

# THE EVOLUTION OF SETTLEMENT IN THE SOUTHERN ARGOLID, GREECE

## AN ECONOMIC EXPLANATION

ARCHAEOLOGICAL SURVEY in Greece has become an established technique of field research, and it is now possible to examine the detailed history of settlement pattern in a number of small regions (Keller and Rupp, 1983). A comparison of the results of surveys in Melos, Messenia, Boiotia, and elsewhere reveals certain similarities in the change of settlement patterns over the course of the last 8,000 years (Wagstaff and Cherry, 1982; Bintliff and Snodgrass, 1985; McDonald and Rapp, 1972). An attempt has already been made to explain this change as a general phenomenon (Bintliff, 1982), but there is every reason to believe that the settlement history of each region owes much to particular local cultural and environmental forces.

In this paper we present in outline the results of the Stanford University archaeological and environmental survey in the Southern Argolid. In an effort to build on earlier survey work conducted by Michael Jameson, Thomas Jacobsen, James Dengage, and others, the Stanford project, directed by Jameson and Tjeerd van Andel, conducted four seasons of fieldwork from 1979 to 1982. A total of 328 sites, mostly settlements or habitations, were recorded. These sites range in date from 50,000 years ago to the present, but in this paper we are concerned mainly with the last 8,000 years. Present evidence shows that the settlement pattern, the distribution of sites in space, has changed considerably in this time. Broadly speaking, it has varied from a low density, nucleated or aggregated one to a higher density, more dispersed pattern. The terms "nucleated" and "dispersed" are at best rather vague terms. In this context "nucleated" will refer to a pattern of a few, concentrated, and relatively widely spaced sites, irrespective of site size. A "dispersed" pattern by contrast has a greater number of more evenly spaced sites. Although the nature of the change from a nucleated to a dispersed settlement pattern is open to further discussion and elaboration, it appears similar to that observed in other parts of Greece. A discussion of our findings may therefore be useful for understanding settlement-pattern change outside the Argolid as well.

Our thesis is simple: the number and density of settlements increased, usually with an increase of population, whenever access to external commercial markets was available. When such access was cut off or markets disappeared, settlement density fell and presumably population along with it. We therefore assign the dynamic cause of settlement change to cultural processes, in this case economic ones, rather than to climatic or other environmental causes. The environment of the Southern Argolid certainly changed in the course of 8,000 years, as can be seen in the history of its soils and alluvia, but we have concluded that the many alluvial episodes of the Holocene are due largely to changes in settlement and land-use practices (Pope and van Andel, 1984; van Andel, Runnels, and Pope, 1986). This is not to say, however, that the alluvial changes triggered by human activity did not alter the subsequent siting of settlements or the possibilities of land use. Here we shall not investigate particular periods in detail; rather, we wish to account for the larger picture of settlement history in the Southern Argolid.

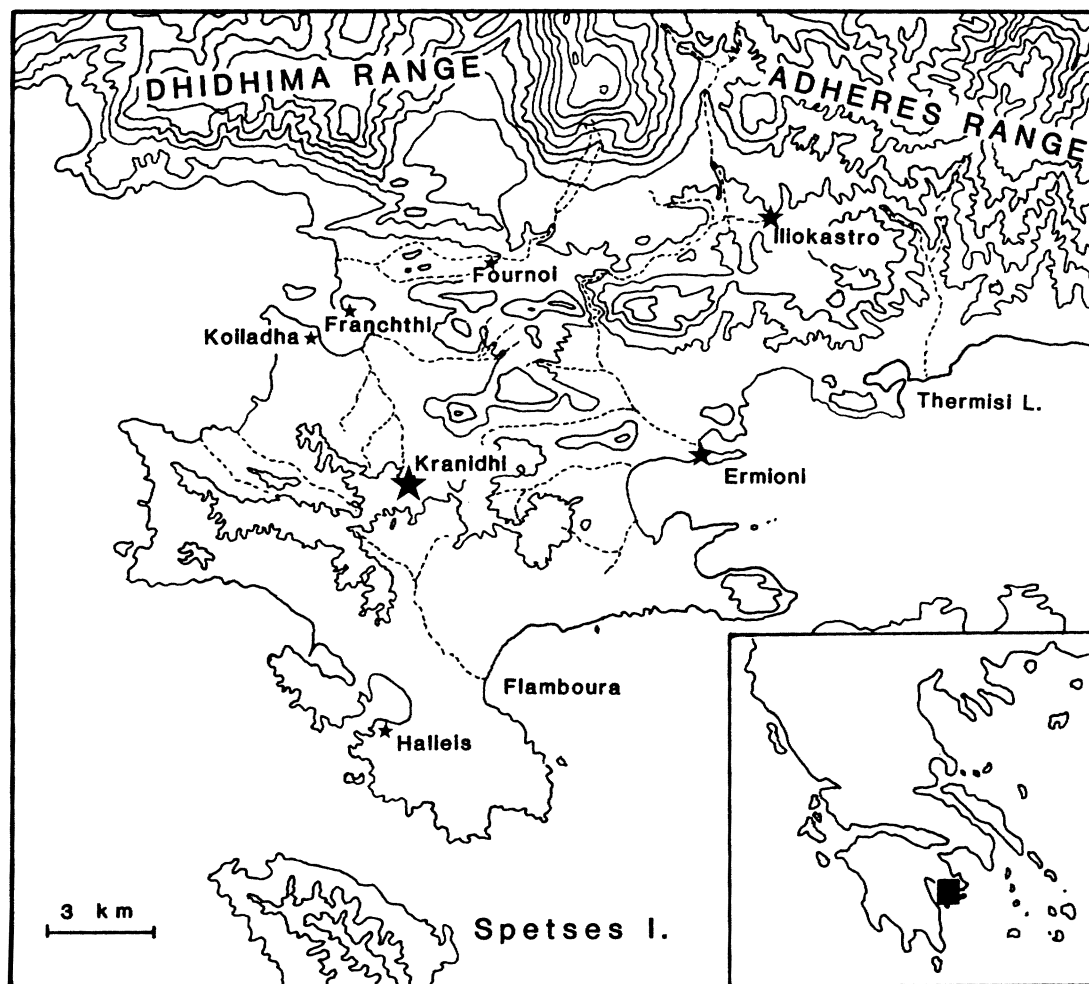


FIG. 1. Study area of the Stanford University Archaeological and Environmental Survey

### THE ARCHAEOLOGICAL SURVEY

The objective of the Stanford University survey was to discover sites and collect samples of cultural materials from them in order to construct distribution maps for every archaeological period. The study area roughly coincides with the modern eparchy of the Ermionis, a part of the Argolis nome. It is an area approximately 225 sq. km. in size located south of the Aderes mountains (Fig. 1). The region has been the focus of archaeological reconnaissance by teams from the University of Pennsylvania and Indiana University since the 1950's, including a survey in 1972 and major excavations at Franchthi Cave and Halieis from 1962 to 1977; the entire research effort has sometimes been referred to as the Argolid Exploration Project (Jameson, 1969, 1976; Jacobsen, 1976, 1981; Boyd and Rudolph, 1978). The 1979–1982 survey, co-directed by M. H. Jameson (Stanford) and one of us (Tj. v. A.), was conceived as the last phase of the Project and consisted of four seasons of fieldwalking and study

with one final season (1983) devoted to study of the finds.<sup>1</sup> The over-all objective of the Stanford survey was to investigate the interaction of human settlement, landscape, and environment from earliest times to the present day (Jameson, 1976).

A preliminary survey by the University of Pennsylvania and Indiana University in 1972 fielded two teams of three persons each for some five weeks, covering *ca.* 20 square kilometers in the Koilada and Fournoi valleys (see Fig. 2) and sampling more than 130 sites.<sup>2</sup> In 1979–1981 two Stanford teams of five persons each were fielded for five weeks each season. A third team of variable size rechecked sites found in 1972 and surveyed selected areas not covered by the other teams. In 1982 one team continued the verification, or rechecking, as part of the study season. Overall, the Stanford teams covered another 24 sq. km. bringing the total to *ca.* 44 sq. km. or *ca.* 20% of the study area. Our resources were insufficient to cover more of the area if the coverage was to be detailed and intensive. The coverage in 1972 was “intensive”, entailing careful fieldwalking over given areas with the intention of discovering all visible traces of cultural activity (see discussion in Keller and Rupp, 1983), but a re-investigation in 1979 of part of the area surveyed in 1972 did discover small sites that had been overlooked. A greater degree of intensity therefore seemed desirable and was obtained by consistent field methods used in all field seasons.

