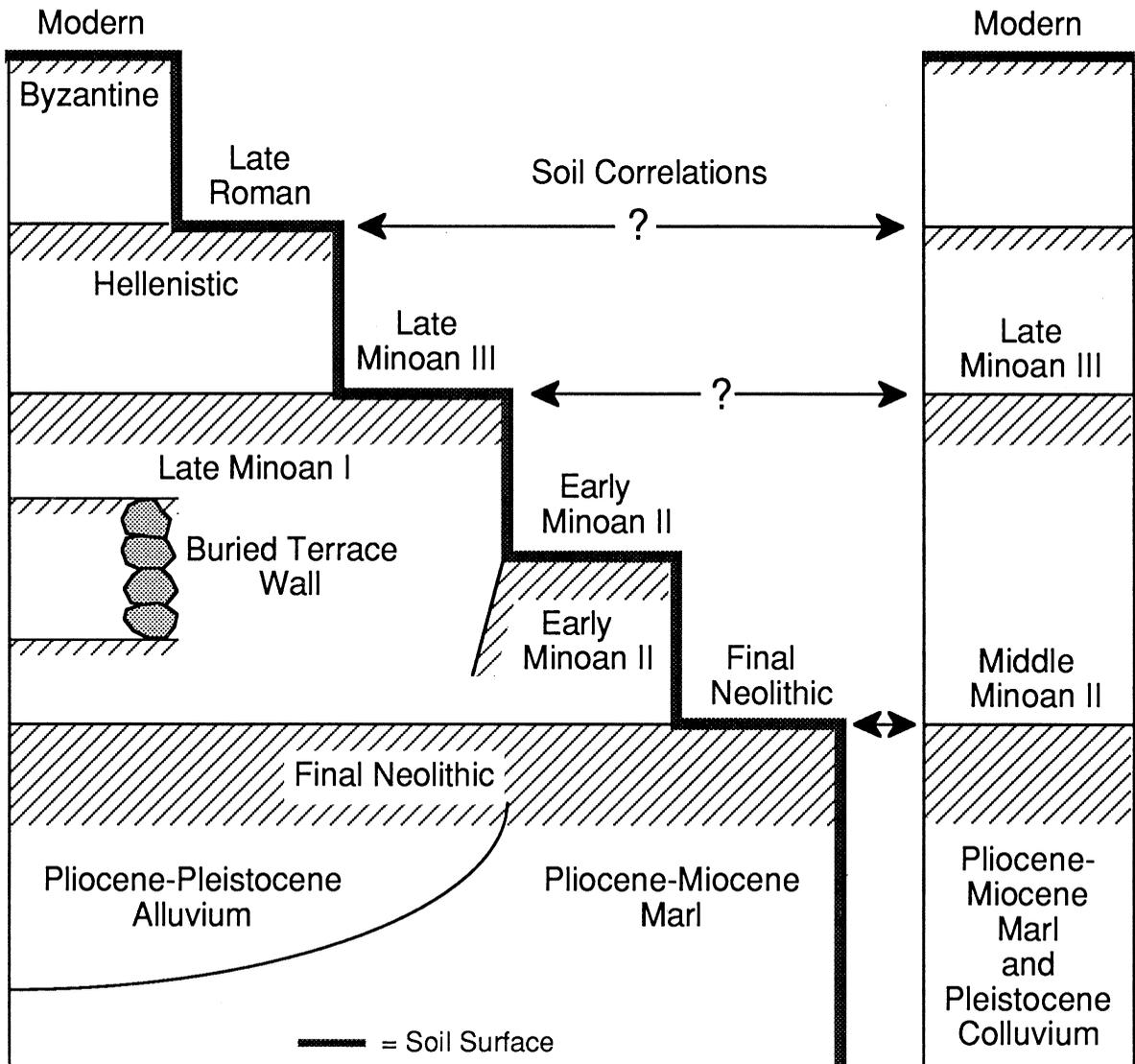


FIG. 4. Composite Alluvial and Aeolian Stratigraphy of the Western Mesara. The lengths of the diagonal lines under the soil surfaces indicate the degree of soil development. The archaeological periods shown on top of soil surfaces are derived from the oldest sites found on these soils and indicate the maximum age of the underlying sediments. Archaeological periods beneath soils come from the youngest artifacts deposited within the sediments and provides the minimum age for the sediment. Final Neolithic artifacts are found only within the upper 50 cms. of the soil and date a period of slow deposition during soil formation. Elsewhere artifacts are found throughout the deposit. Early Minoan artifacts are confirmed in only one location; other artifacts are known to be extensive. The stratigraphical position of a buried Middle Minoan agricultural terrace (check dam) is depicted. Arrows show probable correlation between alluvial and aeolian buried soils.

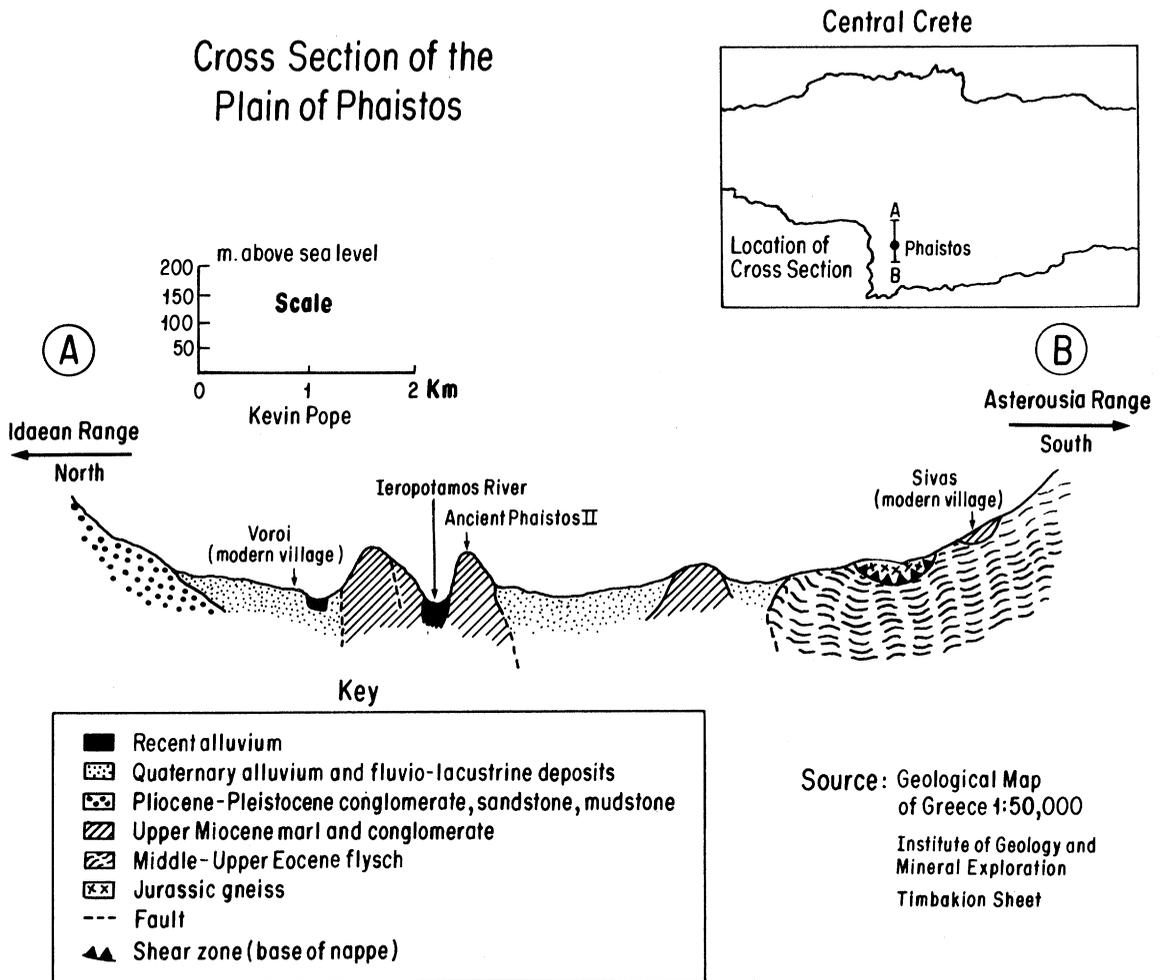


FIG. 5. Geological Cross-section of the Western Mesara

The Mesara Plain lies along the convergent boundary between the Aegean and African land plates, and the plain has therefore had a dynamic geologic history. A period of subduction along this plate boundary in the Early Tertiary resulted in the formation of a series of overthrust sheets composed of sedimentary and metamorphic rock, including limestones, sandstones, shale, metaquartzites, schist, and ophiolites.¹⁴ Today these overthrust sheets form the Asterousias Mountains and the flanks of Mt. Ida (Fig. 5). The Mesara, as well as most of Crete, was submerged for much of the Miocene and Pliocene, when thick deposits of marl mud and conglomerates accumulated in shallow seas.¹⁵

The most recent period of major tectonism began in the Late Pliocene when regional uplift accompanied by normal faulting occurred throughout Crete. This

¹⁴Wood 1984.

¹⁵Meulenkamp, Jonkers, and Spaak 1984.

tectonic episode appears to have also taken place elsewhere in the Aegean plate boundary region and was responsible for the formation of graben systems (tectonic depressions) throughout the Peloponnese.¹⁶ This period of major uplift and faulting continued until the Middle Pleistocene in the vicinity of Corinth, with only a minor shift in the Late Pleistocene that tapered off in the Holocene.¹⁷ If the timing of these events is similar in the Peloponnese and in the Mesara, then the modern system of ridges and valleys found in the Mesara had formed by the Middle Pleistocene. Subsequent tectonism, perhaps an uplift of a few meters, would have occurred after the region was settled in the Neolithic period. Support for this view is found in the Pleistocene soils and sediments discussed below.

The Western Mesara is divided up into five physiographic regions, based primarily on bedrock geology and geomorphology (Fig. 3). Region 1 is a complex system of valleys and ridges formed by a series of faults and uplifted blocks of Miocene and Pliocene marl. The marls are not homogeneous but contain beds of conglomerates, evaporites, sandstones, and mudstones. Conglomerates typically make up the ridge crests, with easily eroded marl and other sedimentary units comprising the colluvium-covered slopes. (Cobbles of chert found in these conglomerates were used by Neolithic and later groups to fashion the stone tools found in the survey.) Soils on the ridges are thin or nonexistent, and the white marl bedrock is frequently exposed. These ridges and their adjacent slopes are actively eroding (Pl. 47:d), the process aided by mechanical plowing, so that few intact soil profiles were observed.

Thick, extensive deposits of Pleistocene sediments lie in Region 2, with much thinner and less extensive deposits occurring in and adjacent to the foothills of Region 3. These sediments include a reddish Pleistocene alluvium derived from the erosion of the adjacent Idaean and Asterousias Mountains, possibly during the period of faulting that created the Mesara Plain. Evidence for the contemporaneity of the faulting and the red alluvium is found near the faults north of Kokkinos Pyrgos and near the village of Sivas. The alluvium is composed mostly of an angular breccia, possibly the result of fault movement. Soil development in these Pleistocene deposits is comparable to that found in Middle Pleistocene deposits in the Argolid.¹⁸ The soils have thick, reddish brown (Munsell 5YR-2.5 YR hues) B horizons with abundant alluvial clay and in many instances large (1-4 cm. in diameter) pedogenic carbonate concretions. Soils in Greece with comparable development have been dated by radiometric methods to older than 250,000 years before the present.¹⁹ If the Mesara deposits are of a similar age, this would confirm our hypothesis, based on the tectonic history of Corinth, that the present-day ridge and valley topography of the Mesara was formed before the Middle Pleistocene.

Region 3, like Region 1, is composed of ridges and valleys, but because of its distinct bedrock, its soils and hydrology are different. The hills in Region 3

¹⁶ Angelier 1978; Dewey and Sengor 1979.

¹⁷ Schroder and Kelletat 1982.

¹⁸ Pope and van Andel 1984.

¹⁹ Pope, Runnels, and Ku 1984.

are composed for the most part of metamorphic rocks, including schist, gneiss, ophiolite, metamorphosed sandstone, and red radiolarian cherts. The soils are generally thinner than in Region 1, even on surfaces of similar slope. This is probably due to the metamorphic nature of the bedrock, which breaks down less rapidly than the marls of Region 1. Thus, when stripped of its soil cover, Region 3 is much slower to recover than Region 1. In several locations, porous Miocene marls overlie impermeable metamorphic rock, and freshwater springs occur at the contact, especially around the village of Sivas. Elsewhere such springs are rare, except in the high relief area near Phaneromeni in Region 1.

Gray to brown (mostly Munsell 10 YR hues) Holocene alluvium deposited by the Ieropotamos River covers virtually all of Region 4 with thicknesses of more than 10 meters. On the east side of Region 4, the broad plain of the Ieropotamos River extends for many kilometers, embracing vast areas of Holocene alluvium. Similar Holocene alluvium and colluvium comprise most of the surface (upper 3–10 m.) sediments in Regions 1 and 3 (Fig. 5). Soils of the Holocene deposits are often irrigated and are prized for modern agriculture. The expansion of ancient land use, principally forest clearing, cultivating, and grazing, caused several periods of landscape destabilization and hillslope erosion in the Bronze Age and later periods. These episodes of erosion resulted in the deposition of the Holocene sediments in the valleys (Figs. 4 and 5). Interstratified with these sediments are several paleosoils which mark periods of landscape stability. Major periods of hillslope erosion and valley deposition occurred in the Middle Minoan and Late Roman–Byzantine periods, with minor episodes in the Final Neolithic–Early Minoan, Hellenistic, and modern eras.

The Mesara is bounded on the west by the Libyan Sea and the extensive aeolian sand deposits of Region 5 (Fig. 3). These deposits occasionally reach thicknesses in excess of 10 meters, but more often they form a veneer of sand a few meters deep covering the seaward side of hillslopes. Paleosoils within these sands document their episodic accumulation, the result of cycles of Bronze Age and later soil erosion, which increased sediment supply to the coastal zone. These sands are currently being quarried for cement by the busy construction industry in central Crete.

Patches of a reddish brown paleosoil (Palaeoxeralf), similar to the Pleistocene alluvial soils described above, are found throughout all physiographic regions. (The Palaeoxeralf is a soil in which sediment has accumulated so slowly that soil formation has been unbroken, despite alluvial or colluvial deposition.) Larger patches (up to many hectares) occur on level or gently sloping terrain (Pl. 47:a), while smaller patches are often in saddles or behind protective spurs in the marl ridges. These patches are apparently remnants of a once extensive soil cover and are thus evidence of a long period of landscape stability throughout the Mesara, which perhaps lasted for much of the latter part of the Pleistocene and early part of the Holocene. Several Final Neolithic sites found on top of remnants of these soils indicate that these Palaeoxeralfs were largely intact before the Bronze Age (Pl. 47:c).

In the Final Neolithic period, when the earliest settlers arrived in the Mesara, the landscape probably consisted mainly of Palaeoxeralf soils supporting woods

of deciduous oak.²⁰ Dry, upland ridges like those around Kamilari and Phaistos probably maintained shrub communities similar to those of today (see *Human Use and Impact on Vegetation*, pp. 210–214 below). Forests of plane and willow would have flanked the Ieropotamos River. In the absence of human activity, this vegetation cover helped maintain a stable landscape. Evidence for the once extensive, now mostly stripped, deep, well-developed Palaeoxeralf soils can be found on the coast where aeolian sands many meters thick have created a fossilized landscape. Coastal sand quarries reveal that a moderately sloping colluvial mantle capped with a Palaeoxeralf lies underneath the aeolian deposit. Since the sand buries Neolithic to Middle Minoan II sites and is interstratified with Middle Minoan III sites, it must have begun to accumulate along the coast during the Middle Minoan II period (Fig. 4).

Bottema's pollen analysis indicates that the oak forests in the Western Mesara began to disappear in the third millennium B.C., approximately the same time that the erosion of the Palaeoxeralfs began. A dramatic rise in the number of local settlements after 1900 B.C. (see *History of Settlement*, pp. 222–233 below) suggests that the forests and soils were removed by erosion brought about by contemporary land-use practices such as forest clearing, cultivation, and grazing (Pl. 49:d).

The erosional history of Crete is comparable to that observed in Mainland Greece, in the southern Argolid.²¹ Similarities (and parallel differences) in the erosional and settlement histories of the two regions strengthen the hypothesis that the histories in each area are causally related. In the Argolid as in the Mesara, Final Neolithic and Early Bronze Age sites are associated with remnants of Palaeoxeralf soils: both the Mesara and the Argolid witnessed the beginnings of major settlement expansion and soil erosion in the Final Neolithic–Early Bronze Age. While the Argolid seems to have experienced sharply reduced settlement and incipient landscape stability in the Middle Helladic Period, the Mesara experienced expanding population and widespread erosion in the Middle Minoan period.

The Holocene alluvial and aeolian depositional history of the Mesara is summarized in Figure 4. Four periods of alluviation are identified, two occurring in the Bronze Age and two during historical times. Three aeolian deposits are also identified, the earliest of which is Middle to Late Bronze Age in date. The latter two aeolian deposits contained no artifacts or associated sites and thus are of uncertain date. Stable periods marked by episodes of soil formation separate the various alluvial and aeolian events. The oldest soil is the Palaeoxeralf discussed above, which is formed of pre-Holocene material. At several sites, Final Neolithic and Early Minoan I sherds were found in the upper 50 centimeters of a cumulic Palaeoxeralf (Pl. 49:c). These cumulic Palaeoxeralfs provide the first evidence for landscape destabilization and incipient soil erosion, which were probably related to the deforestation attested in the pollen record.

The earliest alluvial deposits derived from human-induced slope erosion contained Early Minoan I and II sherds. In the plain near Phaistos, an Early Minoan

²⁰ Bottema 1980.

²¹ Pope and van Andel 1984; van Andel, Runnels, and Pope 1986.

site found by the survey team rested on top of alluvium containing Early Minoan sherds. This discovery confirms that alluviation, and by implication soil erosion, was well under way by Early Minoan times. How extensive this early erosion was has not been determined, but it may well have been substantial.

By the Middle Minoan period (*ca.* 2100–1700 B.C.), severe erosion in the Western Mesara had become widespread; deep alluvial and colluvial deposits containing Middle Minoan sherds are common in the region. Two buried terrace walls (check dams) were found eroding out of a gully southwest of Kamilari. They are *ca.* 75 cm. high and are built of a single course of undressed stones. One can be dated by its stratigraphy to late in the Middle Minoan period (Fig. 4) and may attest to an early attempt to combat soil erosion, which must have become severe by this time. Late Minoan III and Iron Age sites were found on top of this alluvium, confirming the Minoan date of its deposition. The sand accumulation along the coast was probably due to the increased sediment yield of the Ieropotamos River, which in turn was caused by widespread erosion within the plain during the era of the first palaces (*ca.* 1900–1700 B.C.). This period of erosion apparently came to an end after Late Minoan I (*ca.* 1700–1550 B.C.) and was followed by a long episode of landscape stability, only briefly interrupted in Hellenistic, Medieval, and recent times. These later, minor erosional events have been dated by archaeological materials in the same way as the Minoan episodes.

Tentative correlations can be made between the alluvial and aeolian stratigraphies based on age, relative stratigraphic position, and the degree of soil development of each unit (Fig. 4). These correlations support the hypothesis that aeolian deposition is caused by soil erosion and the resulting increase in sediment supplied to the coast. The earliest aeolian deposition occurred sometime between the Middle Minoan II and Late Minoan III periods, which roughly corresponds with the first major period of alluviation in the Middle Bronze Age. Aeolian deposition may lag slightly behind alluviation, but the dates are not precise enough to confirm this. Apparently the minor soil erosion in the Final Neolithic to Early Bronze Age was not severe enough to cause an aeolian event. Correlation of the last two aeolian and alluvial deposits is based solely upon stratigraphic position and degree of soil development.