The field method may be briefly described as follows: Each team was given a specific area to survey each day. These tracts, or “transects”, were traced on a 1:5,000 topographic map prepared by the Greek Army Map Service. The tract was surveyed by the team walking in a line spaced 5 to 15 meters apart depending upon ground visibility. All cultural materials were noted in a log book along with relevant locational and topographic notations. Any occurrence of grouped cultural materials judged by the experienced team members to be a site was plotted on the topographic map, measured for a sketch map, and sampled (according to the size of the site) with random 5 sq. m. sample squares or by means of two or more randomly selected sampling transects. All diagnostic artifacts, such as sherds with

<sup>1</sup> The Stanford University Archaeological and Environmental Survey was conducted under the auspices of the American School of Classical Studies at Athens, with the supervision and support of the Archaeological Service of the Ministry of Culture and Science in Greece, through the Argolido-Korinthia Ephorate, and the Institute of Geology and Mineral Exploration in Athens. We wish to thank the Directors and members of these institutions for their many services and contributions to our efforts. The National Endowment for the Humanities, the National Science Foundation, the National Geographic Society, and many Stanford alumni have funded the project, and more than 50 students from Stanford, the University of Athens, and other universities participated in the field work. A project of this scope is always the work of many persons, but we are deeply indebted especially to Michael Jameson for conceiving the Stanford survey and for many valuable discussions on the topics presented here. The following persons also made substantial contributions to the planning and conduct of the survey and have shared their thoughts and the results of their studies with us: Thomas Boyd, Anne Demitrack, Janet Douglas, Barbara Fiedler, Hamish Forbes, Timothy Gregory, Nick Kardulias, Susan Langdon, Dimitris Matsas, Penny Mountjoy, Mark Munn, Mary Lou Munn, Gulog Nordquist, Priscilla Murray, Kevin Pope, Daniel Pullen, Jeremy Rutter, Robert Sutton, and Susan Sutton. The views expressed here, however, are our sole responsibility.

<sup>2</sup> This survey was directed by M. H. Jameson (then of the University of Pennsylvania), T. W. Jacobsen (Indiana University), and J. A. Dengate (University of Illinois). We have benefited greatly from having at our disposal unpublished reports on the results of the 1972 survey by J. A. Dengate and L. V. Watrous. All the sites, with associated cultural materials, from the 1972 survey were restudied as part of our own effort.

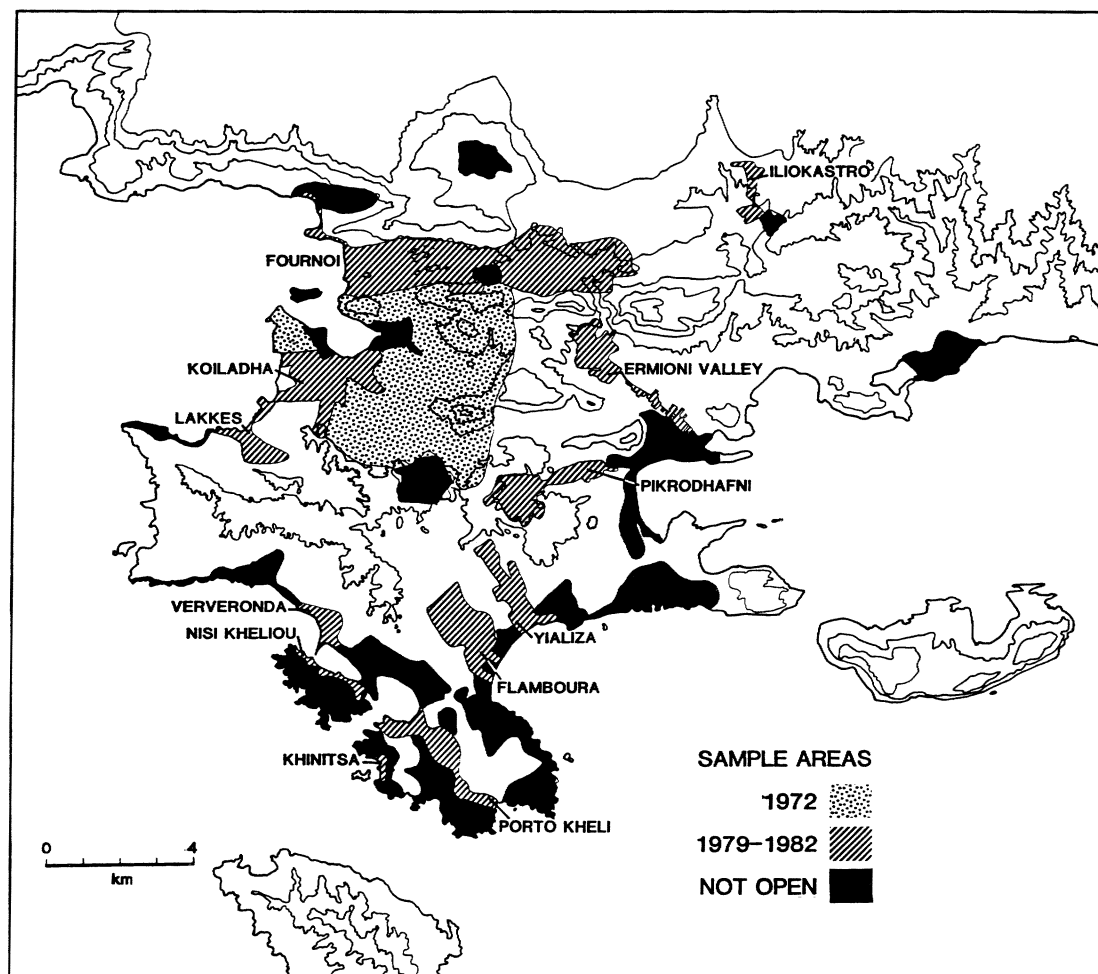


FIG. 2. Survey tracts; the area left blank was extensively surveyed. The names are designations for the intensive survey tracts and do not refer to specific localities.

significant features, were collected as a last sample to insure that rare items useful for determining date and function of each site were included. All materials collected from the surface were bagged by sampling unit, cleaned, marked with the site number, and, after study, turned over to the Greek Archaeological Service for curation.

The selection of the tracts to be surveyed was difficult. A great deal was already known in 1979 about site distribution and cultural history in the Southern Argolid, and a sampling procedure was desirable which took advantage of this information. Probabilistic sampling procedures, although useful in other contexts (such as sampling of sites), were not used. We wanted especially to avoid areas made virtually useless or inaccessible through home construction, industry, heavy fencing, and bulldozing. Instead we concentrated on the complete coverage of 10 tracts which were judged to be representative of the range of natural

environments available for settlement in the area (Fig. 2). Extensive coverage in other areas by Jameson and his co-workers from 1965 on, for instance ridges, hilltops, and coastal areas, as well as sites reported by local inhabitants, assured us that such areas need be covered only by a "verification" team, which systematically rechecked previously discovered sites and spot-checked previously visited areas. The tracts finally chosen for investigation were located in each of the major administrative divisions, or *koinotites*, of the Southern Argolid. They were marked out first on aerial photographs and the 1:5,000 topographic maps and then surveyed by two teams, each walking over a part of the tract.

The intensive fieldwalking method allowed us to discover very small sites, several between 12 and 60 sq. m., and more than 180 new sites were identified, bringing the total of known archaeological sites to 328. This total is undoubtedly a minimum for the area sampled, even when allowing for sites that have been buried, destroyed, or overlooked, and the number may increase slightly as study continues, but it certainly includes enough sites to compare settlement patterns between cultural periods. Arguments of our colleagues working in Boiotia notwithstanding (Bintliff and Snodgrass, 1985), we see no compelling reason to believe that sites of a specific type or of certain periods have been *systematically* overlooked or lost in the Southern Argolid. The number of sites for the region as a whole must have been larger, but the extensive prospecting of other years has shown that much of the unsurveyed area was either devoid of sites or had distributions similar to those discovered. By identifying the associations of sites of particular periods with land forms and soil types, it is possible to make a reasonable estimate of the probable scale of settlement for the region as a whole. From 22 to 25% of the present-day land surface consists of rugged, heavily dissected limestone mountains where there are few sites. The extensive survey of previous years and our own verification work located but two or three sites in such areas, a small number not likely to affect our conclusions. Of the remaining area, about one quarter was intensively investigated and produced a total of 328 sites. If we assume the remaining three quarters of the area to have sites distributed in the same way as in the survey tracts, there would be 1,200 to 1,300 sites preserved in the region as a whole. Even a 20% error one way or the other would make little practical difference in the estimates (a range of 1,000 to 1,500 sites would seem acceptable), provided the sites in areas not intensively surveyed belong to roughly the same periods in the same proportions as the sites already discovered.

The estimation of site totals depends, of course, on how sites were recognized in the field. A site was defined as any location where a cluster or scatter of cultural materials (mainly sherds and stone tools) could be found that had a recognizable boundary (i.e., a discrete distribution in space). Primary sites were marked by such scatters and often had other features such as wall foundations or cisterns. To constitute a primary site, the cultural materials should have been brought up from a buried context. This was ascertained by looking for concentrations of fresh, unweathered pieces, which were usually large in size and were evidently brought recently to the surface. Our definition was intended to exclude secondary, redeposited materials (although such deposits were also recorded and sampled). Most of the study tracts had, in fact, discrete concentrations of artifacts with little or no "background scatter" of artifacts in the intervening spaces. This was not true in all areas:

the flat alluvial plain north of Kranidi (Fig. 1) in the vicinity of a large mound (C11)<sup>3</sup> had widely scattered materials, perhaps resulting from road building, farming, sheet erosion, or even ancient manuring practices (Wilkinson, 1982).

The sites discovered in the survey are mainly the surface manifestations of buried archaeological deposits, and they consist of scatters of material brought to the surface by a combination of natural and cultural processes which belong to the category of "site formation" (Schiffer, 1976, 1983). The processes responsible for creating surface sites are not well known but are presumed to be selective: we cannot say for certain how representative a site may be of the buried sediments from which it is derived. A comparison of intensive surface collections and excavated results from the same sites in the Keban reservoir area (east-central Turkey) was made by Whallon (1979: pp. 288–399) under circumstances somewhat similar to the Southern Argolid. He found that surface collections gave a fairly clear indication of which periods were represented at a site, reassuring us that there is reason to assume that our surface collections may give a reasonable picture of the contents of buried sites, at least for purposes of chronological assessment.

Even when a site has been dated, however, the question of its function remains open. Are sites of different periods really different in use, e.g. farmsteads *vs.* small villages, or are they perhaps non-habitational, special-purpose sites like sheepfolds or shrines? Sites may have served different functions through time, and it is difficult to identify the function of any given site even with full excavation. Surface sites can, with caution, usually be described as "settlements" and "special-purpose sites" based on their size, the presence and nature of architecture or other features, and the kinds of artifacts represented. To take one example, a late Classical site *ca.* 0.5 ha. in extent with a single rectangular foundation of a building, and (if we are lucky) with a scatter of roof tiles, pithoi, amphoras, cooking wares, fine wares, lamps, metal artifacts, millstones, press beds, and floor stucco, can be presumed for the present to be a farmstead or a small settlement. Larger concentrations of similar materials may indicate a settlement of another kind, say a village. The presence of fortification walls and shrines, when associated with large areas of walls and domestic debris, implies a "village" or "town". Special-purpose sites, on the contrary, include isolated graves, quarries, shrines, or memorials which are distinguished by their characteristic assemblages of cultural materials (Murray and Kardulias, 1986). The same reasoning may be extended at least into the Early Bronze Age where the larger sites have roof tiles, hearth rims, a variety of ceramic wares, spindle whorls, millstones, stone vases, etc., indicating the presence of, it is assumed, a village. Isolated scatters of obsidian tools, however, fall into the category of special-purpose sites. An estimate of the distribution of the different types of sites for each archaeological period, whether settlements or special-purpose sites, is shown in Table 1.

<sup>3</sup> The number in parentheses keys the site to a site register in M. H. Jameson, C. N. Runnels, and Tj. H. van Andel: *A Greek Countryside: The Southern Argolid from Prehistory to the Present Day*, Stanford University Press (in press). A detailed discussion of our methods is given in the same work.

TABLE 1: Site Functions (by site component; ranges represent confirmed and possible sites)

<i>Period</i>	<i>Total</i>	<i>Towns</i>	<i>Settlements</i>	<i>Special Purpose</i>	<i>Other</i>
EBA	40		29–32		8
LBA	27		21–25	2	1
G–C	129	4–5	96–102	7–11	12
H–MR	25	1	20–22	1	1
LR	70	1–2	54–59	3–6	3
MB/F	42	1	29–34	8–9	3

Identifying site distributions and site functions is made more difficult because some sites are deeply buried or submerged by the sea and are not represented in our sample. Other sites, especially of older periods, must have been completely destroyed by one means or the other. Only some 5% of the present land surface is covered by alluvium, usually rather thin and much of it deeply incised, and thus deep burial of sites, even in those periods when sites were common in all drainages, is not judged to be a significant problem here. Sea-level rise, however, has certainly affected the counts of sites for the Early Bronze Age and the later Classical period, when sites were numerous and there was a preference for coastal locations. Up to 7% of the land surface has been lost to the sea in the last 5,000 years, which could represent the loss of from 5 to 15% of the sites from those periods. These problems, while serious, do not invalidate our conclusions.

#### THE HISTORY OF SETTLEMENT IN THE SOUTHERN ARGOLID

Although the results of the survey are still being studied, the outline of settlement history for the Southern Argolid is reasonably clear (see Table 3, p. 331 below). Four open-air sites perhaps 50,000 years in age and a few flakes from Franchthi Cave and elsewhere constitute the earliest evidence of human visitation (Fig. 3; Bialor and Jameson, 1962; Pope, Runnels, and Ku, 1984; C. Perlès, personal communication, 1984). The open-air Middle Palaeolithic sites are marked by scatters of flint flakes probably representing special-purpose camps for hunting and toolmaking. They are confined to exposures of late Middle Pleistocene alluvium and are but a remnant of the original population of sites. They span a large period of time, ranging from 50,000 to 40,000 B.P. or later. Open-air Upper Palaeolithic sites contemporary with Franchthi Cave are rarer (Fig. 3), although the period of time represented is greater (*ca.* 35,000[?]-10,500 B.P.); only two or three localities with a few stone tools were found. Franchthi Cave is the only certainly inhabited site in this and in the following Mesolithic period (10,500–8,000 B.P.). The small number of tools attributed above to the Upper Palaeolithic could be Mesolithic, and the flint flakes found in Koukou Cave (F35) about six kilometers from Franchthi almost certainly belong to this period.