SEA LEVEL AND COASTAL CONFIGURATION

Investigations along the coastline of the Mesara revealed evidence for three distinct sea levels over the last six millennia (Fig. 6).²² Within the Matala bay (Pl. 46:b), submerged fish tanks and tombs of Roman date (Pl. 48:a) and beachrock embedded with fragments of Roman amphoras indicate that 2000 years ago the local sea level was approximately 1.20 m. lower than the present level.²³ In addition, the configurations of the local beachrock suggest that between 4000 B.C. and the end of the first

²²This section on Sea Level and Coastal Configuration was written by Nikos Mourtzas.

²³Mourtzas 1988.

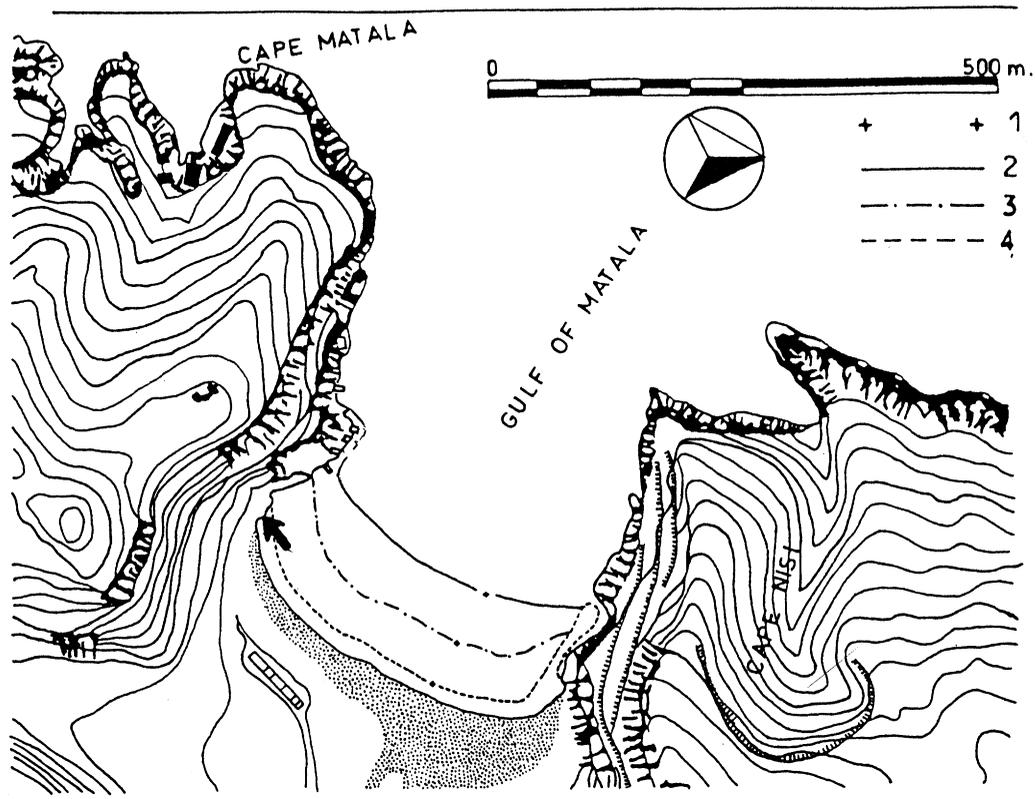


FIG. 6. Map of coastal configurations at Matala. Previous coastlines on the map are marked by broken lines. The location of the underwater Roman tomb shown in Plate 48:a is indicated by an arrow.

millennium B.C. the level of the sea changed twice. At one period the sea level was 2.50 m. lower and at another earlier phase 3.80 m. lower than at present. During the Roman period the shoreline would have extended 15 to 20 m. further out to sea; during the earlier two phases the shoreline would have been approximately 60 m. and 90 m. further to the west. The Bronze Age coastal site of Kommos thus was probably protected to the north by a large spit of sand.²⁴ Only partially visible today, this breakwater would have created a natural harbor against the fierce north (*Meltemi*) and south (*Livas*) winds that blow during the sailing season. These sea level changes are probably the result of both tectonic and eustatic processes.

BOTANY AND BOTANICAL RESEARCH METHODS

The plant life of the Mesara played a major role in the nature and evolution of local society.²⁵ The relationship between society and plants (both domestic and wild) can

²⁴Gifford 1989.

²⁵This section on Botany and Botanical Research Methods (pp. 205–214) was written by Jennifer Shay and C. Thomas Shay.

be seen most clearly in the life of the traditional Mesara (see *Traditional Life and Land Use*, pp. 240–243 below). Archaeological and literary evidence indicates that the regional flora was important in providing food, fuel, fodder, medicine, building materials, and many other benefits. To explore the role that plants played in the culture of the Mesara, the botanical research sought to (1) survey the local flora; (2) study existing plant communities in relation to their environment; (3) assemble data on present-day ethnobotany and human influences on the landscape; and (4) reconstruct as far as possible the human-plant relations in the Mesara through time. A preliminary report on research toward the first three goals follows below; the integrative work for the fourth goal will appear in the final publication.

Three field seasons of botanical work were carried out near archaeological sites (where possible) and along a south–north transect from the south coast to the foothills of Mt. Ida, to encompass the range of botanical environments found in the Western Mesara. Areas along the transect were (1) the valley immediately east of Kaloi Limenes on the south coast; (2) the landscape adjacent to the tholos tomb and Monastery of Odigitria in the Asterousias mountains; (3) the southern edge of the Mesara valley near the Sivas tholos tombs; (4) the Kamilari-Phaistos environs in the center of the Mesara valley; (5) the floodplain of the Ieropotomos River; (6) the northern edge of the plain between Phaneromeni and Voroi; (7) the area between Voroi and Grigorias in the Idaean foothills; and (8) the landscape between Galia and Kourtes north of Moires and in the foothills of Mt. Ida between Zaros and Kamares (Figs. 1 and 2).

The effects of grazing and burning were noted in certain areas. For the effects of grazing we compared vegetation inside and outside a fenced enclosure in the Asterousias mountains south of Listaros (Pl. 52:a). For the effects of burning we surveyed a shrub area near Listaros that had been burnt in September 1985. We also compared the vegetation on three grain fields near Matala, unused since 1942 (Pl. 52:b), with that in the surrounding area to assess the effects of land abandonment.

At each location we made a list of plant species and an estimate of their abundance (rated dominant, abundant, frequent, occasional, or rare) by the amount of ground each species covered within an area of several hundred square meters. Cover of each stratum was estimated in terms of continuous (greater than 75 percent), discontinuous (25–75 percent), and scattered (less than 25 percent). In some cases the heights of shrubs were measured; in other cases, they were estimated as tall (2.0 m.), medium (0.5–2.0 m.), or low (less than 0.5 m.).

At some sites quantitative data were collected. In these cases, the percentage of bare ground and the amount of ground covered by each species of woody shrub was estimated in 10 randomly selected sample squares (2.0 by 2.0 m.) using a slightly modified Braun-Blanquet scale (Pl. 48:b)²⁶ of cover classes (i.e., class 1 = 5% or less ground cover, 2 = 6–25%, 3 = 26–50%, 4 = 51–75%, and 5 = 76–100%). A square (0.25 by 0.25 m.) was nested in the northwest corner of the larger square,

²⁶Braun-Blanquet 1932.

and the cover of herbs, mosses, and bare ground was estimated using the same scale. Specimens were collected in cases of uncertain identity. Notes were made on topography, slope, aspect, stoniness, and soils. At certain sites, soil samples were collected and photographs were taken. A selection of soil samples was subsequently analyzed at the Provincial Soil Testing Laboratory in Winnipeg, for texture, organic matter, pH, salinity, and the concentrations of carbonate, nitrate nitrogen, available phosphorus, and potassium.²⁷

For quantitatively sampled sites, the frequency of species occurrence (the percentage of squares in which a species occurred) and the average cover of each species were calculated. Plant-cover classifications were later converted to cover percentage by using their midpoints (e.g. cover class 1 [a trace to 5%] = 2.5%, cover class 2 [6 to 25%] = 15.5%, etc.).²⁸

Finally, to assess the alluviation in the Mesara through time and to supplement the pollen diagram already established by Bottema (1980), a set of four geological cores was drilled for a total of 25 meters of sediment in the Ieropotamos floodplain. Subsamples from these cores are being tested for pollen and other palaeoenvironmental data.

THE BOTANICAL TRANSECT

The 25-kilometer transect across the Western Mesara from the south coast to the Idaean foothills revealed striking changes in landforms, soils, vegetation, and land use. The descriptions below apply to the landscape in spring and early summer (roughly late April to early June), after the winter rains but before the summer sun and heat have dried the vegetation.

The south coast is a rugged line of steep slopes and sandy beaches interrupted by narrow valleys cut into the the Jurassic gneisses and Upper Cretaceous basalts of the hills (Pl. 48:c). Above the sea the rocky slopes are mostly bare, dotted with shrubs and patches of herbs and grasses. One such slope, less than two kilometers from Kaloi Limenes, is covered with spiny broom (*Calicotome villosa*) with densely prickly stems and golden flowers, Jerusalem sage (*Phlomis* sp.) with white wooly leaves and yellow flowers, and low rounded hummocks of thorny burnet (*Sarcopoterium spinosum*). Together these shrubs provide a scattered ground cover of less than 25 percent. Some tufted grasses such as *Hyparrhenia hirta* and *Stipa* spp. and small herbs also grow on these slopes. Flocks of sheep graze on the slopes and coastal plain where farmers cultivate olive trees, small plots of cereals, irrigated vegetables, and melons. In the mouths of some of the valleys there are dense thickets of

²⁷Analyses to date of the soil samples have revealed variable nutrient content but no significant differences in pH, nitrogen, phosphorus, or potassium from the various geological parent materials.

²⁸Dr. Michalis Damanakis (University of Crete) kindly verified grasses, and Mr. Zacharias Kipriotakis (Municipal Botanist for Herakleion) verified a number of other specimens. Difficult specimens were sent to Dr. W. Greuter, Director of the Berlin Botanic Gardens, for identification. Our plant nomenclature follows Tutin *et al.* 1964–1980, and most common names are taken from Polunin 1969.

gray-leaved shrubby atriplex (*Atriplex halimus*), spiny broom, and the dark green aromatic lentisc (*Pistacia lentiscus*) (Pl. 48:d).

The transect begins on the south coast near the village of Kaloi Limenes and leads northwards up into the Asterousias (see Fig. 1). The sandy beach with its planted tamarisks is left behind as one proceeds up one of the valleys into the mountains. Alongside the stream bed (Pl. 49:a) of the valley grow evergreen shrubs, primarily lentisc and wild olive (*Olea europaea* var. *oleaster*), and an occasional carob tree (*Ceratonia siliqua*). Further upstream the rocky slopes are dry and dotted with low shrubs, some in bloom. Yellow-flowered clumps of the densely branched and spiny legumes Jerusalem sage and the short phagnalon (*Phagnalon graecum*) contrast with the pink rock roses (*Cistus* spp.) and purple-blossomed compact shrubs of thyme (*Thymus capitatus*). Signs of animal grazing are everywhere, and trails can be seen threading through the vegetation. Herb cover is sparse: only the broad, strap-leaved sea squill (*Urginea maritima*) is prominent. Scree slopes support a few shrubs of lentisc and wild olive or are sparsely covered with small spiny bushes of blue-flowered lithodora (*Lithodora hispidula*).

Proceeding northward one ascends the Agiopharango valley (see Fig. 1).²⁹ Low, scattered bushes are intersected by countless animal trails. Particularly showy is the shrub Cretan ebenus (*Ebenus cretica*) with its erect spikes of rose-pink flowers and drooping branches. At the head of the valley sits the small monastery of Odigitria surrounded by grain fields, well-kept olive groves, cypress (*Cupressus sempervirens*), and some large carob trees. Further north the mountainous landscape turns into wild, rocky shrubland, broken only by a plantation of Aleppo pine (*Pinus halepensis*).

The village of Listaros in the foothills at the base of the Asterousias range marks the southern edge of the Mesara valley. As one descends into the Mesara, the steep limestone topography gives way to rolling hills where reddish soils overlie schists, gneisses, and other rocks of Eocene age (see *Geology and Soils*, pp. 197–204 above). Between Listaros and Sivas the landscape is covered by fields of grain and olives (Pl. 50:a). Wild vegetation here is more luxuriant than in the Asterousias; steep slopes are covered by thyme, Jerusalem sage, sage (*Savia triloba*), and other aromatic low shrubs and herbs. The herbs include the tall spikes of pale pink flowers and rushlike leaves of asphodel (*Asphodelus aestivus*), caraway (*Carum carvi*) with tiny white flowers and feathery leaves, and bulbous barley (*Hordeum bulbosum*). Wild pear trees (*Pyrus* spp.) also are found here.

The hills and valley floor of the Mesara are cultivated. Steep slopes and field margins are colonized by shrubby vegetation interspersed with a thin cover of herbs and grasses, such as thyme or thymelaea (*Thymelaea hirsuta*), a many-branched shrub with white, wooly branches and scaly leaves. Intermittent streams are found throughout the Mesara valley and have their own characteristic flora. Tall, spreading shrubs of oleander (*Nerium oleander*) with large pink flowers and Monks pepper tree (*Vitex agnus-castus*) with dark palmate leaves are often entangled with thickets

²⁹Described in Blackman and Branigan 1977.

of bramble (*Rubus ulmifolius*). Rushes (*Juncus* spp.), grasses (*Imperata cylindrica*, *Phalaris minor*), and a variety of herbs favor such damp places.

North of Sivas one descends into the broad floodplain of the Ieropotamos River with its lush orchards and irrigated fields (Pl. 49:b). Citrus fruits, pomegranates (*Punica granatum*), loquats (*Eriobotrya japonica*), and truck farms for vegetables thrive in this location. The river course in the center of the plain is marked by poplar (*Populus nigra*) and plane trees (*Platanus orientalis*), oleanders, brambles, and dense stands of the tall, bamboolike giant reed *Arundo donax*. But the floodplain also contains extensive marshlands; marshes and wet meadows are especially common between Petrokephali and Phaistos (Pl. 50:b). A number of the water channels (Pl. 49:c) and ditches are bordered by giant reeds, others by a more slender reed grass (*Phragmites australis*) with feathery plumes. The vegetation in the wet meadows consists largely of robust tussocks of grasses, rushes, and sedges (*Carex* spp.) and a variety of herbs including the pale green glandular spikes of yellow bartsia (*Parentuciella viscosa*), rounded white inflorescences of water dropwort (*Oenanthe* sp.), and purple spikes of loosestrife (*Lythrum hyssopifolia*).

In the center of the Western Mesara rises the steep marl ridge upon which sit the archaeological sites of Phaistos (Pl. 46:a) and Agia Triada. Native vegetation there today is diverse and is composed of many of the familiar shrubs found elsewhere in the Mesara, including wild olive, Jerusalem sage, phagnalon, and everlasting (*Helichrysum stoechas*), a short, wooly perennial with bright yellow flowers.

North of the Ieropotamos River the land begins to ascend to the foothills of Mt. Ida. The fields are planted in olives, cereals, and grapes. As one climbs, the terrain becomes more hilly, and one encounters shrubland, scattered trees of deciduous oaks (*Quercus pubescens*), and a few evergreen kermes oaks (*Q. coccifera*; Pl. 49:d), seen at an elevation of ca. 400 m. near the village of Moroni north of Moires (Fig. 1). The deciduous oaks range in diameter from 8 to 62 centimeters and are 2 to 8 meters in height. Two kermes oaks were 12 to 15 centimeters in diameter, although larger examples were seen in the area. Several of the trunks show scars where branches had been harvested. In this same community are rock rose, Jerusalem sage, thyme, spiny burnet (Pl. 51:a), wild olive, phagnalon, everlasting, wild pear, and St. John's wort (*Hypericum empetrifolium*), a low shrub with narrow leaves and numerous small yellow flowers.

The northern end of the transect is reached at 600 m. elevation on the steep scree slopes at the base of the Idaean massif (Pl. 51:b). Vegetation is patchy, perhaps due more to the steepness of the slopes and the lack of soil accumulation than to low rainfall. Indeed, rainfall is about twice as plentiful at this elevation as in the valley below. On one southeast-facing slope of 35–40 percent, the scree supports scattered trees of Aleppo pine joined in places by cypress, kermes oak, and domesticated olive. Scrub cover includes Jerusalem sage, spiny broom, and butcher's broom (*Ruscus aculeatus*), a spiny evergreen shrub with flattened branches that grow to almost a meter in height.

From the dry south coast to the subhumid foothills of Mt. Ida, the transect across the Mesara reveals a diversity of habitats and plant communities. Although topography, soil nutrients, and other factors play a role in this diversity, soil moisture is a particularly important influence on the composition of plant communities. Indeed, annual rainfall in the area varies from about 400 mm. at sea level to over 800 mm. in the Idaean foothills.³⁰

Plants have evolved a number of strategies for surviving or avoiding summer drought.³¹ Some shrubs, for example, survive drought with evergreen leaves, while others avoid it by shedding their leaves. Many herbaceous annuals and perennials also avoid drought by dying back before its onset. Other plants capture as much rainfall as possible; this is accomplished through stiff, upright branches and smooth bark that channel rainfall to the stem base and into the soil where the roots are deep and well-developed. Some shrubs lose their leaves entirely at the onset of summer drought, while others grow a new but smaller set of shoots and leaves.

These strategies are manifest in the plants along our transect. Table 1 shows the average percentage cover of selected shrubs in 18 sampling sites. Both evergreen (carob, lentisc, and thymelaea) and deciduous shrubs (spiny broom, thyme, and thorny burnet) occur throughout. Cretan ebenus is most common in parts of the Asterousias and in the Idaean foothills but is rare in the Mesara valley. Lentisc has a somewhat similar distribution. Other trees and shrubs are found only in the more moist northern foothills at an elevation of about 200 to 600 meters. This group includes Aleppo pine, myrtle (*Myrtus communis*), Montpellier maple (*Acer monspessulanum*), white oak, and kermes oak. This last species of kermes oak may assume a number of forms, ranging from a low shrub to a tall tree, depending on age, local grazing intensity, and environmental conditions. Large kermes oaks are common in the northern foothills, but in a much grazed area near the village of Vorizia these oaks grew as compact rounded bushes scarcely 50 centimeters tall (Pl. 51:c).

More than 400 species of flowering plants from the Mesara have been recorded, including 40 shrubs and over 350 herbs. Some are in Tables 1 and 2. The variation in Table 1 is due to the time of sampling (April 30–June 5) rather than to differences in the composition of the plant communities. Missing from Table 1 are species that flower during the winter and early spring, such as members of the iris (*Iridaceae*), orchid (*Orchidaceae*), amaryllis (*Amaryllidaceae*), and buttercup families (*Ranunculaceae*). Despite variations at the time of sampling, all herbs are better represented in the Mesara valley than in the Asterousias and Idaean foothills.

HUMAN USE AND IMPACT ON VEGETATION

The landscape of the Mesara abounds in over a hundred species useful for food, forage, fuel, construction, crafts, medicine, spice, or ritual.³² The main food plants are barley, wheat, various legumes, olives, and grapes. A variety of pot herbs are collected for food, such as the members of the mustard family (*Rapistrum* and

³⁰Zohary and Orshan 1965.