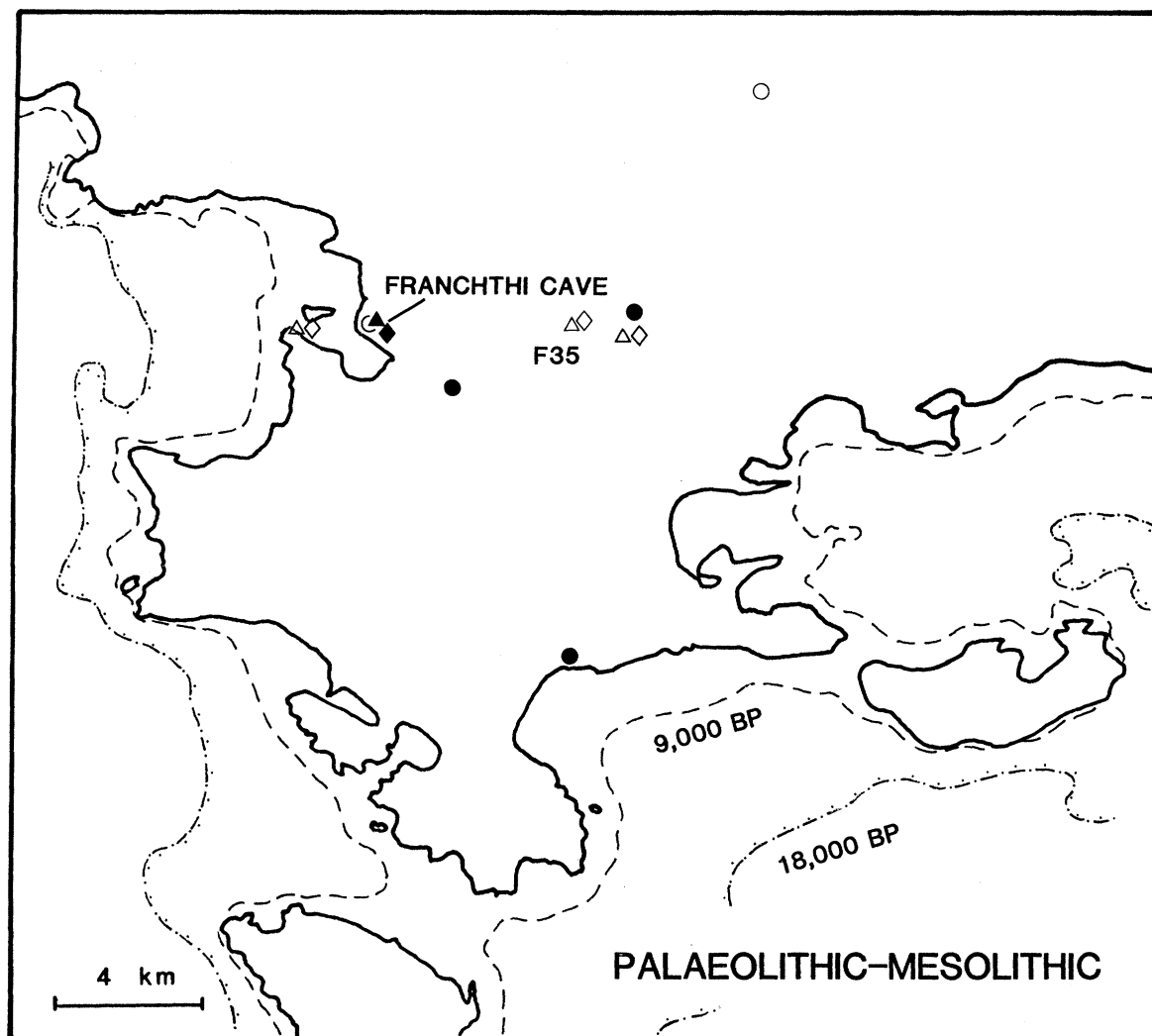


FIG. 3. Palaeolithic-Mesolithic: ●Middle Palaeolithic. ▲Upper Palaeolithic. ◆Mesolithic. Open symbols represent probable sites. Two different symbols placed side by side represent two components at one site. Geographic locations in all figures are approximate. The broken lines show former shore lines; the 9,000 B.P. line also represents the approximate position for the Middle Palaeolithic period (source: van Andel and Shackleton, 1982).

Permanent settlement is attested with the beginning of the Early Neolithic (EN: 6000–5000 b.c.<sup>4</sup>) about 8,000 years ago, when an agricultural village was established below the mouth of Franchthi Cave (Fig. 4; Jacobsen, 1981). During the Middle Neolithic (MN: 5000–4500 b.c.) Franchthi Cave continued as the main settlement, although two caves, one near Didyma (D3) and another near Ermioni (E14), yielded a small number of Middle

<sup>4</sup> Uncorrected radiocarbon dates are indicated as “b.c.”. For a more detailed discussion of chronology, see Jameson, Runnels, and van Andel (footnote 3 above).



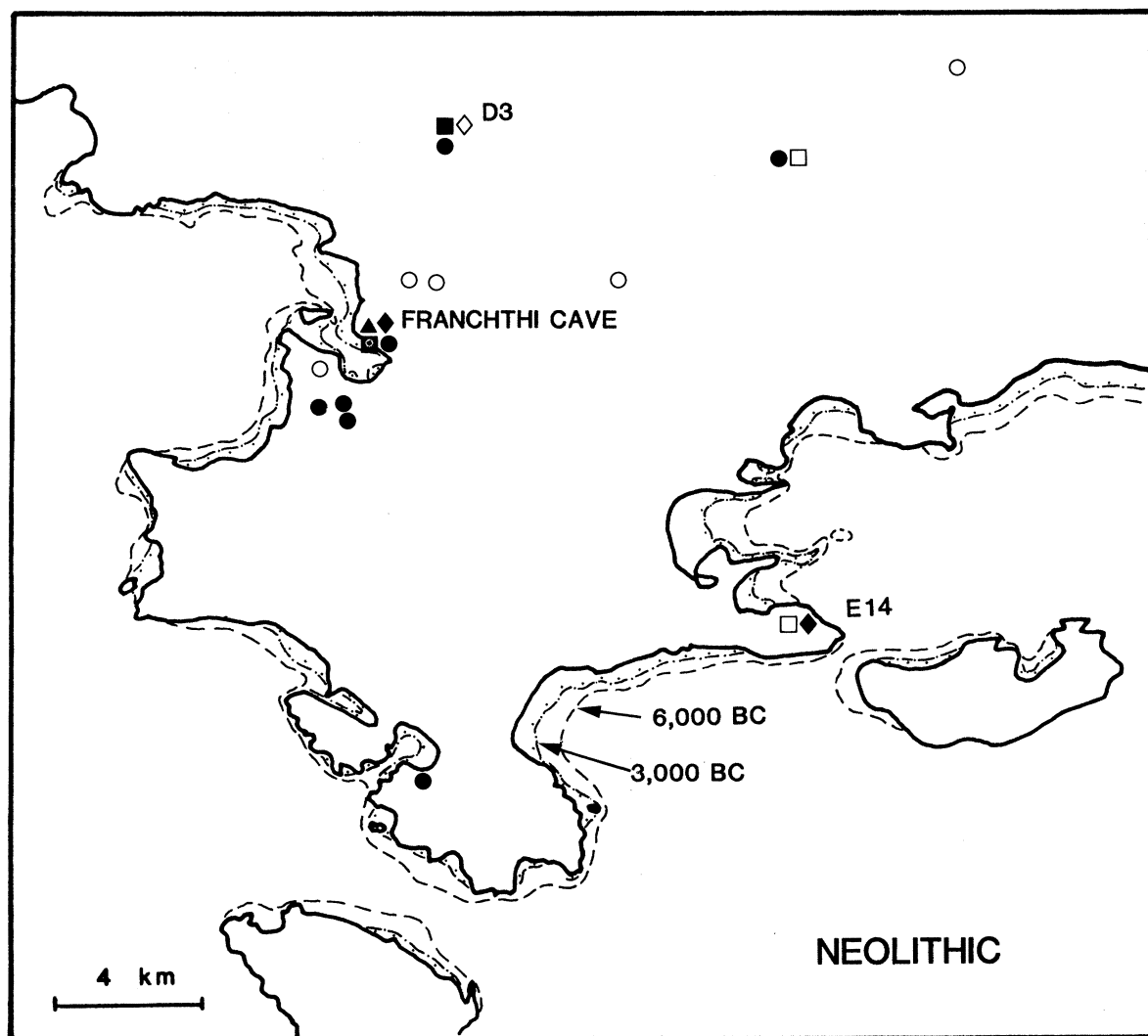


FIG. 4. Neolithic: ▲Early Neolithic. ◆Middle Neolithic. ■Late Neolithic. ●Final Neolithic. The broken lines show former shore lines (source: van Andel and Lianos, 1983).

Neolithic sherds. These caves were perhaps visited by shepherds from the main village at Franchthi Cave, which in this period may have been occupied only seasonally by shepherds (Jacobsen, 1984). It was in the Late and Final Neolithic (LN–FN: 4500–3000 b.c.) that permanent settlements were established elsewhere than at Franchthi Cave. This modest expansion (from 4 sites in LN to as many as 13 in FN, of which 7 are certain) may have belonged largely to the latter half of the 4th millennium, but our pottery chronology for this period is not firm.

The increase in number of settlements and their dispersal across the landscape continued through the Early Bronze Age (Fig. 5; up to 33 sites, 28 certain). Many of the earlier sites (Final Neolithic—Early Helladic [EH] I) with their characteristic domestic debris of

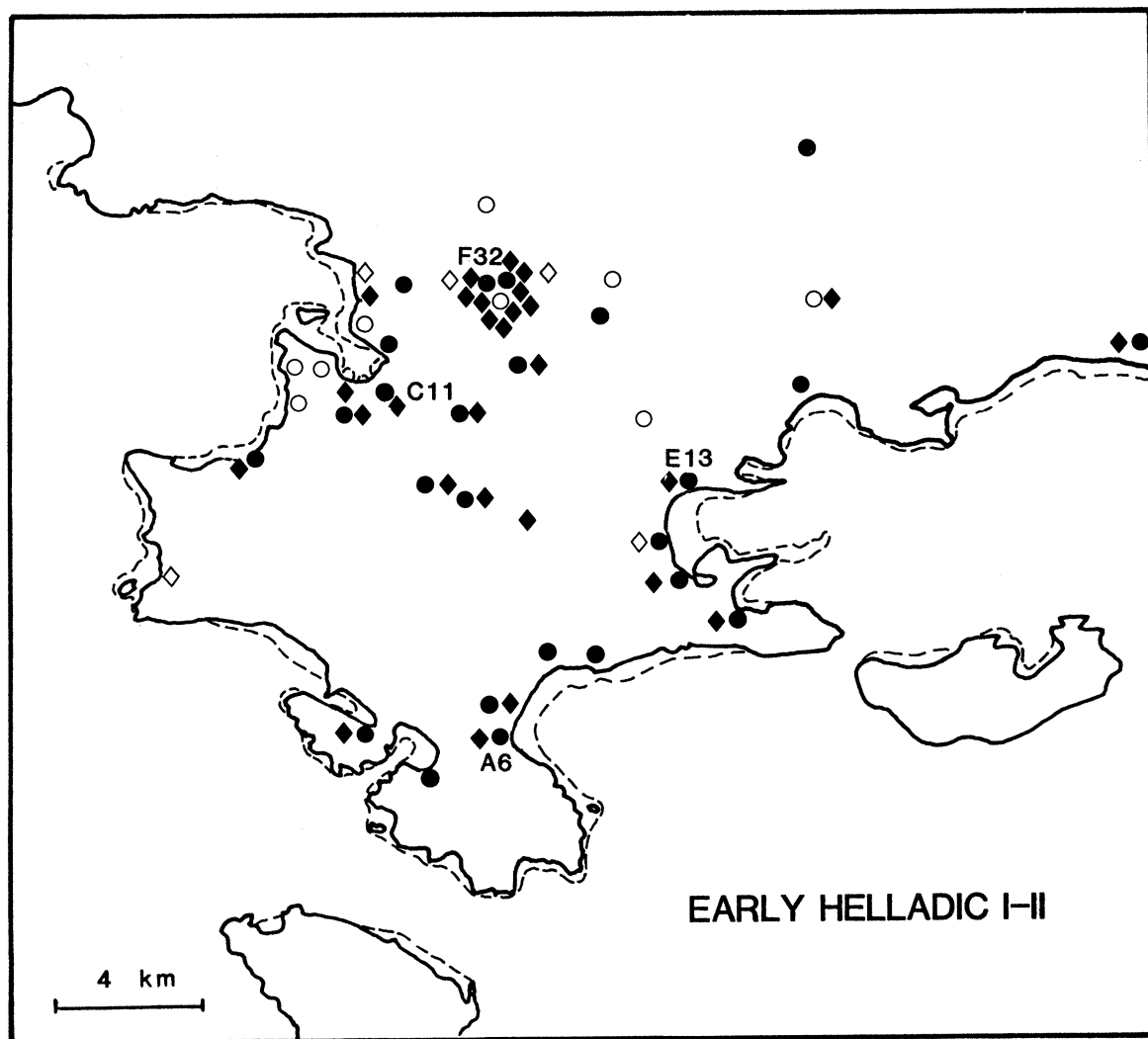


FIG. 5. Early Helladic I-II: ●EH I. ◆EH II. The broken line shows the shore at *ca.* 2350 B.C. (source: van Andel and Lianos, 1983).

sherds, flints, and millstones are small settlements, perhaps hamlets or even farmsteads. Some scatters of flints and small concentrations of sherds found far from the main settlements are presumed to represent special-purpose sites. Early in the 3rd millennium four magoules (artificial mounds) were first inhabited (Fournoi [F32] and near-by localities, Koilada [C11], Ermioni [E13], and Flamboura [A6]). These magoules became the principal settlements in the region in Early Helladic II, growing quite large while some smaller outlying sites of EH I were evidently abandoned. The magoules at Flamboura (A6, 0.9 ha.), Koilada (C11, 5.0 ha.), and Ermioni (E13, 1.8 ha.) were similar in size or even larger than Lerna (1.6 ha.) in the Argolid and Ayios Kosmas (0.7–1.0 ha.) in Attica, if allowance is

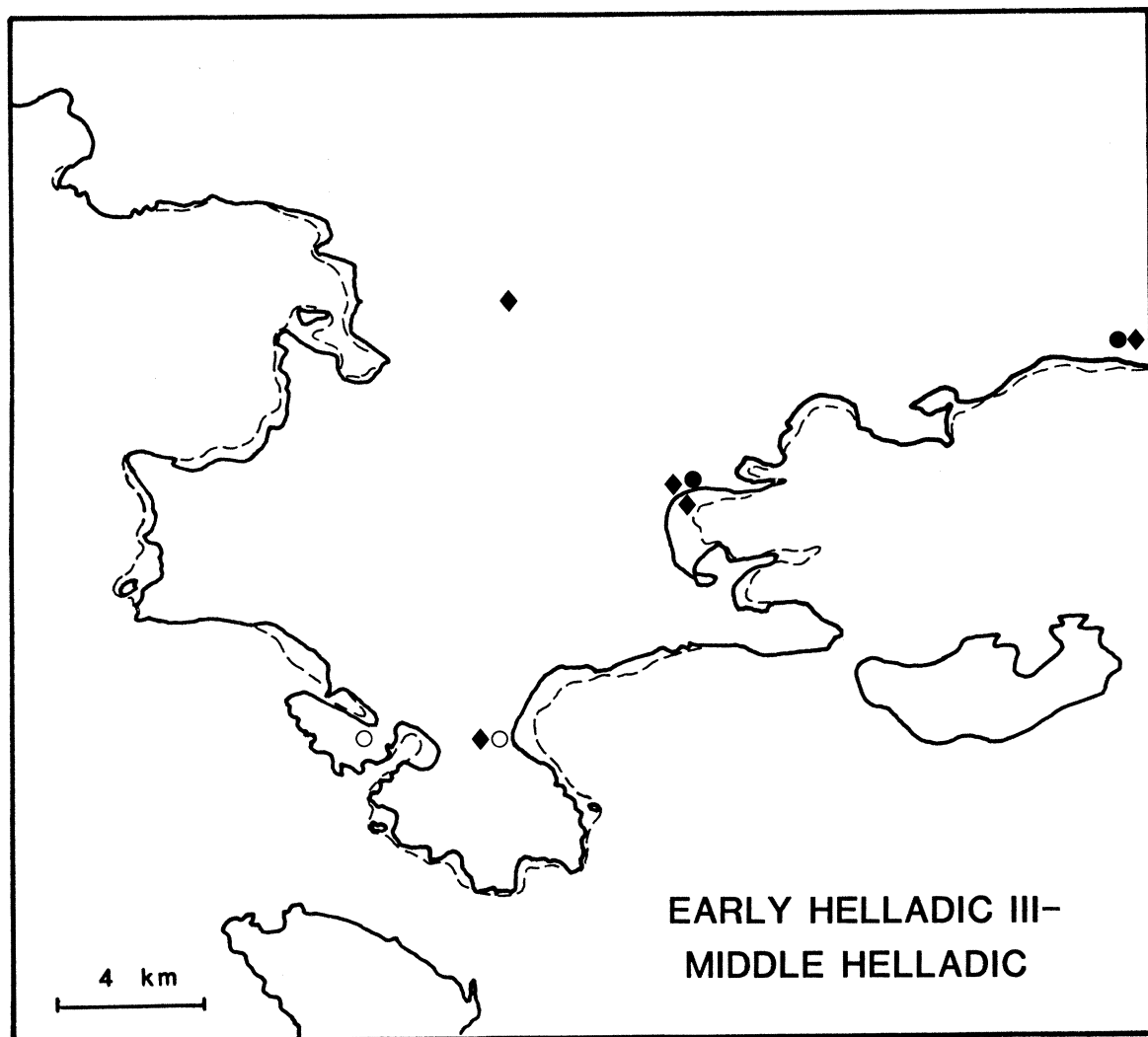


FIG. 6. Early Helladic III—Middle Helladic: ●EH III. ◆MH. The broken line shows the shore at *ca.* 1650 B.C. (source: van Andel and Lianos, 1983).