³¹See Margaris 1981 and Mooney 1981.

³²Shaw, Shay, and Frego in press.

TABLE 1: Average Percentage Frequency of Selected Herbaceous Species along Transect across the Western Mesara. n = number of localities sampled. t = trace, less than 0.1

SPECIES	<i>Asterousias Mountains</i> (n = 5)	<i>Mesara valley</i> (n = 8)	<i>Idaeon foothills</i> (n = 5)
GRASSES			
Poa (<i>Poa bulbosa</i>)	34.0	7.5	8.0
Cock's foot (<i>Dactylis glomerata</i>)	—	47.5	28.0
Brome (<i>Brome</i> spp.)	50.0	52.8	40.0
Wild barley (<i>Hordeum</i> spp.)	6.0	31.2	12.0
Wild oat (<i>Avena</i> spp.)	10.0	37.5	6.0
Hyparrhenia (<i>Hyparrhenia hirta</i>)	16.0	21.2	14.0
Piptatherum (<i>Piptatherum</i> spp.)	6.0	17.5	2.0
LEGUMES			
Sainfoin (<i>Onobrychis</i> spp.)	24.0	18.8	16.0
Clover (<i>Trifolium</i> spp.)	20.0	37.5	24.0
Medick (<i>Medicago</i> spp.)	2.0	50.0	32.0
Birdsfoot-trefoil (<i>Lotus</i> spp.)	4.0	50.0	4.0
Horse-shoe vetch (<i>Hippocrepis unisiliquosa</i>)	8.0	28.8	4.0
DAISIES			
Hawk's-beard (<i>Crepis</i> spp.)	14.0	43.8	28.0
Hedynois (<i>Hedynois cretica</i>)	34.0	13.8	14.0
LILIES			
Wild onion (<i>Allium</i> spp.)	26.0	11.2	6.0
Asphodel (<i>Asphodelus aestivus</i>)	22.0	25.0	32.0
Sea squill (<i>Urginea maritima</i>)	4.0	37.5	34.0
OTHER			
Wild flax (<i>Linum</i> spp.)	72.0	67.0	40.0
Scarlet pimpernel (<i>Anagallis arvensis</i>)	22.0	67.5	40.0
Plantain (<i>Plantago</i> spp.)	24.0	21.2	—
Yellow-wort (<i>Blackstonia perfoliata</i>)	6.0	37.5	28.0
Lagoecia (<i>Lagoecia cuminoides</i>)	20.0	17.5	28.0
Valantia (<i>Valantia hispida</i>)	16.0	20.0	14.0
Crucianella (<i>Crucianella latifolia</i>)	26.0	12.5	20.0
Bedstraw (<i>Galium</i> spp.)	34.0	6.2	20.0
Centaury (<i>Centaureum</i> spp.)	12.0	22.5	22.0

Erucaria) and leafy greens of the daisy family (*Lactuca serriola*, *Chicorium* spp., and *Tragopogon* spp.). *Chrysanthemum* (*Chrysanthemum coronatum*; see Pl. 51:d), wild oats (*Avena* spp.), and other tall grasses are frequently gathered for forage.

Common culinary spices used locally include the dried leaves of thyme and sage. These plants are also ingredients in herbal medicines along with a host of others, including olive, cypress, lentisc, oleander, and chamomile (*Anthemis chia*). As noted below (see *Traditional Life and Land Use*, pp. 240–243), lentisc, spiny broom, olive, and oak are among the woods burned for fuel. Olive, oak, cypress, and giant reed are used for construction in the Mesara villages. Monks pepper tree, rushes, spartium (*Spartium junceum*), and styrax (*Styrax officinalis*), which have strong,

TABLE 2: Average Cover of Selected Trees and Shrubs along the 25-km. Transect across the Western Mesara. n = number of localities sampled. t = trace, less than 0.1

SPECIES	<i>Asterousias</i> Mountains (n = 5)	<i>Mesara</i> valley (n = 8)	<i>Idaeon</i> foothills (n = 5)
TALL SHRUBS AND TREES (2 m.)			
<i>Evergreen</i>			
Olive cultivated (<i>Olea europea</i>)	—	—	0.3
Aleppo pine (<i>Pinus halepensis</i>)	—	—	0.8
Kermes oak (<i>Quercus coccifera</i>)	—	—	4.4
Carob (<i>Ceratonia siliqua</i>)	t	—	t
<i>Deciduous</i>			
Wild pear (<i>Pyrus</i> spp.)	—	0.2	—
MEDIUM SHRUBS (0.5–2.0 m.)			
<i>Evergreen</i>			
Lentisc (<i>Pistacia lentiscus</i>)	10.4	t	0.4
Thymelaea (<i>Thymelaea hirsuta</i>)	—	0.8	t
Wild Olive (<i>Olea europea</i>)	1.5	0.5	1.0
<i>Deciduous</i>			
Spiny broom (<i>Calicotome villosa</i>)	2.7	15.6	9.2
Cretan ebenus (<i>Ebenus cretica</i>)	0.8	1.6	18.6
Jerusalem sage (<i>Phlomis</i> spp.)	0.6	0.9	6.3
Sage (<i>Salvia triloba</i>)	0.4	1.0	4.6
LOW SHRUBS, SHRUBLETS, AND VINES (0.5 m.)			
<i>Deciduous</i>			
Thyme (<i>Thymus capitatus</i>)	13.3	18.9	9.0
Thorny burnet (<i>Sarcopoterium spinosum</i>)	3.9	5.6	2.7
Rock rose (<i>Cistus</i> spp.)	8.6	—	7.0
Germander (<i>Teucrium</i> spp.)	1.8	1.4	0.2
Phagnalon (<i>Phagnalon graecum</i>)	0.7	1.9	0.7
Everlasting (<i>Helichrysum stoechas</i>)	0.4	3.6	1.7
Asparagus (<i>Asparagus</i> spp.)	0.2	0.4	1.3
Prasium (<i>Prasium majus</i>)	t	0.3	0.3

flexible branches, are cut into strips and woven into baskets. Lentisc has a role in local Orthodox liturgy: it is made into tablets for incense.

Land clearance and cultivation obliterate the vegetation cover and pave the way for the invasion of native and alien weeds. As in the Middle East, the plant families most commonly represented among the invaders in the Mesara are the mustard (*Cruciferae*), legume (*Leguminosae*), parsley (*Umbelliferae*), daisy (*Compositae*), and grass (*Gramineae*).³³ Some are widespread, such as the yellow oxalis (*Oxalis pes caprea*), a recent arrival from South Africa, while others are mainly found among certain crops. Cultivated fields frequently have weeds, such as wild carrot (*Daucus* spp.), caper (*Capparis spinosa*), acanthus (*Acanthus spinosa*), field bindweed

³³ Zohary 1973.

(*Convolvulus arvensis*), white mustard (*Spinapis alba*), medick (*Medicago* spp.), other legumes, and daisies.

Sheep and goat are the most common domesticated animals that graze in the Mesara. Sheep graze on herbaceous vegetation, while goats often browse shrubby plant growth. Both feed in fields, pastures, and the surrounding shrubland. Since grazing animals select the most palatable plant species first, they change the composition of the plant communities. This reduces competition among species and encourages the expansion of unpalatable species. Some ungrazed species are thought to have evolved unpalatable features, such as the spines on spiny broom, thorny burnet, and some members of the daisy family (*Carlina*, *Notobasis*, *Onopordum*).³⁴ Other species are relatively unpalatable because of woody growth or the chemical properties of their leaves, as in the mint and parsley families. Intensive grazing dramatically reduces plant height and cover and exposes the soil to erosion; animals also disperse certain plants by carrying their fruits and seeds.

The effects of grazing on local plant cover were assessed in the Asterousias between the Monastery of Odigitria and Listaros. A three-meter-high enclosure offered an opportunity to compare the plant cover on adjacent ungrazed and grazed land (Pl. 52:a) The enclosed area contained strikingly different vegetation from that outside the fence. Plants inside the enclosure but virtually eliminated outside were wild oats, hawksbeards (*Crepis* spp.), branched plantain (*Plantago indica*), and rush (*Juncus* sp.). Many species occurred on both sides of the fence, such as lentisc, spiny broom, thorny burnet, thyme, rock rose, Jerusalem sage, asphodel, and sea squill; inside the fence, lentisc, spiny broom, and spiny burnet were twice as tall and in larger clumps.

Fires have had a pervasive influence on the vegetation of the Mesara.³⁵ Although some fires have natural causes, most are set by shepherds or farmers to improve pasturage or clear the land. The effects of these fires vary widely, depending on the the season, weather conditions, and amount of combustible material. A typical burning during the dry season leaves the area littered with blackened stems, patches of scorched earth, ash, and charcoal. Nutrients in the ash are a boon to plant renewal: the flush of nutrients stimulates a short-lived growth of herbaceous plants, such as annuals of the grass, vetch, and daisy families and perennials of the lily family (wild onion and asphodel), which sprout from underground bulbs. Grasses like *Hyparrhenia hirta* show a marked increase in flowering after a fire, but the herbaceous species are soon replaced by woody plants. Among these woody species are two types of regenerative plants: those that rely mainly on vegetative resprouting, such as lentisc, carob, and kermes oak, and those that resprout and regenerate from seeds, such as spiny broom, thorny burnet, thyme, and several species of rock rose.

In a large burned-out area near the village of Listaros, blackened stalks of dead spiny broom, thorny burnet, and wild pear trees were visible everywhere, two years

³⁴For example, Le Houerou 1981.

³⁵For the effect of fires on Mediterranean vegetation, see Naveh 1974 and Le Houerou 1981.

after a fire on September 5, 1985. According to the local villagers, the burning lasted for two days. The only species that recovered were tree mallow, *Lavatera*, and sage, while spiny broom and wild pear had been virtually eliminated. There was ample evidence of resprouting, however, particularly in the shrubs thorny burnet and tree mallow (*Lavatera arborea*) and the herbs Cock's foot grass (*Dactylis glomerata*) and asphodel. Jerusalem sage, asparagus (*Asparagus aphyllus*), field eryngo (*Eryngium campestre*), gladiolus (*Gladiolus segetum*), grape hyacinth (*Muscaria* sp.), and a host of annuals, such as birdsfoot, trefoil (*Lotus* spp.), brome grasses (*Brome* spp.), and restharrow (*Ononis spinosa*), were among the 45 species recorded. The few grasses and other growing herbs had produced a sparse ground cover under the charred remains of the shrubs.

Fields disturbed by fire and land clearance gradually return to shrubland. Many hillsides in the Mesara exhibit recently abandoned fields whose margins, marked by terrace walls or rock piles, support a number of exotic species, such as the agave (*Agave americana*), and a variety of wild shrubs. The first of these shrubs to invade rapidly the abandoned land are everlasting, thorny burnet, thyme, and thymelaea. Spiny broom is a later intruder. Three former grain fields near Matala (Pl. 52:b), abandoned since 1942, had so completely reverted to shrubland that they were scarcely distinguishable from the adjacent area. Both types of area had dense bushes of spiny broom, lentisc, and thyme about 0.5 to 1.5 m. tall, together with rock roses and everlasting. The main differences between the abandoned fields and the adjacent area was the presence of thorny burnet in the former and carob and heather (*Erica manipuliflora*) in the latter. Abandoned areas need only a few decades to revert to the same shrubby vegetation cover found in adjacent fallow fields.

ARCHAEOLOGICAL SURVEY

STRATEGY

The aim of the archaeological survey in 1984 and 1986 was to cover intensively an area around the site of Phaistos in the center of the Western Mesara.³⁶ The intention was to record densities of artifacts of all periods, to define peaks in such densities (sites), and to record patterns of off-site artifact distribution that might reflect past activities on the land.

We chose to survey a single, large, contiguous area rather than a probabilistic sample (that is, a series of random, nonjoining transects), because we wished to define the specific settlement hierarchy and system that had Phaistos as its center rather than a representative sample of sites in the region.³⁷ We were also interested

³⁶This section on Archaeological Survey (pp. 214-215) was written by L. Vance Watrous and Despoina Vallianou.

³⁷For example, the Melos project (under time constraints) chose to survey a series of isolated samples across the island: Renfrew and Wagstaff 1982, pp. 16-23. As a result of this probabilistic form of survey, we now have a reasonably good idea of the relative diachronic development of Melian settlement but still know little about the regional patterns of settlement or about economic

in providing a regional archaeological context for excavated sites such as Phaistos, Agia Triada, and Kommos so as to integrate the archaeological evidence with our investigation. We focused on the Mesara Plain, a central area within the region, to uncover a complete sample of the regional settlement hierarchy³⁸ and to complement the surveys of the coastal zone around Kommos and the mountainous Agiopharango valley to the south.³⁹ Our survey area included each of the five physiographic subregions discussed above (see *Geology and Soils*, pp. 197–204), so that ecological dimensions of regional settlement could be part of our data and so that we could address the larger ecological and political questions of the project.

The survey teams covered an area of 9 sq. km. in the valley between Phaistos and the village of Kamilari during five weeks in 1984. Over a similar period in 1986 the teams intensively walked 12 sq. km. in the areas to the south of Kamilari, around Sivas, and between Voroi and Phaneromeni. In addition, we visited and recorded a number of sites brought to our attention immediately outside of the intensive survey area. In 1987 a single team completed the areas between Agios Ioannis and Petrokephali and north of Voroi. The total area (Fig. 7) surveyed amounted to *ca.* 22 sq. km. and extended southward from the villages of Voroi and Phaneromeni to the area of Sivas, Listaros, and Petrokephali. On the west, the survey extended as far as a coastal strip of land and beach along the Libyan Sea. The southwestern boundary of the project was determined by the site of Kommos; the eastern limit was roughly defined by a line running north–south from Kalyvia to Petrokephali. Isolated transects were made across the recently alluviated center of the Mesara valley floor. By the end of the 1987 field season, we had discovered well over 100 new sites within this area (Fig. 8).

FIELD METHODS

The field methods⁴⁰ used by the survey were based on those designed for and implemented on the Keos survey in 1983.⁴¹

or political hierarchies on the island. The advantages and disadvantages of probability sampling in a regional survey are simply presented in Flannery 1976, pp. 131–194, with bibliography (to which Hodder and Orton 1976 and Fish and Kowalewski 1990 should be added). Ultimately, all modern surface surveys collect data to answer questions about the economic, social, and political systems of their region, but as Flannery remarks (p. 159), a survey that does not include the metropolitan center of its region is unlikely to understand its region very well.

³⁸See, for example, the survey carried out around the city of Uruk: Adams 1981.

³⁹Hope Simpson 1983; Shaw 1979, pp. 147, 149; Shaw 1980, pp. 208–209; Blackman and Branigan 1977.

⁴⁰This section on Field Methods (pp. 215–222) was written by John Bennet. The author thanks Jack Davis for his helpful comments on an earlier version of this section. Research and preparation of this data was made possible by summer salary support provided by the Graduate School Research Committee of the University of Wisconsin-Madison.

⁴¹Cherry, Davis, and Mantzourani 1991.

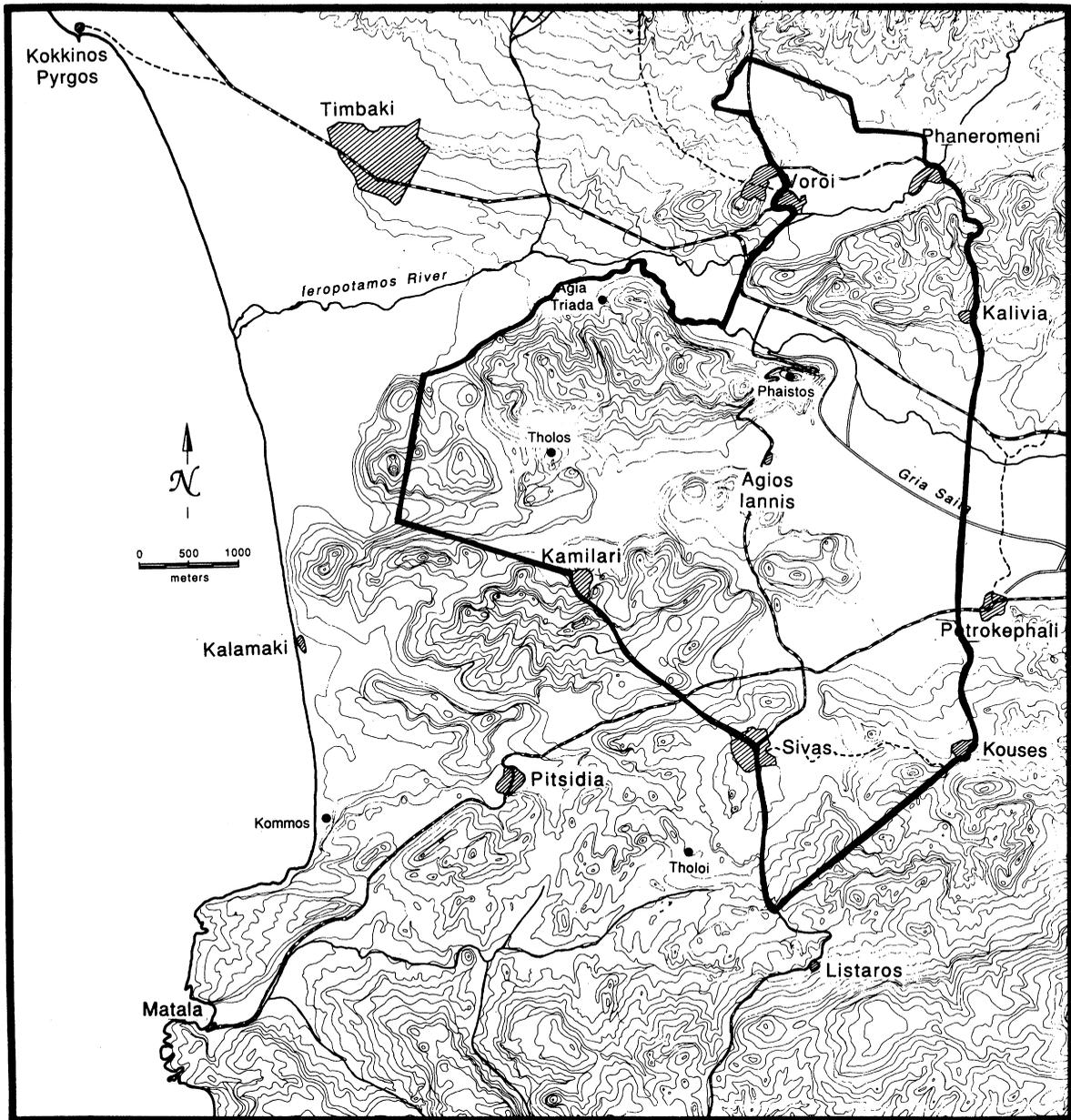


FIG. 7. Map of the Archaeological Area Intensively Surveyed in the Western Mesara

Personnel were divided into work teams A and B (each of 6–10 persons). Each team had a leader, who kept a daily logbook (*ημερολόγιο*) of its activities, and a vehicle. Documentation for each team included 1:10,000 air photographs, 1:5,000 topographical maps, and forms for noting artifact counts and sites. Cameras and all materials for recording sites and other features and plastic bags and tags for collecting material were carried. The teams worked in the field from 7 a.m. to 2:30 p.m.; all collected material was washed and studied in Voroi from 5 to 7:30 p.m. daily.

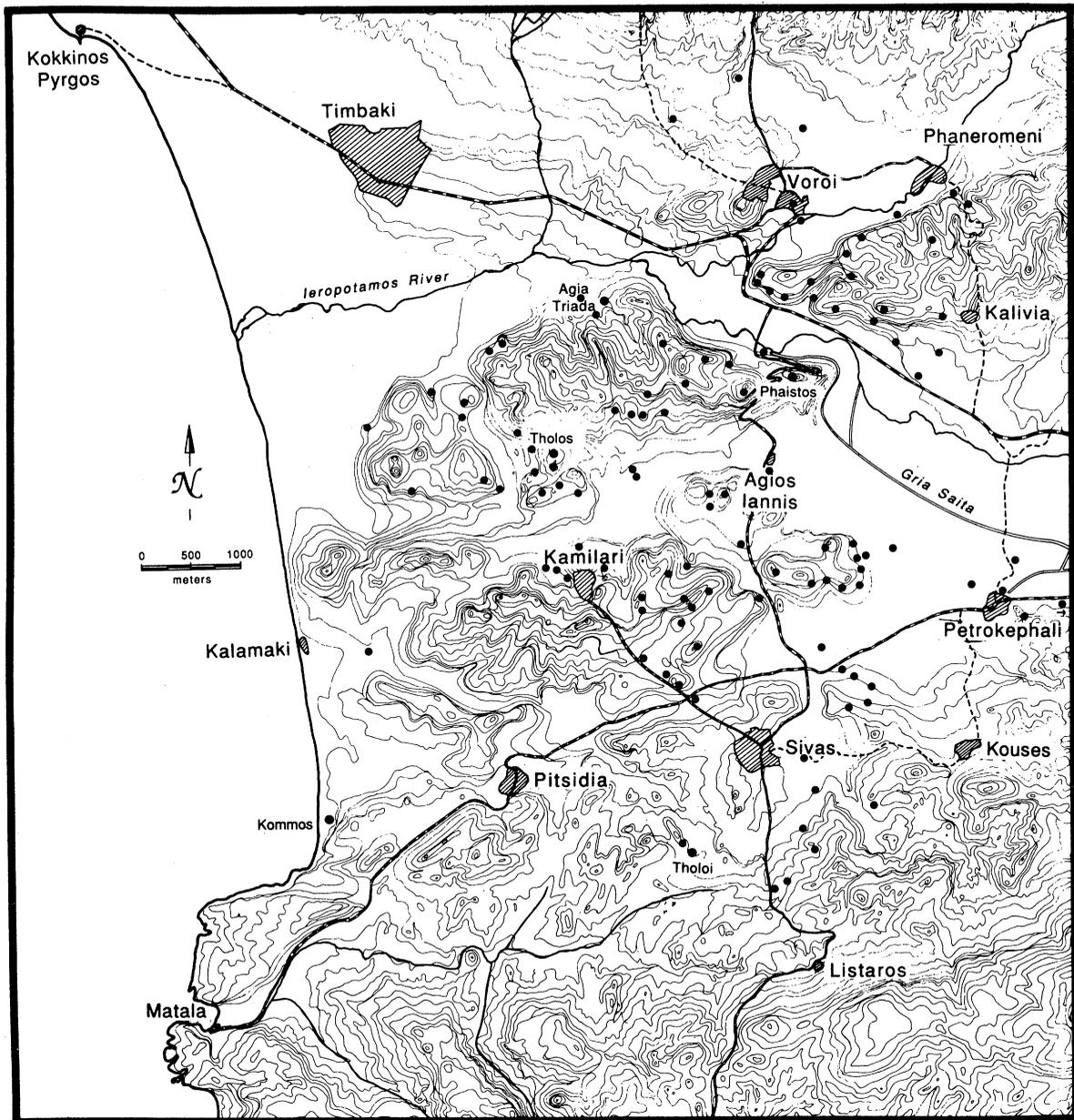


FIG. 8. Map of the Western Mesara Showing Archaeological Sites Found by the Survey

In 1987 we revisited all Bronze Age sites, as well as areas of unusually high artifact count, to check the boundaries of each site, the date of its material, and its possible relationships with other sites. These revisitations were invaluable for providing us with a wider sense of settlement pattern and relationships within the landscape. At the end of each field season, a week was devoted to preliminary study of the finds, drawing of final maps, and preparation and writing of reports before the finds were transported to the Herakleion Museum for storage.

OFF SITE

A team walked transects (*διαδρομές*), minimal units of observation and recording, across landscape units, using a spacing of between 10 and 20 m. depending on terrain and the visibility of the surface. These landscape units were called *fields* (*χωράφια*), to distinguish them from the individual transects within them,⁴² and were defined by topographic features such as terraces, fields, roads, and soil color. At the completion of each field, the area covered was marked on the 1:5,000 maps carried by each team, and a count and date of all artifacts (sherds, roof tiles, stone tools) observed on each transect was recorded on a special form.

A visual estimate of ground visibility (expressed as a percentage of bare earth visible)⁴³ was made to test for consistent relationships between artifact counts and visibility (see below), and the land use was noted. Chronologically diagnostic and functionally distinctive material (e.g., pithoi, amphoras, stone tools, loomweights, spindlewhorls, lamps, figurines, and beehives) was picked up during each transect and recorded as potential indicators of land use. This material, sometimes called *background noise*, was especially plentiful in an area as archaeologically rich as the Mesara. Finally, each field was given a number (i.e., A/B 1), and a composite map and overlay showing the fields of both teams was maintained at the survey home base in Voroi. These records have been valuable in computing an average overall density of material for each unit and in checking variations across the unit by reference to the individual transect counts. These calculations are discussed below.

ON SITE

The team decided in the field whether the presence of surface material warranted consideration of the area as a site, based on the artifact frequencies in transects and any additional factors, such as the distinct clustering of specific artifact types like chipped stone.⁴⁴

The chief criteria were fairly definable boundaries and a dense concentration of artifacts (relative to the local levels of background noise). When a site was identified, the transect was walked to its end to record an artifact count for the whole unit. The site was then walked over, leaving artifacts *in situ*, to determine its approximate boundaries. A center was then marked, and the collection procedure began.

The collection procedure was designed to gather both objective, quantitative data about the size of the site and artifact density and qualitative data about its

⁴²In the terminology of the Nemea Valley survey project, the individual transects walked in the Mesara would be referred to as *passes*, while the units called fields by our teams would be defined as *tracts*. See Cherry *et al.* 1988, p. 162.

⁴³Visibility was, strictly speaking, recorded on an interval scale from 1 to 10, with each step representing 10%: thus 1 = 10%, while 9 = 90%. For this procedure, see Gallant 1986, esp. p. 406.

⁴⁴In this way, for example, a relatively small and sparse but well-defined surface distribution of Neolithic pottery was noted as a site (B 23), although its density was not considerably greater than the local background noise. Decisions on the definition of sites (regarding both inclusion and exclusion) were checked during site revisitation in 1987. For modifications of this system, see Wright *et al.* 1990, pp. 604–608.

period(s) of occupation and possible function(s). To measure the size of the site and artifact density, four radii (ἄξονες) were run at right angles to each other from the center. These were labeled T1-T4 (T = "transect"); T1 was always closest to a heading due north and was given an exact compass bearing. Along each of these lines, at intervals of between 5 and 20 m. (depending on site size, but always consistent within any one site), all material was collected from circles of radius 1.5 m. (7.07 m.² in area). These collections (or "samples": δείγματα) were bagged separately and labeled T1,0, T1,1, and so on.⁴⁵ Samples were taken along these transects until each team member was sure he or she had reached the edge of the site (i.e., the density of material was the same as the background noise in the surrounding area), thus providing information on the dimensions of the site in the four cardinal directions. Back at home base, these samples were counted and analyzed, showing the varying densities of material across the site and providing a collection of diagnostic material.⁴⁶

Further collections of solely diagnostic material were made by team members walking systematically over the four quadrants (τετάρτα) defined by the radii. They were encouraged to collect only material potentially diagnostic for periodization or function: that is, feature sherds, decorated sherds, a range of distinctive fabrics, pithos fragments, and chipped stone. Quadrant pick-ups were bagged separately and labeled Q1-Q4.⁴⁷

The setting, function, probable date, surface visibility, hydrology, and any threat of disturbance to the site were summarized on a special form, photographs were taken, and its position indicated on a map or aerial photograph. The procedure usually took less than one hour and, when completed, produced a site form, a sketch of the site, four quadrant collection bags, and four large transect collection bags, each containing a number of smaller bags of material from each individual sample.

The collection procedure resulted in the definition of the boundaries of the site and the division of the site into smaller units that could yield information about spatial variation (different types or densities of artifacts) or chronological variation (e.g., expansion or contraction of the site through time or areas in use only within certain periods).

PRELIMINARY ANALYSIS OF OFF-SITE DATA

Our three seasons of fieldwalking created 737 fields. Of these 737 fields, density calculations are available for only 653, since all those fields that lack complete data or that were not walked have been excluded from the present analysis.⁴⁸ Table 3

⁴⁵ T1,0 was always reserved for the one sample collected from the site center.

⁴⁶ In our first season, we began by counting by category (such as pottery, stone, tile) the total artifacts for each sample pick-up in the field. This proved to be a time-consuming procedure to follow in the relative discomfort of the countryside, and we therefore adopted the procedure of simply bagging all artifacts separately and counting them in the relative cool of the *apotheke*.

⁴⁷ In this system Q1 was always immediately to the east of T1.

⁴⁸ For example, 20 fields walked in the 1987 season in the low-lying areas northwest of Petrokephali are excluded, since they were in areas already covered and were targeted on specific locations, some

TABLE 3: Observed Mean Density of Pottery, Tile, and Stone per 100 m.²

	Pottery	Max. Min.	Tile	Max. Min.	Stone	Max. Min.	N
All fields	3.84	129.8 0	0.32	25.77 0	0.02	1.92 0	653
Fields <i>without</i> sites	3.17	62.97 0	0.27	25.77 0	0.01	0.35 0	502
Fields <i>with</i> sites	6.05	129.8 0	0.50	12.73 0	0.05	1.92 0	151

presents the mean density of artifacts in the three major categories for these 653 fields.

In Table 3 we can clearly see that average densities of artifacts observed are higher for fields in which a site was defined than for those without sites.⁴⁹ The range of density values for both categories, however, is extreme, and the highest “non-site field” density ranks second among the densities of all fields. This seems to be due to relatively localized effects: for example, the non-site field with the highest pottery density lies right by the boundary fence of the site of Agia Triada (and should therefore be considered as an extension of that site), while the second most dense (41.96 sherds/100 m.²) lies close to the village of Kamilari and is adjacent to the field with the highest site pottery density. It is also interesting to observe how many fields produced zero densities of pottery in an area which has a long and intense history of human exploitation (Table 4).⁵⁰

Comparative figures of the off-site portion of artifact densities are available from surveys in Boiotia, Lefkas-Pronnoi, Keos, and Nemea. For Boiotia, Bintliff and Snodgrass define three categories of artifact density, from least-used areas to heavily used areas: “total background” (density range: 0.4–1.0 artifacts/100 m.²) through “intensive manure” (1–6 artifacts/100 m.²) to “halo” (6–45 artifacts/100 m.²).⁵¹

already known to be sites, some in the vicinity of known sites. This is reflected in their abnormally high density counts: mean = 11.6/100 m.² (pottery), 0.8/100 m.² (tile), and 0.03/100 m.² (stone). A number of other fields still remain as problems to be considered for the final publication.

⁴⁹Densities have been computed in artifacts per 100 m.², since this is the level at which the data are presented in the discussion of surface artifact densities in different world areas by Bintliff and Snodgrass (1988, esp. p. 510, fig. 2). We have assumed that each walker is capable of counting all artifacts seen 1 m. either side of the walker: that is, each transect count represents all the visible artifacts in a strip as long as the transect and 2 m. wide. To help the reader visualize these figures, a density of 1 sherd/100 m.² is equivalent to finding one sherd every 50 m. on a transect. This figure differs from that used by Bintliff and Snodgrass (p. 506), who assume a range of 2.5 m. on either side of the walker, where 1 sherd/100 m.² would be equivalent to finding one sherd every 20 m. on a transect. Assuming both our estimates are accurate for the style of walking of each project, our density figures will be comparable.

⁵⁰The two zero counts for fields containing sites are for part of site A 4 and site A 8. The spatial patterning of non-site fields with zero counts is currently being investigated.

⁵¹Bintliff and Snodgrass 1988, p. 510, note 2, fig. 2; Nemea: Cherry, Davis, and Mantzourani 1991, table 3.4. According to Bintliff and Snodgrass, “total background” signifies total background noise, that is, areas that have been little used; “intensive manure” means areas where manuring has

TABLE 4: Percentage and Absolute Numbers of Fields with Zero Counts of Pottery, Tile, and Stone

	Percentage and Number of Zero Counts					
	<i>Pottery</i>		<i>Tile</i>		<i>Stone</i>	
	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>
All fields	13	82	52	340	84	548
Fields <i>without</i> sites	16	80	57	284	86	430
Fields <i>with</i> sites	1	2	37	56	78	118

Gallant's figures for Lefkas give a mean background density of 8 sherds/100 m.² for Pronnoi and 15 sherds/100 m.² for Lefkas.⁵² Mean background pottery densities for Keos were 0.5 sherds/100 m.², while for Nemea they were 2.0 (although there was a large variation around this mean). Our overall figures for fields without sites broadly correspond to the mean background density in the Nemea region and probably to at least the first two categories of Boiotia density. However, our large range of density values (with a maximum of 62.97/100 m.² for a non-site field) suggests that the Western Mesara has some areas of relatively dense material, which is not surprising, given the number of large and long-lived sites in the region: Phaistos, Agia Triada, Agios Ioannis, and Kamilari. In this connection, it is perhaps not surprising that the mean background density of off-site pottery on Keos, an area perhaps less densely settled throughout antiquity, is considerably lower.⁵³ With further analysis of the spatial distribution of background densities and categorizing similar to the system employed by Bintliff and Snodgrass, certain associated patterns should emerge for the Western Mesara.

The effect of visibility on the densities of observed artifacts can be checked to some extent by using the Spearman Rank Correlation Coefficient (r_s ; Table 5).

The figures in Table 5 show a positive, statistically significant relationship between visibility and the densities of observed pottery and tile, but the relationship between visibility and the density of stone is much weaker and is not statistically significant. Similar analysis of the Keos survey data produced comparable results.⁵⁴ Pottery and tile tend to occur together, since the correlation between the densities of these classes of material is also positive and statistically significant ($r_s = 0.648$); as

deposited a significant number of artifacts from distant settlements; and "halo" represents areas surrounding a settlement where high numbers of artifacts have been washed or somehow moved from that settlement.

⁵²Gallant 1986, p. 417. Gallant (p. 417) also notes the mean densities of material on-site: 290 sherds/100 m.² for Pronnoi and 307 sherds/100 m.² for Lefkas. These are clearly much higher than the mean densities observed by us on transects through fields with sites (see Table 3) but should be compared with the densities derived from intersite collection.

⁵³The Keos survey also provides comparable data for chipped stone on and off site (Cherry, Davis, and Mantzourani 1991, table 3.4). The mean density of obsidian off site is 0.03 pieces/100 m.², as compared to the Mesara where the mean for all chipped stone is only 0.01 (Table 3 above).

⁵⁴Cherry, Davis, and Mantzourani 1991, table 3.3.

TABLE 5: Spearman Rank Correlation Coefficient (r_s) (all observed fields: n=653)

Correlations (V = Visibility)					
V:Pottery	V:Tile	V:Stone	Pottery:Tile	Pottery:Stone	Tile:Stone
0.212	0.288	-0.042	0.648	0.12	0.026
Z=5.423	Z=7.362	Z=-1.062	Z=16.556	Z=3.059	Z=0.66
(p=0.0001)	(p=0.0001)	(p=0.2881)	(p=0.0001)	(p=0.0022)	(p=0.5091)

we might expect, many fields and sites will turn up both sherds and tile. On the other hand, the correlation of pottery and tile with stone is weak ($r_s = 0.12$ and 0.026 respectively).

What is perhaps more interesting is the relationship between visibility and the definition of sites. Mean visibility for all fields was 3.9 on our scale of 0–10; for fields with sites, the mean was 3.7, whereas for fields in which sites were not defined it was 4.0. These figures imply that visibility was not a significant factor in our ability to define artifact concentrations as sites. For the Keos survey, the median value of visibility was significantly higher for those units in which sites were defined, suggesting that sites tended to be defined more often in areas of better visibility.⁵⁵ It would seem that this was not the case in the Mesara, and indeed 71 of the fields that contained sites or parts of sites fell in areas with visibility of 30 percent or lower, while 80 were in fields with 40 percent or better visibility. It is possible that the difference between the Mesara and Keos findings may be accounted for in terms of differences between the sites. Nevertheless, it seems that visibility, although having some effect on the detectability of artifacts, has not seriously vitiated our calculation of densities or our ability to define the dense concentrations as sites.

HISTORY OF SETTLEMENT

This section summarizes the survey data by period and presents some preliminary conclusions about sites and settlement patterns based on the survey and on earlier archaeological research in the region.⁵⁶ All site sizes given below are measured by a north-south and an east-west line which pass through the center of the site.

PALAEOLITHIC-BRONZE AGE: CA. 12,000-1000 B.C.

The survey found no evidence of Palaeolithic or Mesolithic human activity in the Western Mesara. As sites of these periods are rare and often hard to recognize in Greece, the survey teams walked large areas of red soil of Pleistocene date in search of pre-Neolithic material. While the Pleistocene soil areas did produce

⁵⁵ Cherry, Davis, and Mantzourani 1991, fig. 3.6.

⁵⁶ During the survey Watrous dated the collected pottery each afternoon and taught the students how to recognize and describe it. In 1986 Watrous restudied all the Bronze Age pottery from the survey in the Herakleion Museum. In 1987 and 1988 Blitzer studied the stone tools. In 1987 and 1988 John Hayes provided precise dates and sources for the Hellenistic through Ottoman pottery during study periods in the Herakleion Museum. This section on the History of Settlement from the Palaeolithic through Roman periods (12,000 B.C. to A.D. 400) was written by Watrous and Vallianou.

abundant amounts of chipped stone in greater quantity than the later, lighter-colored soils, none of these artifacts appear to be earlier than Neolithic in date. The Western Mesara, like the rest of Crete, has yet to produce archaeological evidence for human activity earlier than the Neolithic period. The earliest archaeological traces of humans on Crete remain the settlement material at Knossos (dated by radiocarbon to 6100 ±180 B.C.), the basal artifact-bearing level at the Gerani Cave near Rethymnon, and in the Lera Cave.⁵⁷

The earliest evidence for settlement found by the survey in the Western Mesara dates to the Final Neolithic period (*ca.* 4000–3300 B.C.). The dark-burnished and wiped wares (the latter continuing into the Early Minoan I period) from these settlement sites resemble those published from the basal levels at Phaistos. During the Final Neolithic period Phaistos was the largest settlement in the region. Eight new Final Neolithic sites were identified during the survey.⁵⁸ One sizable settlement (A 70), at least 120 by 30 m., was found on a hillslope above a spring, near the village of Kamilari. Other sites were smaller, and some were quite small, including a site (B 48) located on a low hill at the north edge of the plain, represented by a thin scatter of sherds over an area 15 by 15 m. A Final Neolithic settlement (B 7) at the base of the Phaistos ridge was distinctive in that it produced, in addition to sherds, large quantities of chipped stone knapped from chert pebbles and cobbles contained in the Pliocene/Miocene marls here. Among the chipped-stone types represented were multi-directional flake cores and retouched flake tools, including shallow and steeply backed scrapers and piercing tools.