made for size distortion of surface scatters and additions from later components. They were villages, and it is safe to assume some increase of population from the preceding Neolithic. Domestic artifacts were found at Flamboura and Fournoi, and all magoules produced materials not found at smaller contemporary sites, such as baked roof tiles, stone vases, and obsidian cores. The region as a whole was dominated by a large town at Fournoi. Early Helladic II materials are found over as much as 55 ha. around the present-day village of Fournoi and comprise four distinct but smaller localities; these last allow us to estimate the minimum size of the settlement at between 2.2 and 10 ha., assuming that the localities are not exactly contemporary. Among the artifacts there are hundreds of sherds, parts of as

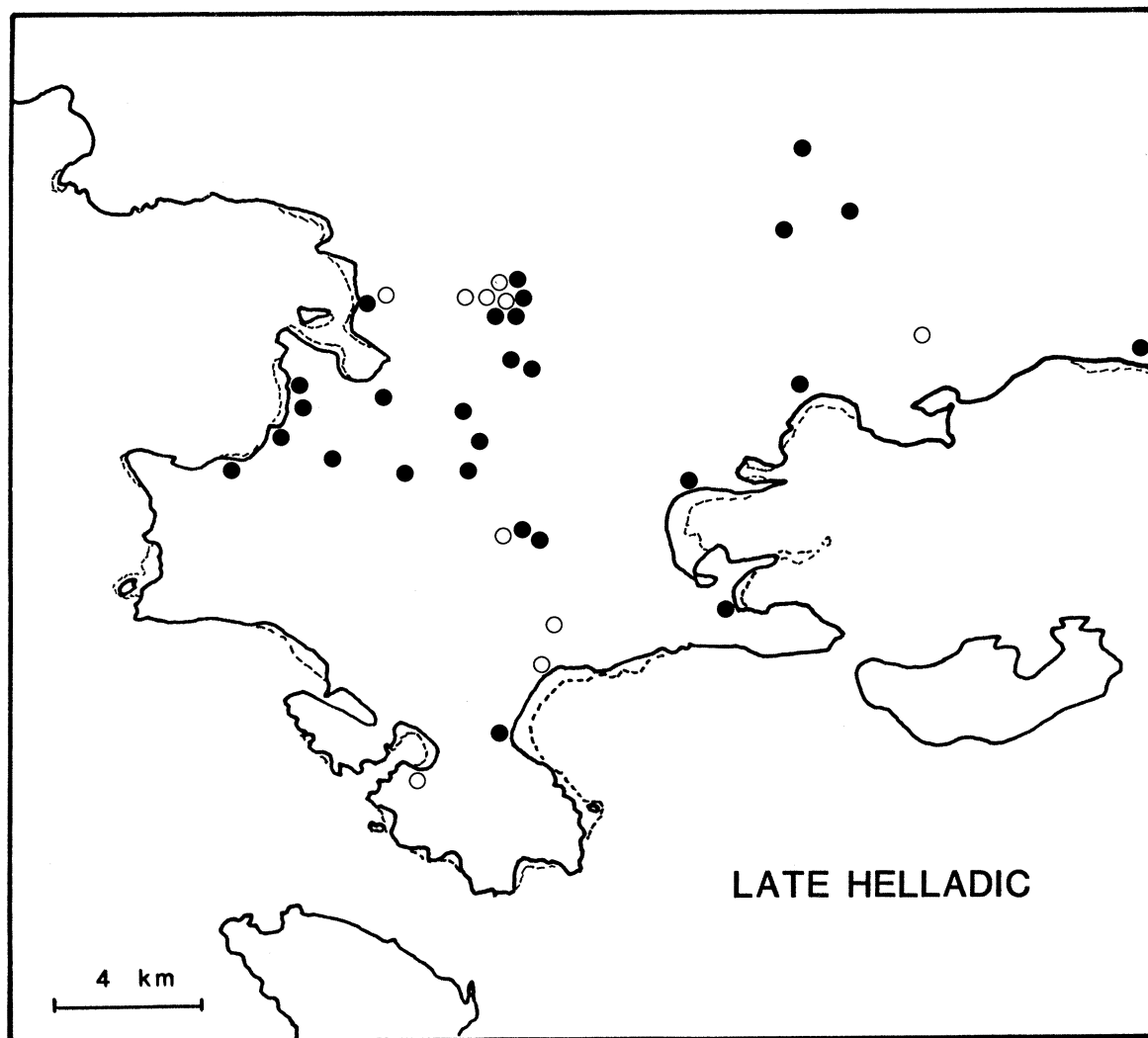


FIG. 7. Late Helladic: The broken line shows the shore at *ca.* 1100 B.C. (source: van AnDEL and Lianos, 1983).

many as 20 decorated terracotta hearth rims, and more than 50 millstones and stone mortars, all evidence of domestic activity. There are also large quantities of obsidian cores, blades, and tools (2,134) at one of the localities (F32), indicating that this craft was centered in Fournoi. Obsidian cores, common at Fournoi (*ca.* 50), are rare on the other magoules (about one each). Thus we have in EH II for the first time the elements of a two- or even three-tier hierarchy of settlements with the larger villages functioning somewhat as "central places".

A striking abandonment of sites occurred in the last quarter of the 3rd millennium; only two or three sites produced small numbers of EH III sherds of Lerna IV type (Fig. 6). The scant traces of habitation indicate that there must have been a drastic reduction of population and not simply a concentration of existing population into fewer settlements. This