Final Neolithic sites in the Western Mesara have been found on low hills near the coast, on the floor of the plain, in caves, and especially on slopes and ridges near the edge of the plain.⁵⁹ With one exception, all Final Neolithic sites from the survey area were discovered under the present soil surface, through prior archaeological excavation, or in road cuts (Pl. 47:c), deeply plowed fields, or irrigation channels. Given the intensive amount of colluvial and alluvial deposition over the region since the beginning of the fourth millennium B.C. (see *Geology and Soils*, pp. 197–204 above), the number of known Final Neolithic sites is clearly underrepresented in our survey.⁶⁰

The survey found almost twice as many Early Minoan I sites as it did Final Neolithic ones. Most Early Minoan sites produced material of the Early Minoan I and II periods (*ca.* 3300–2250 B.C.), including Agios Onouphrios sherds, Gray

⁵⁷Knossos: Warren *et al.* 1968. Gerani Cave: Tzedakis 1971. Tzedakis' claim that the pre-Neolithic level at Gerani Cave contains human artifacts has not been generally accepted. See Guest-Papamanoli and Lambraki 1976.

The evidence for pre-Neolithic inhabitation of Crete has recently been reviewed by Cherry (1990, pp. 158–163), who finds "no supporting data of any kind" for such habitation.

⁵⁸See Vagnetti 1972–1973. The excavators at Phaistos have reported finding Final Neolithic pottery everywhere on the hilltop under Minoan remains; see Vagnetti 1972–1973.

⁵⁹Final Neolithic pottery was found on the plain at Kannia, near Metropolis: see Vagnetti 1973. For Final Neolithic from the cave at Miamou, see Taramelli 1897.

⁶⁰The Cambridge/Bradford survey came to similar conclusions about their region in Boiotia: Bintliff and Snodgrass 1985, pp. 137–138.

ware, Vasilike ware, a patterned burnished red ware, local red chert, and imported obsidian. These small sites were thickly dispersed across the landscape, on ridges and slopes, the valley floor, and hills. Early Minoan sites in the Western Mesara are found in a variety of ecological areas, especially spots near water and Miocene bedrock ridges adjacent to arable soils. Minoan I and II sites follow the Final Neolithic settlement pattern. While a number of Early Minoan I and II sites, especially some smaller ones at higher elevations, may have been seasonal, there does seem to have been a sizable demographic expansion in the Western Mesara during the Final Neolithic–Early Minoan period, and the Agiopharango valley in the Asterousias Range south of the Mesara Plain was also first settled in the Early Minoan I period.⁶¹ Dense settlement in the Western Mesara probably brought with it extensive land clearing, which, as the modern situation suggests (see *Human Use and Impact on Vegetation*, p. 212 above), would have produced the nascent Early Minoan erosional sequence.

During the Early Minoan period Phaistos continued to be the largest settlement (measuring a minimum of 100 × 150 m. with an estimated population of 300–450) in the Western Mesara.⁶² At Agia Triada, recent excavations by Vincenzo La Rosa within the later settlement and near the tholos tombs have uncovered deposits of Early Minoan, indicating the site was large.⁶³ In the surrounding countryside there were many smaller settlements, perhaps hamlets, averaging 50 m. (north–south) by 100 m. (east–west), as well as some quite small sites less than 50 m. square (perhaps single farmsteads or camps). In 1986 we mapped what may be the main cemetery complex for the Early Minoan settlement at Phaistos. This cemetery (B 28), directly northeast of the church of Agios Onouphrios (*ca.* 800 m. northwest of Phaistos), stretches at least 300 m. across the south slope of the steep ridge called Ieroditis.⁶⁴ The site produced fragments of human bone, marble figurines, much Agios Onouphrios ware, handmade jar fragments, and other ceramic wares. Immediately south of Phaistos, a small marble figurine (Pl. 53:a) of Early Minoan date found by the survey may have come from a burial.

Minimal evidence for the Early Minoan III–Middle Minoan IA periods (*ca.* 2250–1900 B.C.) was identified by the survey. This may mean that many of the smaller sites in the Western Mesara were abandoned at the end of the Early Minoan II period. On the other hand, this gap may be more apparent than real, since the Early Minoan III and Middle Minoan IA ceramic phases in the Mesara are poorly known.⁶⁵

⁶¹ Blackman and Branigan 1977, pp. 65–67.

⁶² This estimate is made by Todd Whitelaw (1983, p. 339).

⁶³ See La Rosa 1985, p. 47; La Rosa 1988; and DiVita 1991. Laviosa reports on EM II houses east of the tholos tombs (Laviosa 1969–1970 and 1972–1973).

⁶⁴ The first material from this cemetery was discovered by F. Halbherr in 1894 on the south slope of the Ieroditis Ridge above the church of Agios Onouphrios. Halbherr showed the Early Minoan II vases and other finds to Arthur Evans who published them (Evans 1895, pp. 105–136).

⁶⁵ No deposit of EM III from the Mesara has yet been identified. Branigan sees no significant break in the occupation of Mesara settlements during the EM III–MM IA period. See Branigan 1970, pp. 23 and 166–172 (and Blackman and Branigan 1977, p. 68).

In the succeeding Middle Minoan IB-II period (*ca.* 1900–1775 B.C.), Bronze Age settlement in the Western Mesara reached its greatest density. Protopalatial sites found by the survey produced Barbotine ware (Pl. 54:a), red-burnished ware, cooking ware, Kamares and eggshell ware, carinated cups, teapots, conical cups (with parallel stringmarks on their bases), bowls, straight-sided cups, bridge-spouted jars, pithoi, basins, jars, lamps, loomweights, and chipped-stone implements. Sites of this period found by the survey vary greatly in size, from 17 × 31 m. to 200 × 130 m. For example, a concentration (90 × 20 m.) of sherds (Middle Minoan IB-II Kamares and Barbotine ware, pithoi, and cooking ware) was located on a small hilltop southeast of Kamilari, just north of the present Kamilari-Sivas crossroad. This small site (B 14) may have been a farmstead. A large (225 × 90 m.), newly founded Middle Minoan IB settlement (A 24/B 12) was located on a terraced slope northwest of Kamilari. This site produced much domestic pottery, including conical cups, Kamares ware, pithoi, and tripod cooking pots. The large fieldstones used in one terrace suggest that the Protopalatial houses on the site were supported by a retaining wall built into the slope. This site may have been a rural settlement that farmed the small valley below it. While some of the Middle Minoan IB-II habitations are located on settlement sites occupied in the Early Bronze Age, a significant number are new foundations in areas previously unsettled.

By the Middle Minoan IB period, Phaistos had developed into a state center (Pl. 46:a) measuring at least 1500 × 1000 m.⁶⁶ It extended as far south as the village of Agios Ioannis, since excavations immediately north and on the south edge of the village have produced Middle Minoan IB levels. Deep trenching for a water pipeline in the field west-northwest of the village yielded similar material. To the west, the settlement of Phaistos extended *ca.* 450 m. beyond the hilltop of Ephendi Christou (west of the palace), as Middle Minoan IB-II material was found there by the survey. Within Phaistos itself, the Italian excavations⁶⁷ have revealed other signs of its position as the center of a regional state: the monumental architecture of the first palace; ceremonial courts; a complex written administrative system for the storage and redistribution of goods; a literate bureaucracy; and specialized craftsmen.

Certain Middle Minoan IB-II sites within the Western Mesara showed signs of new, specialized functions. The Middle Minoan I–Late Minoan III sanctuary at the Kamares Cave has long been thought to have been the sole rural shrine associated with Phaistos. In 1986, however, the survey discovered several clay animal figurines below the conical hilltop of Ephendi Christou immediately west of Phaistos. This could indicate that the Ephendi Christou had served as a peak sanctuary in this period. In 1989 we identified what we believed to be a large Middle Minoan cemetery (serving Phaistos) in the valley of Phalangari at the base of the Ieroditis ridge north of Phaistos. Chamber tombs there (Pl. 52:c), recently excavated by Despoina

⁶⁶ See the archaeological characteristics (nos. 6–10) of urban states listed in Redman 1978, p. 218.

⁶⁷ See Pernier and Banti 1935–1950 and Levi 1976.

Vallianou, yielded rich Hellenistic finds.⁶⁸ Each tomb has a short dromos cut into a steep vertical slope, which steps down into a single oval chamber; niches are cut in the walls. Protopalatial sherds were found in the earth fill within the tombs, originally raising the possibility that these were Protopalatial tombs,⁶⁹ reused in the Hellenistic era. Subsequent excavation, however, has revealed no traces of Minoan use in the tombs. Finally, imported pottery from Cyprus in Protopalatial levels at Kommos indicate that this coastal site was probably an international port for the Mesara already in the Middle Minoan IB–II period, just as it was during the Late Bronze Age.⁷⁰

Most of the Protopalatial sites in the survey area continued to be inhabited during the Neopalatial period (*ca.* 1775–1550 B.C.), although the overall number of Middle Minoan III–Late Minoan I sites seems to be less than during the Protopalatial period. No new sites were founded in the Neopalatial period. This change may be due to a drop in regional population or to some degree of centralization of population at larger settlements.⁷¹ On this last question, the excavated sites of Phaistos and Agia Triada yield ambiguous evidence: the Neopalatial site at Phaistos is less densely settled than in Middle Minoan IB–II, while Late Minoan I Agia Triada may be the same size (or smaller) than in Middle Minoan II.⁷² Survey sites of this period produced cups decorated with Tortoise Shell Ripple, spirals, and floral sprays, dark-ground vases, bridge-spouted jars, conical cups, bowls, jugs, a pitharaki, amphoras, pithoi, cooking ware, and ground stone implements.

The Late Minoan I settlement pattern in the Mesara exhibits a three-tiered hierarchy. Phaistos remained the largest settlement in the region; a new, smaller palace was constructed there after the Middle Minoan II earthquake, implying that the site continued as the administrative center of the Mesara until Late Minoan IB, when it was destroyed.⁷³ A number of small concentrations of Middle Minoan III–Late Minoan I sherds, mainly pithoi, cups, and cooking pots, along the Ieroditis ridge north of Phaistos are probably to be interpreted as coming from graves associated with the settlement at Phaistos. Neopalatial Phaistos, however, was less densely settled than it had been in Middle Minoan II. One house from Chalara (the Phaistos east slope), one from Agia Photini (Phaistos northeast slope), rooms west of the palace, and traces of structures near the present parking lot were the only Late Minoan I domestic remains uncovered by the Italian excavations

⁶⁸Reported in Catling 1989, p. 70.

⁶⁹Several of the features of the Phalangari chamber tombs are also found in the MM Knossian tombs: short dromos (Forsdyke 1926–1927, p. 251, fig. 4), wall niches (p. 261, fig. 15), back wall/buttress (p. 256, fig. 8), and central column (p. 277, fig. 32).

⁷⁰For a preliminary note on Cypriote pottery from MM IB contexts at Kommos, see Watrous 1985, p. 7 *contra* the view of Branigan (1988) that Phaistos had no foreign relations in the MM IB–II period.

⁷¹A similar decrease in the number of LM I sites has been noted elsewhere in Crete: see Pendlebury, Pendlebury, and Money-Coutts 1937–1938, p. 15; Watrous 1982, p. 15 and note 41.

⁷²See DiVita, La Rosa, and Rizzo 1984, p. 163, fig. 230 and the recent comments of La Rosa (1991b).

⁷³For a different view, see La Rosa 1989b and Militello 1988.

around the palace.⁷⁴ The settlement was also considerably smaller in extent during the Neopalatial period than during the Protopalatial era.⁷⁵ Apparently missing at Phaistos was the complex of grand villas that surrounded the palace at Knossos or even the urban blocks of houses found at Mallia and Zakros.

These upper-class residencies seem instead to have been located at Agia Triada. There, at least two luxurious villas faced onto an upper court. At the center of the lower town stood a public court, portico, and storage (?) building. Around the edge of the settlement were smaller houses surrounded by a town wall. One of these villas (A) was well preserved and seems to have functioned something like a manor house on a medieval estate, employing literate officials, servants, farmworkers, weavers, and other laborers.⁷⁶

On the coast at Kommos, a large, walled port complex, supplied with a harbormaster's residence (?), an open court, shipsheds, workrooms, and storage magazines, was constructed in Late Minoan I.⁷⁷ This port was probably built by and under the central control of the palace at Phaistos or even ultimately Knossos. The port had widespread commercial contacts with the Cyclades, the Greek Mainland, Anatolia, Cyprus, the Levant, and Egypt.⁷⁸ Outside the enclosed port complex were blocks of houses, smaller and less pretentious than contemporary houses at Tylissos, Palaikastro, or Zakros. Phaistos, Agia Triada, and Kommos seem to have had distinct, complementary roles in the region during the Late Minoan I period.

Beyond these three centers, the survey found two distinct types of permanent Neopalatial settlements. The first, quite numerous, was a medium-sized settlement (i.e., with a length of over 100 m.), which probably represented a small Neopalatial village. The second, less numerous, was much smaller (usually less than 10–50 m. in length). Comparison with several excavated examples of this type (Kannia, Selli [south of Kamilari], and Kouses⁷⁹) shows that it was probably an isolated Minoan farmhouse. In addition, there were also several extremely small sites (less than 5 m. in length) which appeared as small concentrations of stones (from decayed rubble walls) and coarse pottery; these may have been seasonal fieldhouses.

Late Minoan II and IIIA1 (ca. 1550–1490 and 1490–1375 B.C.) are difficult ceramic periods to distinguish by means of surface collection because the periods are relatively short and diagnostic ceramic features are confined to a few fine-ware shapes. The limited survey data for these two periods must thus be interpreted with special care.⁸⁰ No Late Minoan II pottery was recognized by us; pottery of

⁷⁴See La Rosa 1985, p. 48.

⁷⁵Neopalatial levels are missing from the two recent trenches north and northwest of Agios Ioannis mentioned above. Intensive sherding by the survey of the area immediately west of the peak of Epheni Christou produced substantial MM IB–II material but relatively little definite MM III–LMI.

⁷⁶Halbherr, Stefani, and Banti 1980; DiVita, La Rosa, and Rizzo 1984, pp. 161–194; Watrous 1984.

⁷⁷See Shaw 1984.

⁷⁸*Kommos* III.

⁷⁹Kannia: Levi 1959. Selli: DiVita, La Rosa, and Rizzo 1984, p. 196. Kouses: Marinatos 1924–1925.

⁸⁰For example, extensive surface sherding on the site of Kommos before excavation produced no LM IIIA1 pottery. Once excavation began there, a number of LM IIIA1 habitation levels and deposits came to light.

this period is known only from excavated sites in the region, at Phaistos, Agia Triada, and Kommos.⁸¹ On the other hand, Late Minoan IIIA1 pottery, mostly fine-ware kylikes and cups, was recognized on the survey at a handful of sites. These were not new sites, and the amounts of Late Minoan IIIA1 recognized were always relatively small, although this may have been due partly to problems of ceramic identification. Nevertheless, the Western Mesara survey evidence suggests that many of the settlements, especially the smaller ones, were not occupied during this period and that Neopalatial sites occupied in Late Minoan IIIA1 were smaller in size. Excavations corroborate this interpretation: some excavated sites (e.g., Selli, Kannia, and Kouses) yielded no Late Minoan IIIA1 pottery; at Phaistos, the palace destroyed in Late Minoan IB was not rebuilt and Late Minoan IIIA1 occupation at Phaistos seems to have been sporadic; Agia Triada was inhabited in Late Minoan IIIA1, but apparently there was little construction on the site until Late Minoan IIIA2.⁸²

During the succeeding Late Minoan IIIA2-B period (*ca.* 1375–1200 B.C.), the population of the Western Mesara apparently grew. The number of Late Minoan IIIA2-B settlement sites in the survey area is double that of Late Minoan II-III A1. Sites of the Late Minoan IIIA2-B period produced kylikes (including one Chaniote example), champagne goblets, cups, bowls, coarse stirrup jars, an amphoroid krater, plain basins, ladles, jars, amphoras, pithoi, cookpots, dishes, a clay firedog, and larnakes. In most cases, this material consisted of a patch or thin scatter of sherds on a larger Neopalatial settlement. Several small, earlier sites near Kouses, Voroi, Sivas, and Phaneromeni, unoccupied during Late Minoan II-III A1, showed signs of reoccupation in this period.⁸³ Concentrations of sherds along the Ieroditis ridgeline probably represent graves. The tholos tomb at Kamilari and the cemetery at Kalivia ceased to function in Late Minoan IIIA2,⁸⁴ but a cemetery site (B 37) discovered in 1986 south of Sivas seems to have functioned from Late Minoan IIIA1 through the Protogeometric period.

The survey data suggest that the Mesara communities experienced continuity and growth within the Late Minoan IIIA2-B period. According to excavation, however, Phaistos was a smaller site in Late Minoan IIIA than it had been earlier and apparently consisted mainly of small houses, while at Agia Triada a monumental architectural complex (the huge “Megaron”, renovated “Bastione”, and upper and lower Stoas) was constructed.⁸⁵ Thus, local excavations point to a discontinuity and a major shift in regional power, while the survey data suggest the opposite. In fact, the historical implications of these two types of evidence are probably both correct.

⁸¹LM II at Phaistos: Levi 1969. The sherds from goblets in plates 92:b and 93:b may be LM II. LM II sherds from Agia Triada: La Rosa 1989a. Kommos: Shaw, Betancourt, and Watrous 1978, pp. 165–170 and pl. 44.

⁸²For Late Minoan Phaistos after LM IB, see the remarks of La Rosa 1985, pp. 50–51. For the LM II-III B history of Agia Triada, see La Rosa in press.

⁸³The MM II-LM I farmhouse at Kouses, for example, produced an LM III B stirrup jar. See Marinatos 1924–1925, p. 68, fig. 9:ζ.

⁸⁴Kamilari tholos: Levi 1961–1962; Kalivia tombs: Savignoni 1904; Kanta 1980, p. 99.

⁸⁵La Rosa 1985; La Rosa in press.

The data recovered by the survey came from outside the population centers and thus reflect the life of rural communities that were tied to the land and tended to change relatively slowly. On the other hand, excavation in the Mesara has concentrated on major sites, such as Agia Triada and Phaistos, that were the seats of local rulers. These major sites changed swiftly, as is evident in their architecture, under the influence of political events. Thus, the differing data obtained from survey and excavation support the famous characterization by Fernand Braudel of human history as three superimposed currents of water, each flowing with a different speed.⁸⁶

Very few sites of the succeeding Late Minoan IIIC period (*ca.* 1200–1000 B.C.) were found by the survey. Apparently the countryside was nearly abandoned during this period. The three Late Minoan IIIC sites discovered were a settlement (B 38) and its cemetery (B 37) south of Sivas and a gravesite on the slope of Ieroditis northeast of Phaistos. The settlement (B 38), occupied from Middle Minoan I to Late Minoan III, yielded a scatter (80 × 110 m.) of Late Minoan IIIC monochrome sherds and cooking ware. At the base of this settlement, the associated cemetery (70 × 70 m.) produced bones, ash, larnakes, kraters, monochrome bowls, tripod offering tables, and snake tubes. In the Western Mesara, Late Minoan IIIC pottery is also known from the excavated sites at Liliana, Agia Triada, Kommos, and Phaistos. Liliana, southwest of the village of Kalivia, is the site of a cemetery where eighteen larnakes from eight tombs were recovered in excavation.⁸⁷ The settlements at Agia Triada and Kommos were abandoned in the second half of the 13th century B.C., although a shrine at Agia Triada was visited by worshipers during Late Minoan IIIC.⁸⁸ Little of the Late Minoan IIIC material found at Phaistos has been published, so the size of the settlement at this time remains uncertain. Rural depopulation elsewhere in Crete at this time suggests that the population in our survey area may have been centralized at Phaistos during LM IIIC.⁸⁹

PROTOGEOMETRIC–ROMAN: 1000 B.C.–A.D. 400

During the Protogeometric–Geometric period (*ca.* 1000–725 B.C.), Phaistos was a large fortified settlement.⁹⁰

The Late Minoan IIIC settlement (B 38) and cemetery (B 37) south of Sivas also continued to be inhabited during this period. These were the only

⁸⁶This concept of history is reflected in Braudel's three-part organization of his classic 1972 study. Part One consists of the physical environment and the human response to it, conditions that rarely change. Part Two treats economic, social, and political institutions, which tend to change slowly. Part Three describes individual historical events, which are fast moving. See Braudel's comments on pp. 21–22 of volume I.