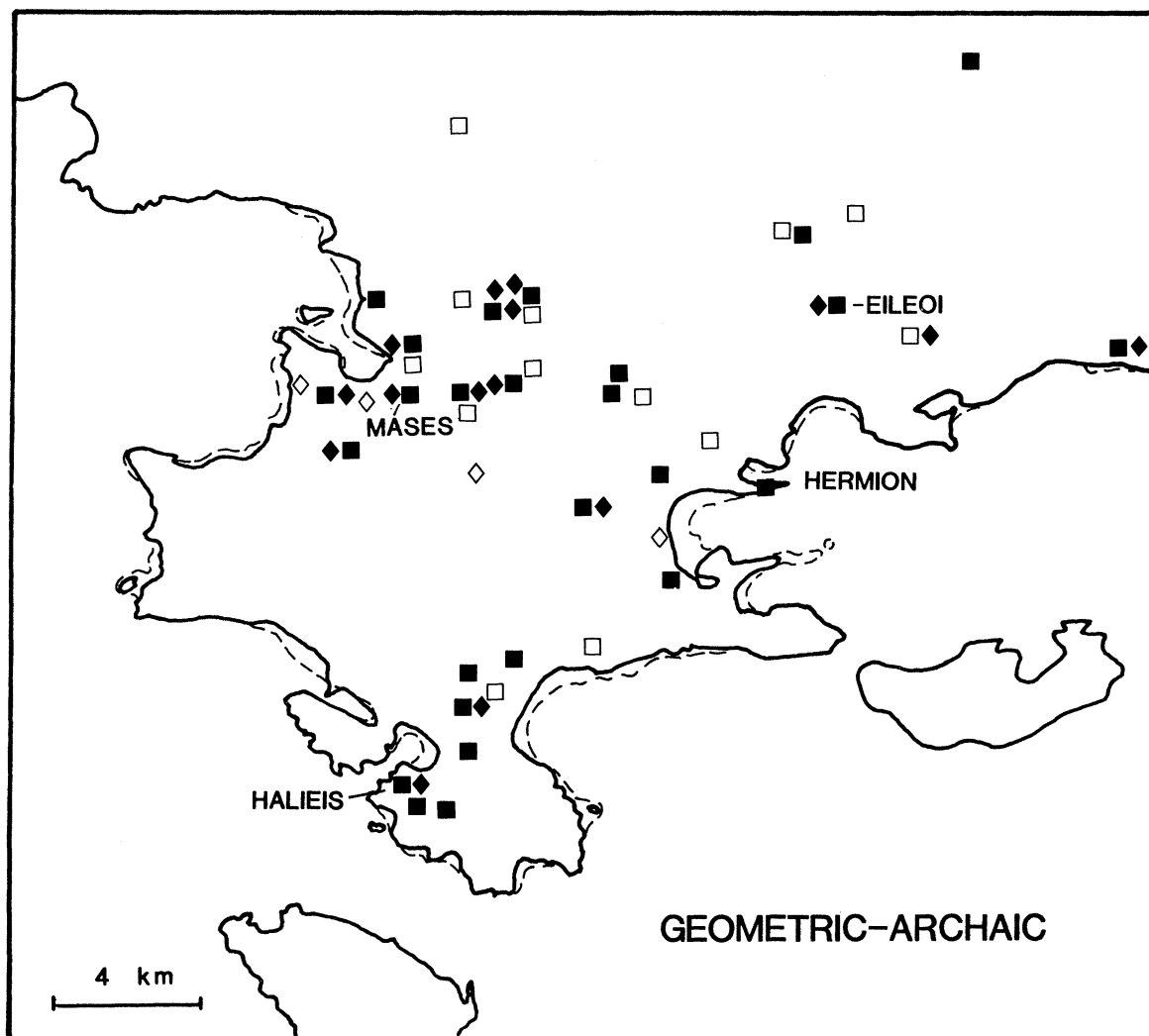


FIG. 8. Geometric-Archaic: ◆Geometric. ■Archaic. The broken line shows the shoreline at *ca.* 750 B.C. (source: van Andel and Lianos, 1983).

reversal of fortunes coincides with the destruction and abandonment that affected the Northeast Peloponnese, Euboea, and the Cyclades at this time (Caskey, 1960; Rutter, 1979, 1984). Something of a modest recovery occurs in the Middle Helladic (MH) period (an increase to *ca.* 5 sites) with definite settlement attested at Flamboura (A6), Fournoi (F5), and Ermioni (E13). There is a Late Helladic (LH) increase in site numbers to as many as 37 (27 are certain), and the dispersal of settlements across the landscape can be attributed to a period of population increase and intensive land use that may have begun in MH (Fig. 7). The EH II magoules are resettled, and once more a differentiation of sites into villages and smaller satellites is evident. The pattern of LH settlement parallels closely that of EH II. All phases of LH are well represented; the most abundant material dates to LH III.

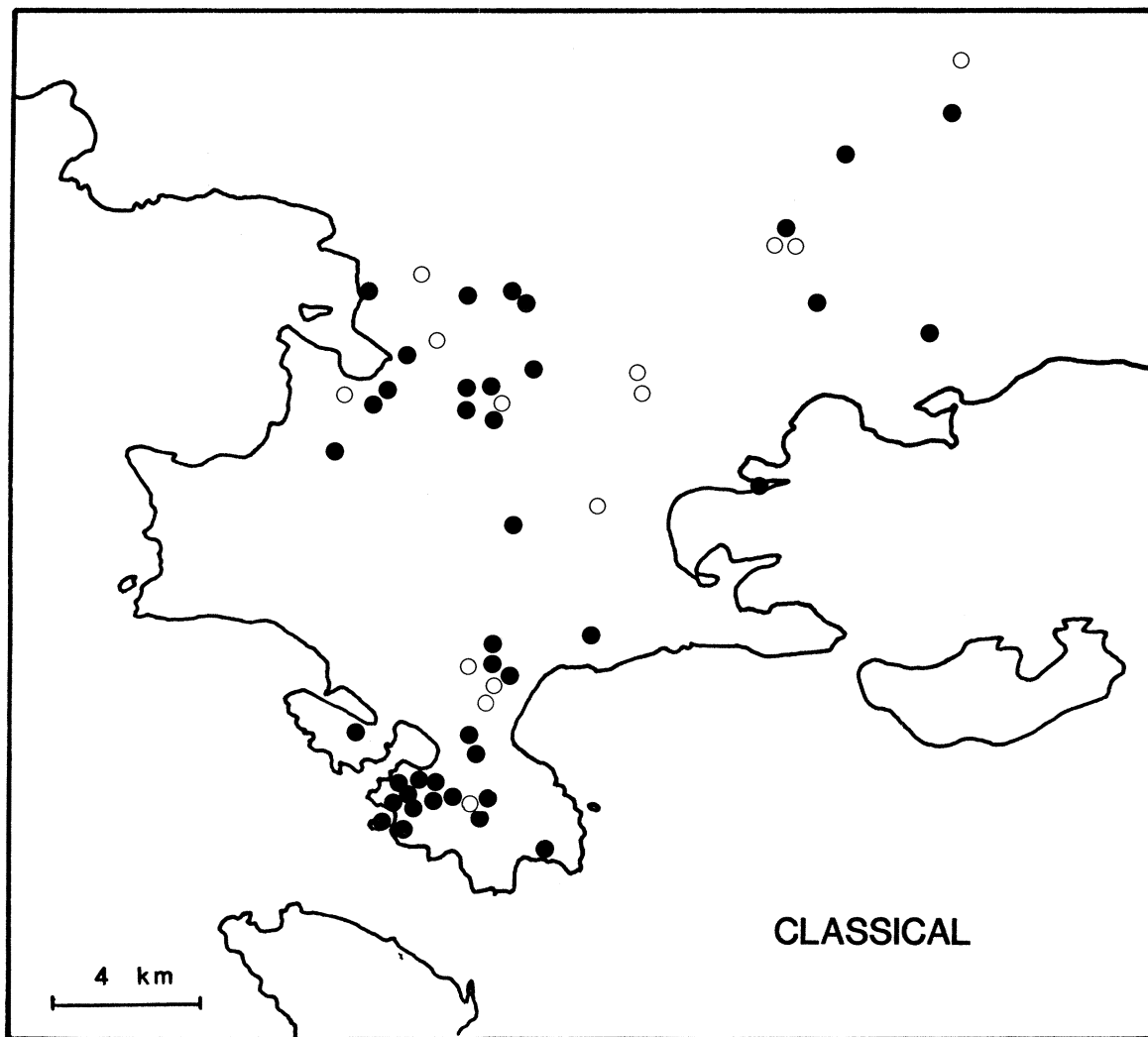


FIG. 9. Classical. The shoreline was approximately as shown in Figure 8.

Subsequently, there was a rather sharp contraction in LH IIIC, approximately the 12th century, to fewer than six sites, followed by the abandonment of all known sites. Although small groups of people may have lingered in the area in the following centuries, no traces of their presence, if any, were identified. The 11th and 10th centuries are an archaeological dark age.

In the study area proper, new settlements are established only in the late 9th or early 8th century (Fig. 8). The first somewhat tentative habitations are near Bronze Age sites at Flamboura magoula (A9) and Fournoi, but in the 8th to 6th centuries settlements rapidly increase in size and number (from approximately five in Middle Geometric to as many as 39 in the Archaic [29 are certain]). It is in the Late Geometric and Archaic periods that the