⁸⁷Liliana tombs: Savignoni 1904 and Kanta 1980, p. 100.

⁸⁸See Banti 1941–1943; D'Agata in press. Kommos shrine: Shaw 1984, pp. 279–284 and pls. 53–60.

⁸⁹This pattern of rural abandonment in LM IIIC Western Mesara is matched in other areas of Crete where the coastal plain is deserted for hill- or mountain-top settlements, such as Vrokastro and Kavousi. See Hayden 1983; Gesell, Day, and Coulson 1988.

⁹⁰For Phaistos during the early Iron Age, Levi 1964, p. 12, figs. 51–56 and bibliography on p. 14; PECS, p. 696, *s.v.* "Phaistos".

sites of Protogeometric–Geometric period found by the survey. Monochrome Protogeometric–Geometric pottery found at these sites included a high-footed skyphos, kalathos, krater, jugs, and pithoi. Both Agia Triada and Kommos were the sites of shrines at this time.⁹¹ During the Geometric period the port at Kommos reestablished international connections overseas.⁹² A few burials of this period are known from Agios Onouphrios, Liliana, on the ridge of Ieroditis, near Petrokephali, and elsewhere.

The survey discovered 13 sites of the Orientalizing–Archaic period (*ca.* 725–500 B.C.). Material from these sites included black-glazed cups, bowls and jugs, a dinos, and relief pithoi (one decorated with a sphinx). Most of these sites continued to be occupied in the Classical and Hellenistic periods. At least three of these sites were over 100 m. in length and thus were hamlet-sized settlements probably consisting of more than one house. One site (A 11/B 6) consisted of two distinct rubble scatters (50 × 50 m.) of 6th-century cups, black-glazed sherds, and pithoi, which are likely to represent individual houses. Several other sites had smaller sherd concentrations and may have been single structures. Nine of the Archaic sites were clustered around Phaistos (less than 30 minutes walking time away), which remained the largest settlement in the region. This clustered pattern of settlement suggests that the new sites may have been outgrowths from the center at Phaistos. The amount of Orientalizing material recognizable on these sites indicates that the dispersal of settlement in the Western Mesara was well under way by the 7th century. One or two Geometric sherds found at almost a dozen settlements, while by themselves not proof of habitation, may suggest, however, that the dispersal had begun earlier than the 7th century.

During the Classical period (*ca.* 500–325 B.C.), the number of settlement sites outside the center at Phaistos almost doubled. Phaistos may have grown at this time, for signs of Archaic occupation on the site were found on the ridgetop (including a monumental structure over the southwest corner of the palace, identified as a temple) and the lower slopes. Most, perhaps all, the sites outside of Phaistos were small (e.g., *ca.* 40 × 60 m.) and produced roof tiles, black-glazed cups, skyphoi, bowls, and jugs (some of Attic manufacture), pithoi stamped with designs, clay beehives, spindle whorls, and coarse basins. As in the Archaic period, the sites were distributed within relatively close distance of Phaistos. These sites give the appearance of being suburban farms. Northwest of Pitsidia, a site recently excavated by Despoina Vallaniou, appears to have been a 4th-century industrial structure of some kind. One cemetery (A 21), containing small rectangular cists constructed of limestone slabs set on edge, probably served nearby settlement A 24/B 12. East of Kamilari, a long wall whose upper surface is provided with cuttings for stelai (Pl. 53:b) probably marked the line of a Classical–Hellenistic road between Phaistos and Matala.

⁹¹ Shrine at Agia Triada: Banti 1941–1943. Shrine at Kommos: Shaw 1981, pp. 224–251; Shaw 1984, pp. 279–287; Shaw 1986, pp. 224–233.

⁹² Shaw 1989.

The number of rural sites in the region nearly doubled again in the Hellenistic period (*ca.* 325–69 B.C.). The distribution of these sites was wider than during the Classical period, having expanded into areas south of Sivas, further north near Phaneromeni, and west, closer to the seacoast. Hellenistic remains were abundant on the surface of the Western Mesara; they included house and field walls, tiles, stone olive presses, black-glazed pottery, Megarian bowls, “Cream ware”, amphoras (including stamped and Rhodian [?] examples), pithoi, lamps, cooking ware, coarse basins, loomweights, spindlewhorls, beehives, and glass. The survey found a mason’s mark (Pl. 53:c) carved into the bedrock at a Classical–Hellenistic (?) quarry east of Phaneromeni.

The Hellenistic pattern of settlement displayed a more developed hierarchy than that of the Classical period. Still the largest regional settlement, Hellenistic Phaistos expanded as far as the present village of Agios Ioannis to the south, to the base of the ridge on the north and east, and beyond the hilltop of Ephendi Christou to the west. The east slope of Phaistos was covered with streets and houses.⁹³ The best preserved of the Hellenistic houses that covered the site is visible today, built over the upper west court of the Minoan palace. Hellenistic Phaistos appears to have reached approximately one square kilometer in area. The city walls of the settlement can still be seen at the west end of the site on the south slope of Ephendi Christou (Pl. 52:d). Recent excavation just north of Agios Ioannis has exposed a Hellenistic house set along an east–west street.

A second large settlement (A 52), located east of Sivas at the edge of the plain, was probably large enough (600 × 800 m.) to be considered a small town. Next, in descending order, was a large group of settlements, of small village or hamlet size, (measuring 100–250 m. in length), which consisted of several buildings. Equally numerous were the smallest settlements (*ca.* 50 × 50 m.) that seem to have been single farmsteads. These exhibited a similar assemblage of artifacts: roof tiles, sherds (including pithoi, amphoras, and coarse basins), beehives, loomweights, and oil presses (Pl. 53:d). One farm (B 2) near Phaistos was situated within its own rectangular plot of land (measuring 150 × 25 m.) carefully marked out by a fieldwall of upright slabs. Some farmsteads were situated in dry, marginal land, perhaps an indication of changing agricultural practices, local population pressure, or both.

Hellenistic graves varied in elaborateness and wealth. In 1986 and 1987 Despoina Vallianou excavated six chamber tombs (Pl. 52:c) north of Phaistos which yielded rich burials. In one of these tombs was found a black-glazed jug that contained 600 silver tetradrachmas of the successors of Alexander the Great.⁹⁴ Other local graves were poorer; small pit-graves (A 71) south of Phaistos, for example, produced only pottery, including Hadra ware.

Minoan sites in the Mesara became the focus of cult during the Hellenistic period. One of the Minoan tholos tombs at Kamilari served as a shrine in the

⁹³ Hellenistic city on east slope: Levi 1969 and the color plate at the end of the volume.

⁹⁴ See Catling 1989, p. 70.

Hellenistic period where worshipers left terracotta plaques and figurines of women as well as a miniature horns of consecration (Pl. 54:b). A 4th-century black-glazed skyphos found by the survey at the Late Minoan IIIC cemetery of Liliانا may also have been left as a votive. The perforated base of a cup was noted at the Late Minoan IIIA chamber tombs at Kalivia. Near Voroi a small site (A 37) that produced a clay mask or head and a stone carved with kernos-like depressions may have contained a rural shrine. A Greek inscription found at Agia Triada testifies to a Hellenistic shrine dedicated to Zeus Velchanos.⁹⁵

The survey discovered a Greek inscription about 20 minutes walk southwest of Phaistos. The inscription is on an ashlar block of sandy limestone (H. 0.40, L. 0.76, W. 0.50 m.) with smoothly dressed front, lateral sides, and top. In letters 0.05 m. high, the inscription reads:

ΧΑΥΧΑΥΝΤ(Ι)
ΜΕΝΟΚΛΕ(Ω)Σ

Margins to the left and right of the two lines suggest that the inscription is a list, probably of names. The dressed surfaces indicate that the block originally had other blocks placed above and beside it. The narrow margin above the upper line may indicate the list continued on the block above. The broken-barred alphas date the inscription to the Hellenistic or Early Roman period. Found built into a low terrace wall, the block does not seem to have been *in situ*. No site was found in the immediate vicinity, the closest being the Hellenistic farmstead (B 2) about 200 m. away. This block is probably part of a funerary inscription; Halbherr found a number of grave stelai inscribed with lists of names in the same general area.⁹⁶

The political independence of the Western Mesara came to an end in the mid-2nd century B.C., when Gortyn destroyed Phaistos and annexed its territory (see Fig. 1); by the 1st century B.C., Gortyn controlled all the Mesara. After the Roman conquest of Crete in 69 B.C., Gortyn became the capital of the Roman province which included Crete and Cyrenaica in North Africa. At this time Gortyn expanded to become the largest city (at least 150 hectares) in Crete, with its own acropolis, agora, aqueduct, theater, odeion, temples, public baths, nymphaeum, basilica, amphitheater, and stadium.⁹⁷

Gortynian hegemony had radical effects on settlement in the Western Mesara. The city of Phaistos seems to have lost much of its population; on the east slope of the site, only a single Late Roman house was built over the destroyed Hellenistic city. It is possible that a small part of the settlement continued at the edge of the plain (under the present-day village of Agios Ioannis) where the remains of a Roman

⁹⁵ Guarducci 1935, pp. 273–274, no. 4. La Rosa publishes an altar of the Hellenistic period found at Agia Triada (1991a).

⁹⁶ Halbherr 1890; Guarducci 1935, pp. 275–277. We have restored the first name in the dative and the second name in the genitive, in accordance with the funerary inscriptions cited above.

⁹⁷ A recent summary of Italian archaeological work at Gortyn appears in DiVita, La Rosa, and Rizzo 1984, pp. 69–115. For Roman and later graves around Gortyn, see DiVita 1988.

bath can still be seen.⁹⁸ Roman pottery was also found by the survey in the fields south of Agios Ioannis. Worship at local shrines (e.g., at Agia Triada and Kamilari) apparently ceased in this period.

Most rural Hellenistic settlements in the Western Mesara continued to be inhabited in the Early Roman period (*ca.* 69 B.C.–A.D. 300). Early Roman sites produced walls constructed with cement, roof tiles, bricks, stone facing slabs, stone presses, beehives, lamps, pithoi, spindlewhorls, cooking ware, amphoras, coarse basins, and local fine wares. The rural settlement hierarchy, that is, the ratios of large (200+ m. in length) to medium (200–100 m. in length) and to small (under 100 m. in length) settlements, did not change at this time. There are some signs, however, that this pattern of continuity may be deceptive. The four Hellenistic cemeteries found by the survey produced no Early Roman material. A Roman period rock-cut tomb north of Kamilari (Pl. 54:c) with a dromos, two rectangular rooms, and wall niches is the first known in the area. A number of settlements near Phaistos were deserted, whereas the nine new Early Roman settlements were established at some distance from the former center. Several of these settlements, probably small farms, were situated on the bottomland of the Mesara, in the alluvial center of the plain. It has been suggested that these new sites are a sign that the Mesara Plain may have been drained by some engineering project during the Roman period.⁹⁹ Alternatively, it is possible (as is certainly the case during the Bronze Age) that earlier Iron Age sites on the floor of the valley have simply been covered over by alluvium.

The overseas contacts of the Western Mesara expanded considerably during the Early Roman period: an impressive rise in imported pottery is evident. Phocian, African, and Cypriote (?) Red Slip were fairly common on survey sites. Eastern Sigillata A, Chandarli ware, Arretine, Pompeian Red, Koan, Rhodian and Campanian amphoras, Italian Terra Sigillata, and Spanish (?) jars were recovered in smaller numbers.

THE WESTERN MESARA DURING THE BYZANTINE–OTTOMAN PERIODS:

A.D. 400–1894

The historians studied existing Byzantine, Venetian, and Turkish historical and archival material relating to the Mesara as well as the collected survey data in order to write a post-classical history of the region and to make chronological maps of local settlements.¹⁰⁰ Whenever possible, they visited the local monuments and settlements mentioned below to relate them to the documentary evidence.¹⁰¹

⁹⁸Sanders 1982, p. 161.

⁹⁹Sanders 1976.

¹⁰⁰This section on the Western Mesara during the Byzantine–Ottoman Periods: A.D. 400–1894 was written by Dimitris Tsoungarakis and Eleni Angelomati-Tsoungarakis.

¹⁰¹For a treatment of Crete during this period, see Tsoungarakis 1988, from which some elements of this discussion are drawn.

During the First Byzantine period (*ca.* A.D. 400–828), Gortyn (immediately to the east of the survey area; see Fig. 1) continued to be the seat of the provincial governor of Crete, the administrative center of the island, and the market center for the Mesara. The city also had its own *curia*, in which its citizens participated. The *koinon*, the pre-Roman confederation of Cretan cities, continued to meet at Gortyn during this period.¹⁰² Contemporary documents, the *Synekdemos* of Hierokles, the *Peutinger Table*, and the *Stadiasmos of the Great Sea*, mention four or five settlements in the Western Mesara as well as Gortyn. Phaistos and other settlements must have had the status of *kome* (village), under the direct administration of Gortyn. Survey-pottery collection indicates that the Mesara continued to have contacts with North Africa and Cyprus.

The archaeological survey corroborates the picture given by documentary sources: by the 4th century after Christ, the number of sites in the Mesara had begun to drop sharply. The total of Late Roman sites in the Western Mesara is less than one-fourth the preceding period. In the eparchies of Kainourgio and Pyrgiotissa, approximately 25 settlements of this period are known through archaeological evidence; the survey has added eleven more settlements to this list, most of them farmsteads. The sanctuary at Kommos was apparently abandoned during the 1st century after Christ,¹⁰³ but the coastal port of Matala was probably not deserted until the end of the 5th century after Christ.¹⁰⁴

Frequent earthquakes and Arab naval raids beginning in the mid-7th century had an adverse affect on the population, economic prosperity, and municipal institutions of the region (as well as on the rest of Crete). After the mid-7th century the population of Gortyn must have declined, and the regional settlement became ruralized, as in Crete generally.¹⁰⁵ Overseas contacts (*viz.*, with Constantinople) were, however, kept up.¹⁰⁶ When Crete fell into the hands of Andalusian Arabs in 828, Gortyn ceased to be the capital of the island. Under the Arabs, the capital became Chandax (modern Herakleion), on the north coast. Very little is known about Crete under Arab rule, and virtually nothing is known about the Mesara at this time.¹⁰⁷ Numerous Byzantine attempts to retake the island failed until 961, when the Arabs were finally expelled. Overseas trade during this period, however, continued; Arab sources mention imports of cheese and honey from Crete to Egypt.

Crete rejoined the Byzantine Empire in 961, beginning the Second Byzantine period (A.D. 961–1210). During this time the island had direct administrative, economic, cultural, and artistic connections with Constantinople. Crete became a *theme* (eparchy) governed by a *strategos* from Chandax, and the Mesara was probably one of the administrative/military divisions (*turmae*) of the eparchy.¹⁰⁸ About ten

¹⁰² Chrysos 1981, p. 544.

¹⁰³ Shaw 1980, pp. 243–244.

¹⁰⁴ Sanders 1976, p. 114.

¹⁰⁵ Tsoungarakis 1988, pp. 135, 254–265. Cf. DiVita 1985.

¹⁰⁶ See the seals of Byzantine officials in Crete during this period: Tsoungarakis 1990, pp. 146–147.

¹⁰⁷ Christides 1984, *passim*.

¹⁰⁸ See the document of 1193 referring to the “*turmae* of the north of the Mesara” in Miklosich-Mueller 1890, p. 125.

present-day villages appear for the first time in written records during this period. Within the Western Mesara, at least 19 villages existed in the 12th century. The village of Sivas, located on a defensive hilltop, certainly predates the mid-10th century and could be an Arab period foundation. Within the survey area, Agios Ioannis and Agia Triada (now deserted), as well as a few sites discovered in the survey, were probably 12th-century villages. Large landed properties owned by the Crown, the Church, and noble families came into being and existed side by side with small landholdings; for instance, more than half of the 19 villages are listed as belonging to the Archbishopric and the monasteries of Paliani (southwest of Herakleion) and Kyrmoussi (in Kainourgio).¹⁰⁹

In 1210/11 Crete became a Venetian possession ruled by the *Duca di Candia* whose seat was in Chandax (Candia). Land was redivided among the Venetian state, the new settlers sent to Crete, and the Latin Church. This redistribution of land caused repeated local rebellions led by the older Cretan landed families.¹¹⁰ These uprisings, combined with earthquakes and the plague in the 14th century, created great insecurity.

Under the Venetians, Crete was divided administratively into six geographic regions called *saxteria* (later redefined as *territori*), which were subdivided into *castellaniae*. The Western Mesara was divided into two *castellaniae*, *Castel Nuovo* and *Pyrgiotissa*, corresponding to the present-day eparchies of Kainourgio and Pyrgiotissa. Today, the ruins of the castle seat of *Castel Nuovo* can still be seen on a hilltop a little east of the market town of Moires. The castle of *Pyrgiotissa*, originally a Byzantine construction located at the mouth of the Ieropotamos River, is no longer visible.

Written documentation for the region becomes more abundant in the Venetian period, and, as a result, the pattern of settlement becomes clearer. At least 19 villages are mentioned in 12th- and 13th-century records; the number of known villages rises to 30 in the 14th century and to 33 in the 15th century.¹¹¹ The official census of Castrofilaca, dated to 1583, lists 81 villages in the two eparchies and gives the total population of the region as 11,729. Some 12 monasteries of the Byzantine and Venetian periods are known in the Western Mesara. Based on these later records, one can infer that the region was more densely settled before the 16th century than the sparse documentation suggests. Venetian land redistribution and taxation caused many *villani* to abandon their land; various measures taken against rural flight, including tax relief and colonization, were not very successful.

Venetian records describe landholdings, produce, and the various social classes in the Mesara.¹¹² Throughout this period, the Mesara was one of the chief grain-producing areas in Crete. Shepherding in the foothills and mountains is mentioned. Flax was produced near the Ieropotamos River in both *castellaniae*, and, with the beginning of Venetian export of Cretan wines, viticulture became important

¹⁰⁹See Tsirpanlis 1985.

¹¹⁰For the latest account, see Maltezos 1991.

¹¹¹See the villages mentioned in the acts of the contemporary notaries (Pizolo, Scardon, Brixano, Marcello), and in the documents published by Tsirpanlis 1985.

¹¹²See the documents in Theotokis 1933; Theotokis 1936–1937; Gasparis 1986.

locally.¹¹³ By the 15th century, the growing of grapes had expanded, possibly at the expense of grain production. The Venetians also encouraged the cultivation of olive trees to increase the olive oil production.¹¹⁴ Large groves of massive olive trees, at least 500 years old, are still visible today in the Western Mesara (Pl. 54:d). Venetian economic restrictions encouraged local black marketing; documents mention illegal trade and smuggling (probably in grain) carried out along the coast of the Mesara.¹¹⁵

Beginning in 1645, Crete was conquered by the Ottoman Turks. The Venetian administrative divisions of the island were kept; thus the Mesara was part of the self-governing province (*hukumet sancak*) of Candia and was ruled by the Pasha of Candia. Lands conquered by the Ottomans became state property (*miri*), if the already existing property rights were not confirmed by the Sultan. The Sultan transferred the usufruct of land (*timar*), but not property rights, to individuals as a reward for satisfactory service and on condition of future military obligation. These individuals (*timarli*) could also act as policemen and tax collectors. At times the Sultan did confirm existing property rights or gave lands as a gift to individuals whose descendents could inherit them. Finally, the Sultan or other rich landowners could establish a trust (*vakif*) by bestowing religious foundations with land for their support in perpetuity.¹¹⁶

In Ottoman Crete, much land became the property of the Sultan, was given to local leaders of the Turkish forces, or became a *vakif*: ten villages in Kainourgio and at least three in Pyrgiotissa belonged to the Turks. Less extended lands (*zeamets*) and *timars* were given to other officials. Many, but not all, of the local landowners lost their land and became serfs, paying one-seventh (later one-fifth) of their revenues to their landlords.¹¹⁷ Monasteries were allowed to keep their holdings but suffered extortion.¹¹⁸

There was little central control over the Cretan Turks who oppressed the Christian population, and frequent local uprisings were put down. As a result, the population of the island declined considerably. In addition, many Cretans converted to Islam.¹¹⁹ A number of older settlements were abandoned, and many rural hamlets (*metochia*; in Crete this term can be used of a rural settlement unrelated to the Church) were established. These were dependent on nearby large villages, and some survived throughout the period, while others were soon abandoned.¹²⁰

A census conducted in 1671 records 81 villages for the Western Mesara, while a land register of 1705 mentions 91 villages in the area.¹²¹ For the century following,

¹¹³Thiriet 1975, p. 320.

¹¹⁴Politis 1967.

¹¹⁵See, e.g., Santschi 1976, p. 386, nos. 1797 and 1798.

¹¹⁶Sugar 1977, pp. 42, 93–100, and 197.

¹¹⁷Stavrakis 1890, pp. 147–152; Stavriniidou 1955, p. 315.

¹¹⁸Stavriniidou 1975–1985, *passim* and particularly II, pp. 59 and 247–250. Angelomati-Tsoungarakis 1990, pp. 14–15.

¹¹⁹Stavriniidou 1975–1985, *passim*; Stavrakis 1890, pp. 183–191; Angelomati-Tsoungarakis 1990, pp. 13–15, 25–27.

¹²⁰Stavriniidou 1975–1985, II, pp. 122–126; Pashley 1837, pp. 308–325.

¹²¹Stavriniidou 1975–1985, II, pp. 122–126; Stavrakis 1890, p. 189.

there are no figures available. During the Greek War of Independence (1821–1829), the Cretans also rose up, and many villages on the island were destroyed by the Turks; a Greek document refers to only 55 villages in the eparchy of Kainourgio in 1832.¹²² Pashley, an English traveler to the Western Mesara, recorded only 66 settlements in 1834.¹²³ The Egyptian census of 1834 lists 1043 families in the region.¹²⁴ Constant uprisings by the Cretan population against Ottoman rule in the 19th century contributed to regional insecurity and a drop in settlement. Only in the late 19th century does the local population begin increasing: the census of 1881 recorded 70 settlements in the Mesara with a total population of 12,859 inhabitants,¹²⁵ which rose to 16,128 by the year 1900.¹²⁶ Turkish rule came to an end in 1898, and the island officially joined Greece in 1912, an event still recalled by older Cretans today.

SETTLEMENTS AND MONUMENTS OF THE WESTERN MESARA: A.D. 961–1900

For many years the Museum of Cretan Ethnology at Voroï has been studying the Byzantine through Ottoman monuments and material culture of the Western Mesara. The following is a synthesis of the Museum's work and that of the survey.¹²⁷

By the time of the Arab occupation, *ca.* A.D. 827–961, the city of Gortyn seems to have been deserted, and the Mesara shows signs of depopulation. After A.D. 961 many soldiers from the army of Nikephoros Phokas were settled on Cretan land with the intention of protecting the island and strengthening the population. The Byzantine conquest had two immediate affects on Crete: forts were constructed along the coast, and many new churches were built. One fort, probably at Kokkinos Pyrgos, is known to have been built at this time on the Gulf of Mesara (Fig. 2). A church adjacent to this fort, called the Panagia Pyrgiotissa, gave the region its name, Pyrgiotissa. Remains of other Byzantine forts are preserved near the villages of Phaneromeni and Kouses; other forts were constructed within the region on high locations.

In the early years of the First Byzantine period, many new churches in the Western Mesara were constructed on or near the sites of early Christian basilicas (Fig. 2). Because of the strength of local tradition, these churches were often dedicated to the same saint as the earlier structure. Eight churches in the Western Mesara are of this type. The variety of plans, basilican, cross-shaped, or single-aisled, is perhaps partly due to the origins of the architects. Armenian construction

¹²² Hourmozis–Vyzantios 1842, pp. 87–88, 96–103.

¹²³ Pashley 1837, pp. 315–316.

¹²⁴ Nomarchias Herakleïou (*Νόμος Ηρακλειο*).

¹²⁵ Stavrakis 1890, part II, pp. 54–57.

¹²⁶ Chouliarakis 1973, pl. XXVIII.

¹²⁷ This section on Settlements and Monuments of the Western Mesara: A.D. 961–1900 was written by Christophoros Vallianos and is based in part on his own research (Vallianos and Kokkore 1987) and on the work of the survey.

techniques, for instance, are noticeable in some of the churches and may be related to the fact that there were many Armenians in the army of Nikephoras Phocas. The most important Byzantine church in the Western Mesara is the Church of Agios Paulos at Phaistos. It is built over an Early Christian baptistry of the 4th–5th century and incorporates in its wall a boustrophedon inscription that mentions both Phaistos and Gortyn.

At the end of the 11th century, certain noble Byzantine families were settled in Crete and were given land holdings and control of the feudal administration. These noble families each maintained a body of horsemen and weapons within their own regions, and the administrative system was perpetuated through the Venetian control of the island.

Some older settlements in the Western Mesara, such as Voroi, Agios Ioannis, Pobia, and Plora, received new settlers during the Byzantine period. Some new villages, Sivas and Pitsidia, may have derived their names from the places in Asia Minor where their founders, soldiers in Nikephoros' army, came from. Yet other settlements, for example, Agioi Deki, Agios Kyrillos, and Panagia (north of Moroni), grew up around religious structures. The style of the architecture of these village structures shows some Byzantine influence; probably more than 70 percent of the present-day villages of the Western Mesara were established during this period. In the 12th century the Mesara became the largest wheat producer in Crete, sending its surplus to the city centers and forts. Byzantine technology influenced many industries, such as metalworking and textile production; fine pottery was imported from Constantinople.

The church became an important institution in the Western Mesara during the Byzantine period. An early bishopric at the settlement of Episkopi near Gortyn continued to function. Parish churches of the 12th century have survived in Voroi, Kalyvia, Monochoro, and Apomarmas (northeast of Moroni), although the original number must have been much greater (Fig. 2). At the same time, churches were constructed in more remote, mountainous locales. Investigations have identified sixteen 12th-century examples, of which four are cross-shaped with a dome and the rest are single-aisled. Certain churches mentioned in written sources, such as Agios Eutykianos and Panagia Kyrmousi, belonged to monasteries.

Under the Venetian rule, the Orthodox bishops were removed from their seats. Catholic as well as Greek priests ministered to the population on the island. Venetian colonists assumed the role of the Cretan nobility, whose previous privileges were abolished; this policy led to frequent and widespread uprisings against the Venetians. The nobility of the Mesara must have resisted the Italian conquest of the island, since the invaders constructed three fortresses in the Mesara, *Castel Nuovo* near Moires and *Castel Belvedere* and *Castel Bonifaccio* in the eastern part of the plain. *Castel Nuovo*, situated about nine kilometers east of Phaistos, replaced an earlier Byzantine fort, as its name implies. Rectangular towers were built along the western coast of the Mesara at Kokkinos Pyrgos and Kastelli.

After the Kallergi Treaty of A.D. 1299 between the Cretans and the Venetians, some of the Cretan nobility regained their feudal privileges, and the Orthodox clergy

became more influential. We know that by the 14th century Venetian and Cretan noble families (e.g., the Kallergi family) from elsewhere on the island had settled in the Mesara and that some redistribution of local land took place. It is possible that the Venetian authorities accepted this redistribution since it enabled them to collect greater surpluses of produce from the region. During the 15th century the local centers of population became larger. Land clearing also continued, mainly in the area of the foothills, and grazing reached up into the wooded Asterousias Mountains.

As elsewhere on Crete, the building of new churches (four examples have been identified) was rare in the Western Mesara during the 13th century because of unsettled conditions. After the Kallergi Treaty and the destructive earthquake of 1302/3, however, many new churches were constructed; 82 present-day churches of the Western Mesara were built in the 14th or 15th century (Fig. 2). Forty-six of these can be accurately dated, while two-thirds of the remaining 36 (now in ruins) are probably 14th century. Some were built as thank offerings (a practice continued to this day), while others served as boundary markers for landholdings and for grazing pastures in the mountains. Two of the churches were Catholic: one at *Castel Nuovo* and one at Moni Phrati. Eight new monasteries, Valsamonero, Vrondisi, Kera, Phalandra (at Phaistos), Kardiotissa, Odigitria, Apezanes, and Phrati, were established between the 14th and 16th centuries (Figs. 1 and 2). The number of new monasteries in the Mesara is probably due to the prosperity of the region and to the immigration of new clergy from Asia Minor.

During the next two centuries (1500–1645), Venetian rule of Crete became less severe. Legal documents show that the local Venetian nobility had assimilated: they no longer knew Italian and had converted to Orthodoxy. Some local buildings were now built in Venetian architectural style. A Venetian villa, for instance, was constructed at Rapti in the Mesara, northeast of Gortyn. By the middle of the 16th century most of the villages of the Mesara began to replace their churches with larger structures in Italianate style, with portable icons instead of wall paintings. The local Cretan nobility adopted a form of house fortified with a thick tower (Pl. 55:a, b). Thirteen examples of these houses (datable to the end of the 16th and the 17th century) have been discovered in nine Mesara villages (Fig. 2). A number of small family settlements (*metochia*) began to be established on rural land. By the mid-16th century, olive production in the Mesara was more systematic: with the establishment of large workshops in the Mesara employing the new pressure-screw olive presses, the production of olive oil increased significantly. Olive oil was especially important in Venetian trade since it was marketable in Europe for the making of soap. As a result of this new economic emphasis, the Mesara ceased to export wheat and barley to other parts of Crete by the beginning of the 17th century.

Crete passed into the hands of the Turks in 1669. In the Mesara during the 17th and 18th centuries, many water mills were erected (Fig. 2).¹²⁸ Cereal production in

¹²⁸Vallianos 1985; for the drawing and conservation of a watermill of the Venetian period near Phaistos, see Vallianou 1985, pp. 204–249.

the Mesara rose, and the Cretan export of cereals, which had ceased in the 16th century, resumed for a short time. The Turks maintained the Venetian fortresses in the Mesara and built small forts elsewhere in the region. The only substantially constructed fort (Pl. 55:c) in the Western Mesara was on the foothill of Mt. Ida, at Koules, near the village of Grigorias (Fig. 2).

During the Turkish period many small settlements and *metochia* were established in the Western Mesara. Local buildings continued to be constructed in the Venetian style. Kalathiana, one of the first villages settled after the conquest, was founded near Moroni by Cretan families wishing to avoid contact with the invaders. Families from Sphakia in West Crete also moved to different parts of the Mesara during the 18th century. Cretans who had converted to Islam also established their own, relatively poor villages, notably along the north edge of Pyrgiotissa and Kainourgio. Toward the end of the 18th century all village construction in the Mesara, as elsewhere in Crete, began to show signs of decline (the use of lime, for example, becomes rare) due to the increasingly harsh economic conditions. Only in the last third of the 19th century does this architectural trend reverse itself when local houses and churches began to be constructed in the Neoclassical style by masons from the island of Karpathos.

ETHNOGRAPHIC RESEARCH ON TRADITIONAL LIFE AND LAND USE DURING THE LATE 19TH AND EARLY 20TH CENTURIES

The extraordinary breadth of the Mesara region and the diversity of life contained within it required that ethnographic research follow the intensive pattern established by the archaeological, environmental, and historical studies of this survey project.¹²⁹

¹²⁹This section on Traditional Life and Land Use was written by Harriet Blitzer. Fieldwork for this study took place annually in the Mesara from 1984 through 1989. Research also benefited from the writer's previous experience in the Western Mesara, at the site of Kommos, each summer from 1977 through 1982, and from nine months of study in the village of Pitsidia (1981–1982). All field research was carried out in Greek by the writer, who is responsible for any inaccuracies. Greek words are written as they are used in the Mesara region.

Previous ethnographic work in the Mesara includes Burgel 1965 and Allbaugh 1953, for which extensive research was carried out on the agriculture and land use of the plain. For comparative purpose, a useful study of shepherding in the Mylopotamo eparchy on the north slope of the Idaean range was published in Herzfeld 1985. A systematic examination of plant use in Crete (Phrangaki 1969) proved helpful in the identification of floral resources and uses in the Western Mesara, as did Polunin 1980. The wood resources of the Western Mesara were compared with the rest of Crete through the use of Zachare 1977. Turkish documents from Crete (e.g., Stavrinidou 1985) and syntheses (such as Triantaphyllidou-Baladie 1988) gave insight into 18th- and 19th-century use of the region and provided a comparative foundation for studying the late 19th- and 20th-century economic structure. Verification of terms used in the Mesara dialect was aided by Pitikakis 1971 and Pagkalou 1983. The Herakleion nome, including cultural and economic details on the Mesara Plain, is described in *Νομαρχίας Ηρακλείου*. Comparative statistical details were available in Stavrakis 1890 and in extant statistical reports from various branches of the Greek government (e.g., *Ετησία Στατιστική της Γεωργικής Παραγωγής. Έτος 1914* [Αθηνάι, Βασιλείον της Ελλάδος, Υπουργείον Εθνικής Οικονομίας, 1916]; *Γεωργική και Κτηνοτροφική Απογραφή της Ελλάδος του*

As we could not hope to examine in detail all parts of the region, a research transect across the Western Mesara Plain involving the villages of Listaros, Sivas, Kouses, Petrokephali, Pitsidia, Kamilari, Agios Ioannis, Voroi, Magarikari, and Vorizia was established. In this way, the villages along the transect included land use and landholdings within the full range of geological and botanical zones identified by our project members. In addition, extensive fieldwork was carried out in the mountain village of Zaros, in the market town of Moires, and briefly in several of the Eastern Mesara villages for comparative purposes. The fieldwork was based on systematic inquiry into village family structure and village interconnections; soils and water resources; patterns of land use and landholdings; utilization of wild flora and fauna; agriculture, arboriculture, and animal husbandry; the local economy and local household and specialized industries (e.g., pottery manufacture, soap manufacture); trade within the Mesara and social and economic connections with the rest of Crete and the eastern Mediterranean. Within these larger categories a total of over 200 themes were systematically explored through interviews and participation in local activities.

The goals of this research included (1) definition of local patterns of subsistence in pre-mechanized periods; (2) recording of human-land interactions (e.g., land use, exploitation of natural resources) to identify the physical results of these interactions within the Western Mesara landscape; (3) integration of (1) and (2) with the geological and botanical data to understand the processes of societal development archaeologically and historically documented for the Western Mesara.

In the perception of present-day inhabitants, the Mesara Plain, well into its northern and southern foothills, is divided into two parts, the *Kato Mesara* or *Exo Mesara* (the western part) and the *Epano Mesara* or *Mesa Mesara* (the eastern part). This cultural division of the landscape into two parts roughly equivalent to the modern-day administrative units (Kainourgio and Pyrgiotissa in the west and Monofatsion in the east) is accompanied by a common perception that the inhabitants in both parts are different in lifestyle and values.

The most visually striking characteristic of the Mesara Plain is the soil, with all of its variations in color, texture, and extent. Two major soil types and several less frequently occurring types are perceived by the inhabitants of the Western Mesara in terms of color, content, and productivity. *Rousses*, *kokkinas*, or *kokkinochoma*, a red soil (Pl. 47:a), is considered the most productive by far in terms of yield but only when consistently irrigated. Irregular or infrequent irrigation results in hard, dry, open cracks within a field and a poor yield. Thus the red soils are viewed as extremely risky and likely to result in a low yield. These red soils are found today in the foothills north and south of the plain and, more rarely, in patches on the plain itself (see *Geology and Soils*, pp. 197–204 above). *Asprochoma*, *asproulias*,

¹Έτος 1929 [Αθηνάι, Υπουργείον Εθνικής Οικονομίας, 1934]; Αποτελεσμάτα της Απογραφής Γεωργίας Γεωργίας-Κτηνοτροφίας της 19 Μαρτίου 1961 [Αθηνάι, Εθνική Στατιστική Υπηρεσία της Ελλάδος, 1966]; Γεωργική Στατιστική της Ελλάδος Έτος 1961 [Αθηνάι, Εθνική Στατιστική Υπηρεσία της Ελλάδος, 1963]; Αποτελέσματα Ερευνής Θαλασσίας Αλιείας διά Μηχανοκινήτων Σκαφών Έτος 1980 [Αθηνάι Εθνική Στατιστική Υπηρεσία της Ελλάδος, 1982]. These sources enabled us to review the economy of the Western Mesara through the course of the 20th century.

and *asprouli* are all names for the common whitish soil that occurs throughout the bottomland of the plain (Pl. 47:b). This soil type is perceived as rich (it is described as *παχύς* or “fat”) because it retains moisture for long periods (better than any other in the region) and is not likely to need irrigation. The yield for grain and olives per *stremma* (1/4 acre) of unirrigated white soil is perceived to be much greater than for the unirrigated red. Weeds and edible greens (*horta*) also prosper on the white soils as they do not on the red. Since *asprouli* is the preferred soil for traditional dry agriculture and arboriculture, villages (such as Listaros) whose landholdings consist primarily of red soils are considered to be (and are) at a disadvantage in terms of subsistence. Clearly, the bearing properties of these two soils have implications for our perceptions of agriculture in earlier periods.

The crops traditionally planted included olives, grain (primarily barley, but some wheat), legumes, and vines, with citrus and other fruits in the river bottomland. Olives were domesticated by the farmers themselves from wild olive shrub growth (*argoulides*) found on the coastline south of the Asterousias mountains and in the southern foothills of the Idaean Range. Barley (*krithari*) was the primary subsistence grain of the late 19th and 20th centuries. It was chosen over wheat for its greater yield, because wheat was more valuable (and was therefore used as a cash crop), and because it was more durable and less likely to fail in extreme climatic conditions. Wheat (*sitari*) was sold or traded in Herakleion and was rarely used in the traditional Mesara home. Oats (*vromi*) were planted as animal fodder and more rarely in combination (in the same field) with wheat and barley for use in bread. Among the legumes, peas, lentils, and many types of beans were grown for household use. Figs were grown for home consumption and were a minor crop at best. Carob trees were once more plentiful than at present, and the pods were used primarily for animal fodder. Grapes for wine and more rarely for raisins were intended for local use, although some wine from the region went by caravan to the north coast of the island. Flax was grown for home use in the Mesara; because it was a crop requiring much water, it grew best near springs and along the course of the Ieropotamos River. Sesame was commonly grown for household use in bread and sweets. Honey was produced in clay beehives (*kypselia*) placed in rocky areas with heavy growth of thyme and other flowering shrubs.

Of all available woods and shrubs in the Western Mesara, *schinos* (*Pistacia lentiscus*; Pl. 48:d) was considered the best firewood. Spiny broom (*Calicotome villosa*), olive prunings, and more rarely oak were also used as fuel, and a variety of small shrubs was kept for kindling. In addition to the use of wild woods for household hearths and ovens, the firing of lime kilns had a serious effect on the abundance of shrubs in the 19th and 20th centuries. (In the wood-poor Eastern Mesara, dung-cakes were used during this period.) Over 1500 *dematies* (large bundles) of shrubs, including *schinos*, *aspalathos* (spiny broom), thyme, and others were used in the standard seven-day continuous firing of a lime kiln. This resulted in serious deforestation of the hills located near the kilns, and the regrowth of shrub cover was estimated to take from three to five years.

Irrigation, before World War II, was carried out with the aid of a *gerani* (pole-and-bucket lever), used primarily for kitchen gardens because only limited amounts of land could be watered in this way. Villages holding land near the Ieropotamos River (Voroï, Agios Ioannis, Petrokephali) were able to divert water into channels for crops. Standing water on the floor of the plain near Agios Ioannis and Petrokephali was a constant winter problem. As a result, at least a century ago, drainage channels were dug into a main flow known as the *Gria Saita* (Pl. 49:c), which fed one of the water mills north of Phaistos. This drainage was especially important in the winter months when the Levadhia, the bottomland directly below Phaistos, became a lake.

Agricultural techniques, including a three- to four-year rotation of crops on a schedule that also involved fallow periods, allowed for moderate growth in olives, vines, and grain. This maintenance of the soil, along with plowing and limited fertilization, was viewed as the only means of increasing production. Before World War II, substantial household agricultural surplus was considered a rarity in the Western Mesara.

Trade within the Western Mesara took place on market-days in the town of Moires, through peddling in the villages on the plain and sometimes through exchange of goods between neighbors. Commodities were sold to middlemen who shipped them out of the Mesara from storerooms at Matala. Produce included grain (which went to Sphakia in western Crete), *pirines* (crushed olive pits used for fuel), grapes, olives, and carob pods. Trade with ports along the coast of north Africa, including Alexandria and Marsa Matruh, is attested in the late 19th and early 20th centuries. Sailing vessels stopped regularly at Matala to unload wood for construction (mainly cypress from Sphakia), barrels of rum from Egypt, and clay pots for household use from the port of Ierapetra. Village caravans of donkeys and more rarely carts traveled regularly to Herakleion on a route via Agia Varvara. These caravans transported produce, including olive oil in leather sacks (*asches*), wheat, olives, and wine to be traded or sold. This frequent passage to and from the north coast is affirmed by several 19th-century rest stops (*khania*) for travelers in the village of Agia Varvara (Fig. 1).

Cultural processes and culture change in the traditional Western Mesara Plain are directly related to social, economic, and political factors both within and outside of the plain. Our comprehension of the Mesara environment in relation to these cultural factors will provide comparative data for the origins and subsequent development of complex society in the region.

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See also the statistical reports cited in note 129 above, pp. 240-241.

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Landsat image of Central Crete

L. VANCE WATROUS *ET AL.*: A SURVEY OF THE WESTERN MESARA PLAIN IN CRETE

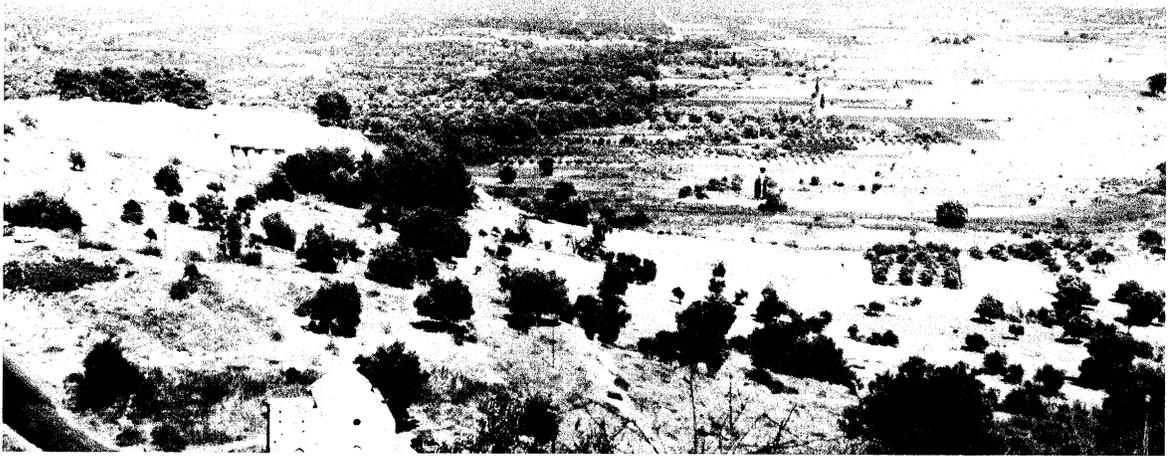


KRITI / CRETE

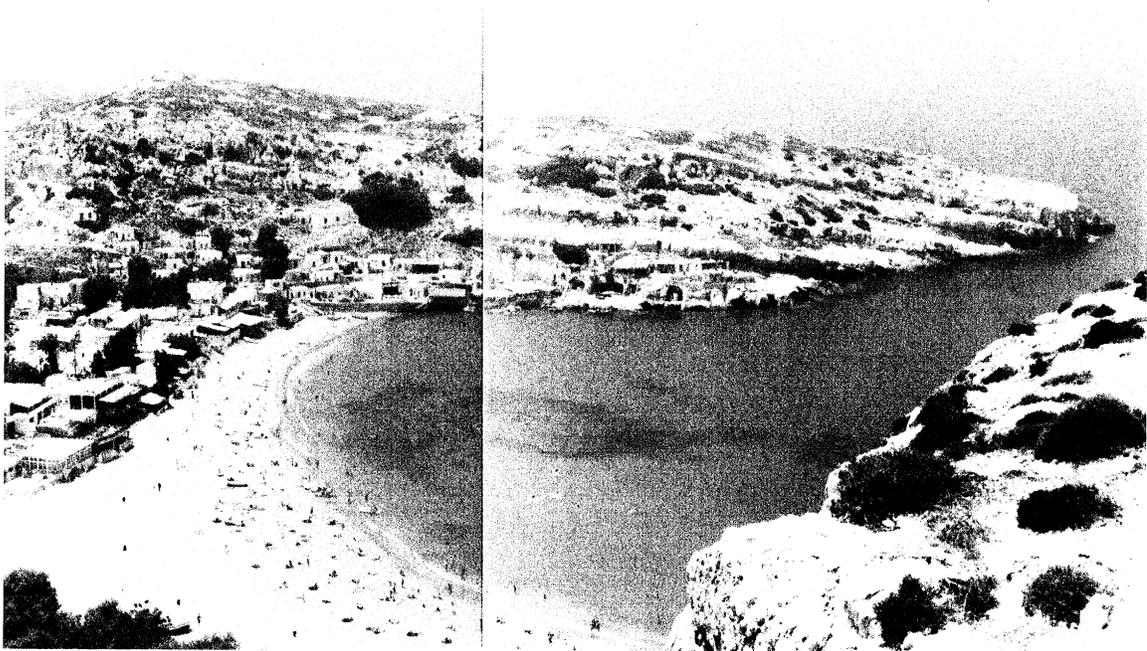
Landsat image of the Western Mesara

L. VANCE WATROUS *ET AL.*: A SURVEY OF THE WESTERN MESARA PLAIN IN CRETE

PLATE 46



a. View of Phaistos from west. The Minoan palace appears in center left with Mesara plain in background



b. View of the Matala Bay from north



b. Recent white soils (*Asprouti*) on the floor of the Mesara plain



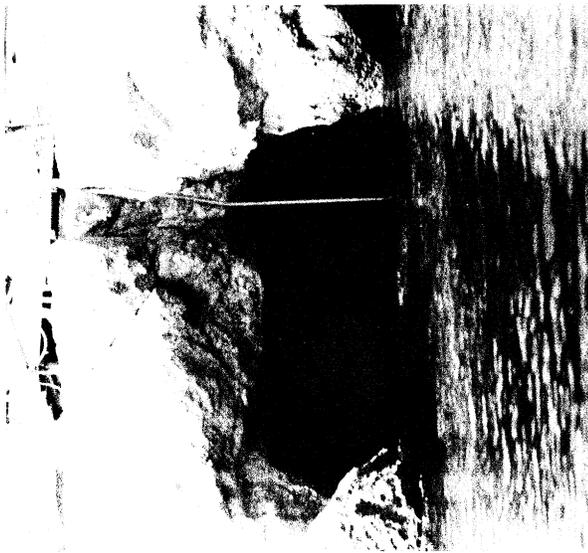
d. Eroded slope terraces in the Western Mesara



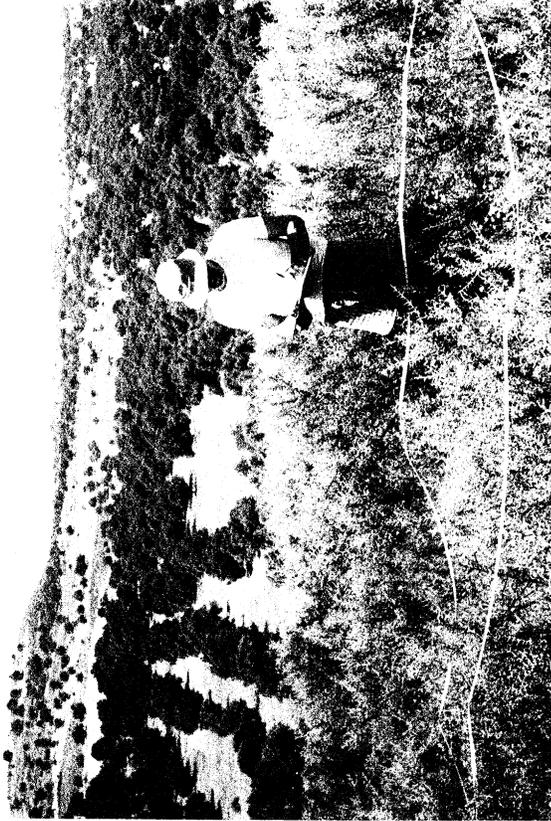
a. Palaeoxeralf red soils (*Kokkinas*) in the Western Mesara



c. Section with buried Final Neolithic site marked by the line of stones and sherds



a. Underwater
Roman tomb
at Matala



b. Botanical sampling of a two-meter-square plot near Sivas



c. Shrub-covered slopes on south coast of Crete near Kaloi Limenes



d. Lentisc (*Pistacia lentiscus*)



a. Steep-sided stream valley near south coast



b. View from Phaistos looking northeast at the plain near the Ieropotomos River



c. Bottomland east of Phaistos. Drainage channel in foreground



d. Slope dotted with oak trees in the foothills of Mt. Ida



a. View looking northward at the southern edge of the Mesara plain, with the village of Sivas at center



b. View southward from Phaistos, with drainage channels at left and Agios Ioannis at center right



a. Landscape in the Idaean foothills, with clumps of thorny burnet (*Sarcopoterium spinosum*)



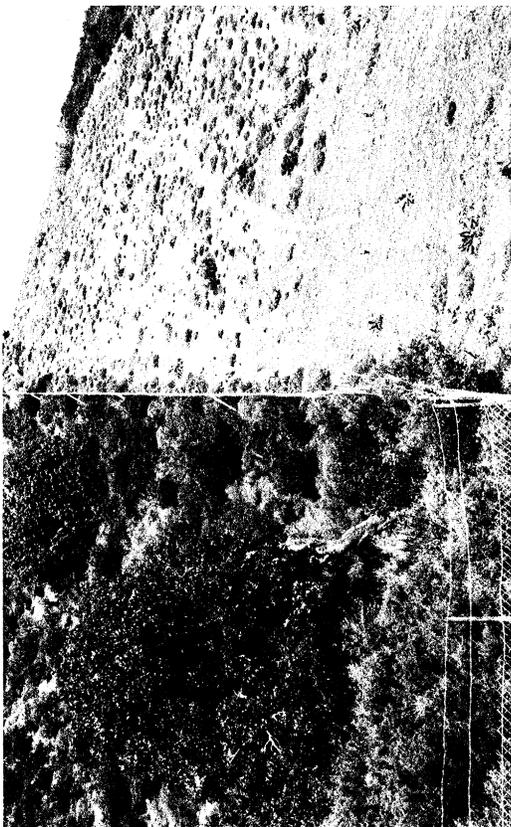
b. View of the base of Mt. Ida above Zaros (visible at lower right)



c. Stunted kermes oak (*Quercus coccifera*) on the Idaean foothills



d. Corn marigold (*Chrysanthemum segetum*)



a. View of fenced enclosure near Listaros



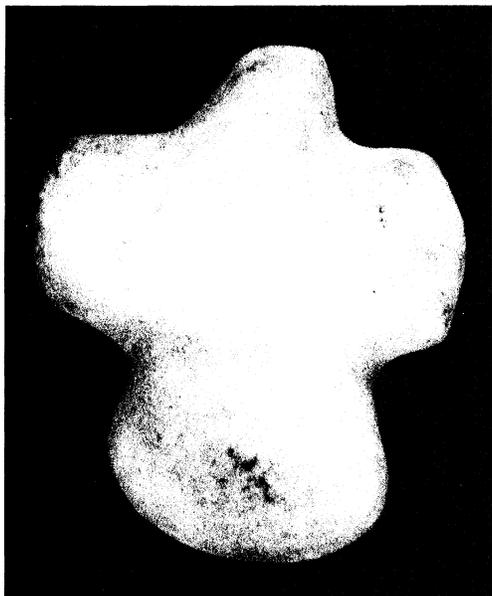
b. Terraced field near Matala abandoned since 1942



c. Chamber tombs in the Phalangari valley north of Phaistos



d. Classical-Hellenistic city wall of Phaistos



a. Early Minoan figurine (scale *ca.* 2:1)



b. Stele base along Classical-Roman road



c. Mason's mark (ten-drachma coin at left appears as scale)

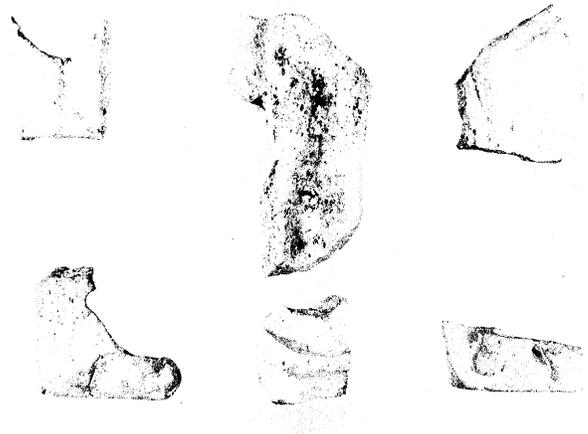


d. Oil press from Hellenistic-Early Roman farmstead north of Phaistos

PLATE 54



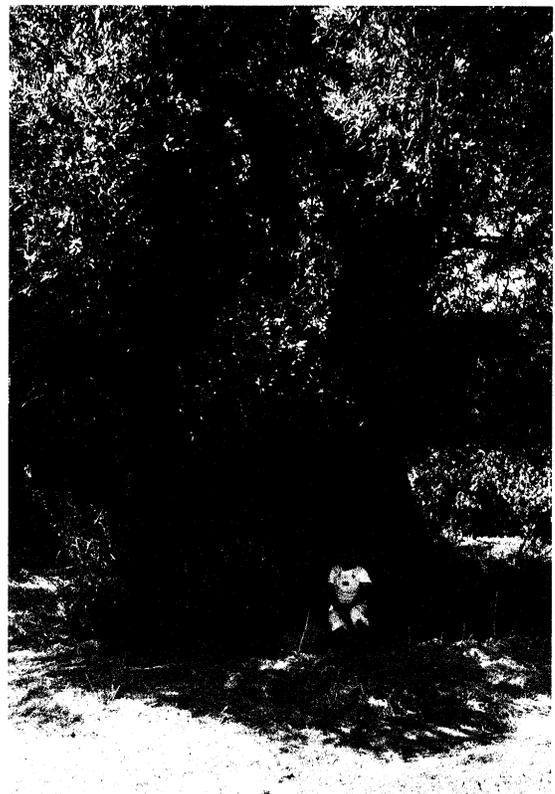
a. Barbotine ware found by the survey



b. Hellenistic votives from the Minoan tholos tomb near Kamilari



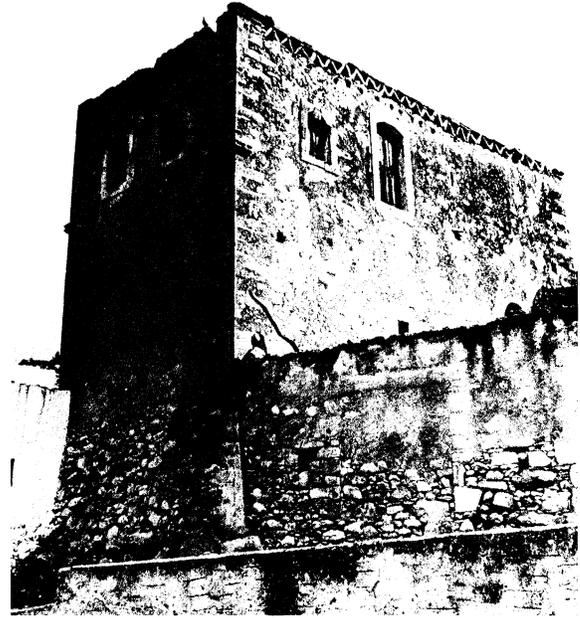
c. Roman chamber tomb north of Kamilari



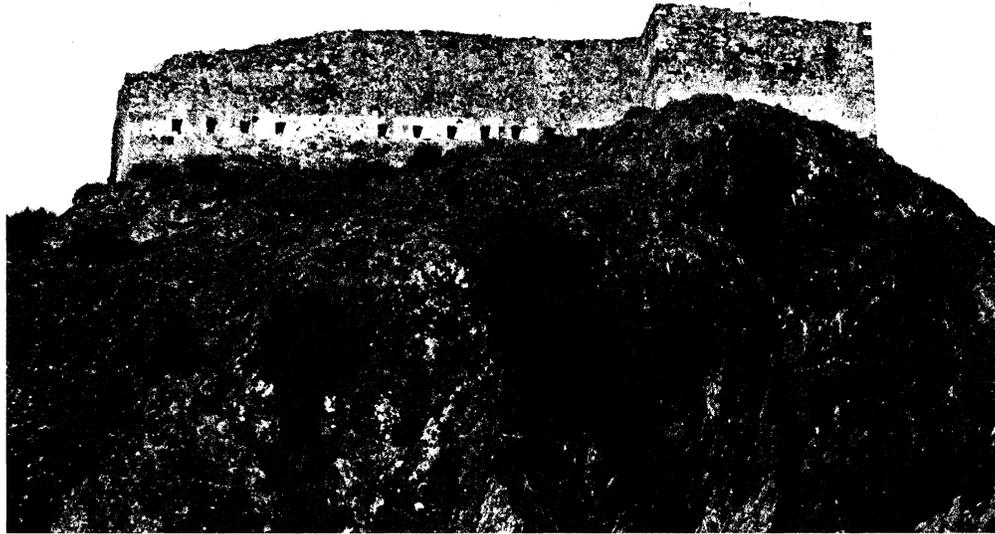
d. Olive tree near Voroi planted during the Venetian period



a. 17th-18th-century fortified house in Kouses



b. 17th-18th-century fortified house in Kouses



c. 19th-century Turkish fort at Koule near Grigorias