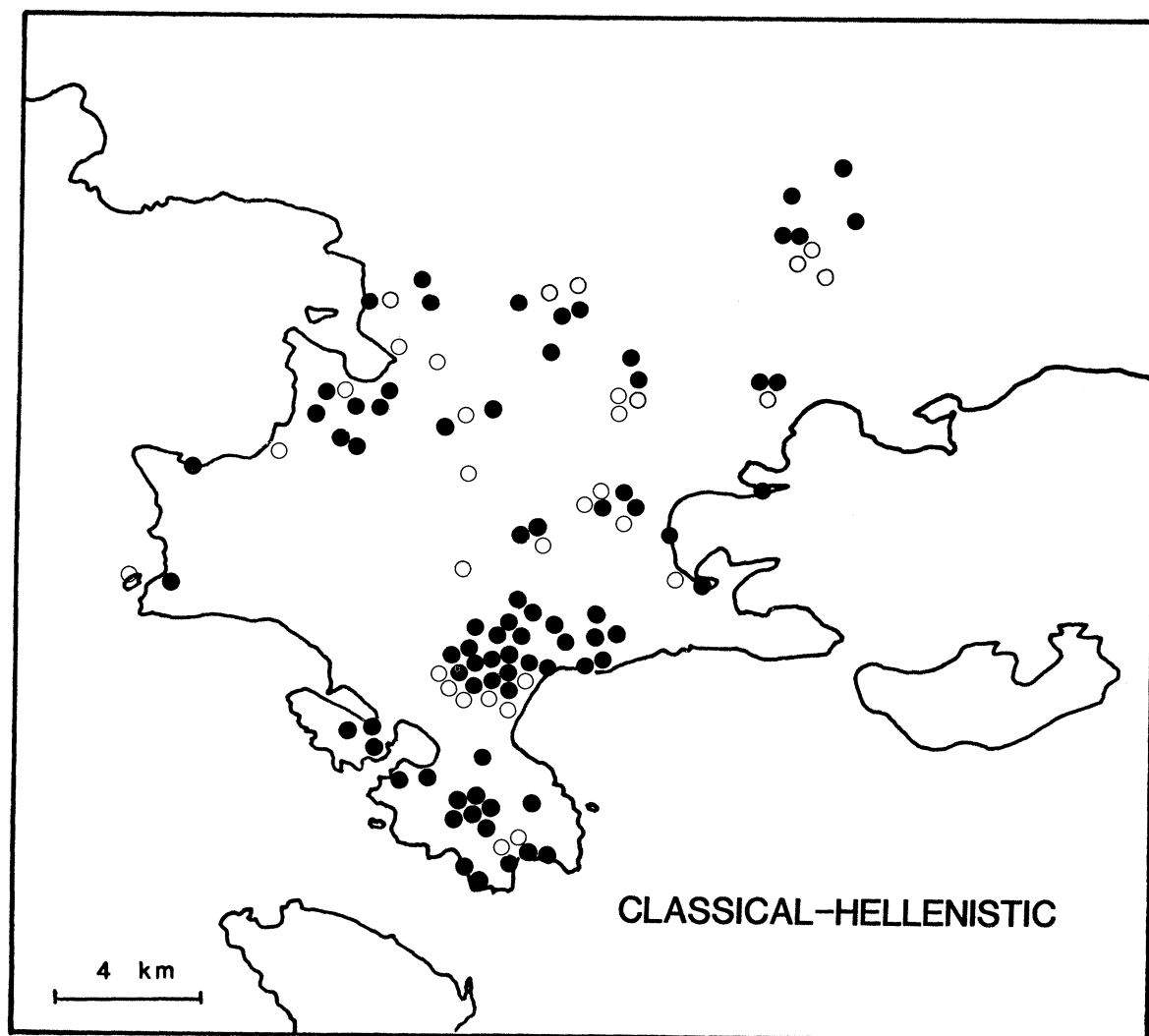


FIG. 10. Late Classical—Early Hellenistic. The shore line was approximately as shown in Figure 8.

towns known from Classical sources and recent excavations can be identified: Mases, Eileoi, Hermion, and Halieis.

Expansion to a point of maximum dispersal continues through the Classical period (Fig. 9), indicating clearly an unprecedented increase of population and concomitant intensification of land use. As many as 54 sites (40 are certain) were occupied in the 5th and early 4th centuries, but the greatest number (perhaps as many as 110, 78 certain) belong to a short period from early in the 4th century to the early 3rd century. The pattern in the 5th to 3rd centuries resembles a classic market-oriented central-place distribution (Fig. 10). The larger towns of Hermion and Halieis had significant populations (as many as 2,500 inhabitants for Halieis, more for Hermion), important cult centers, and their own coinage,

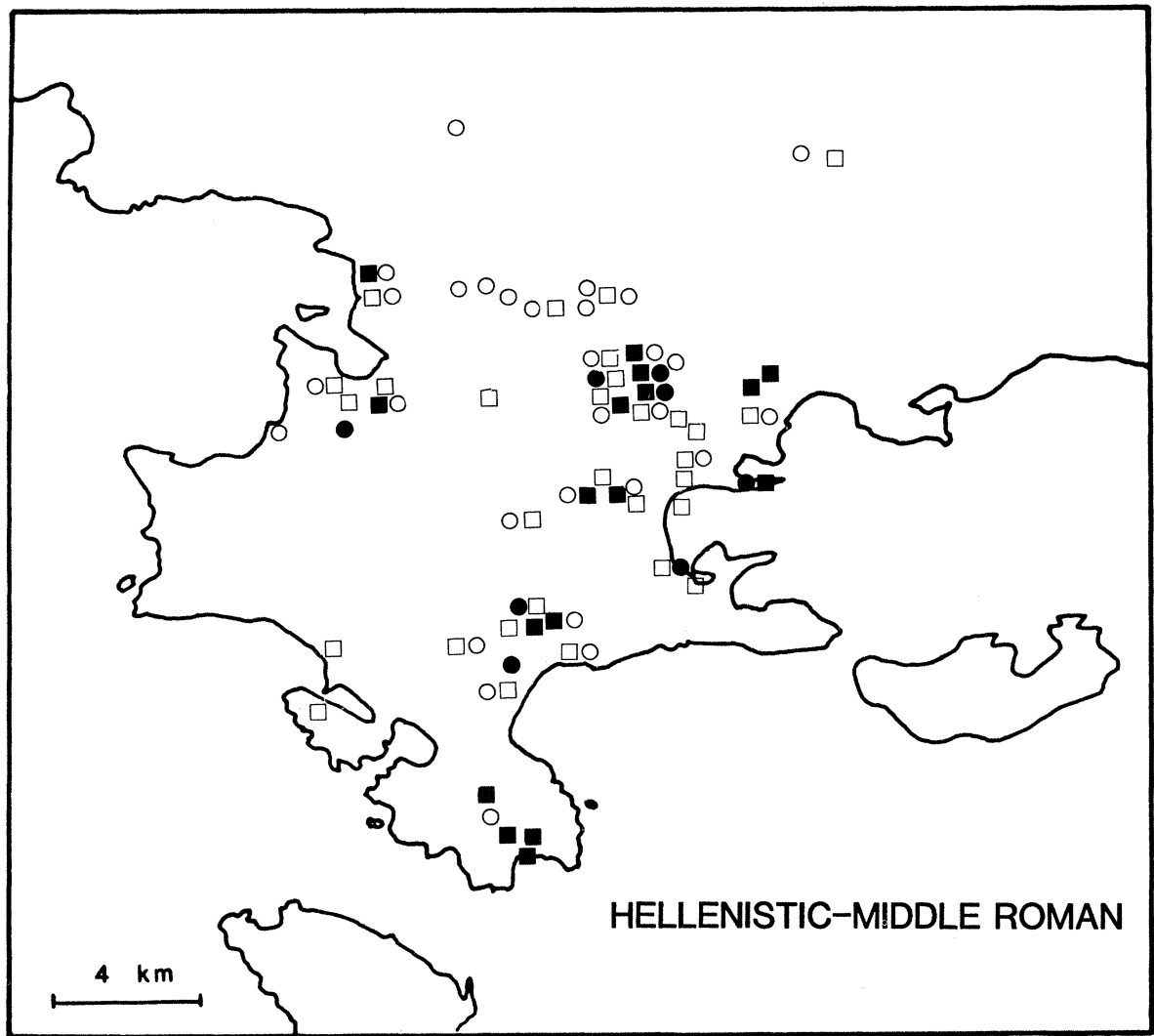


FIG. 11. Late Hellenistic—Middle Roman. The shore line was approximately as shown in Figure 8.

qualifying them as the urban centers of *poleis*. These towns, and here we might include the large villages of Mases (Koilada), Eileoi (Iliokastro), and at least one other village at Petrothalassa (E6) between Hermion and Halieis, had their satellite villages or hamlets, while a large number of the smallest sites detected in the survey may be described as farmsteads, many with characteristic towers and domestic assemblages (cf. Young, 1956).

A decline in site numbers is noticeable in all parts of the study area, with partial exception of the Ermioni drainage, from the middle of the 3rd century B.C. on (down to fewer than 30 sites; only 10 sites are certainly assigned to Early and Middle Roman times: Fig. 11). Halieis is abandoned early in the 3rd century, nearly all sites in its territory by the beginning of the Roman Imperial period. Few certainly attested sites remain in the Porto Cheli, Koilada, or Iliokastro areas. Of the Classical towns only Hermion continued to be inhabited and to enjoy a modest level of prosperity along with a scattering of small sites within its



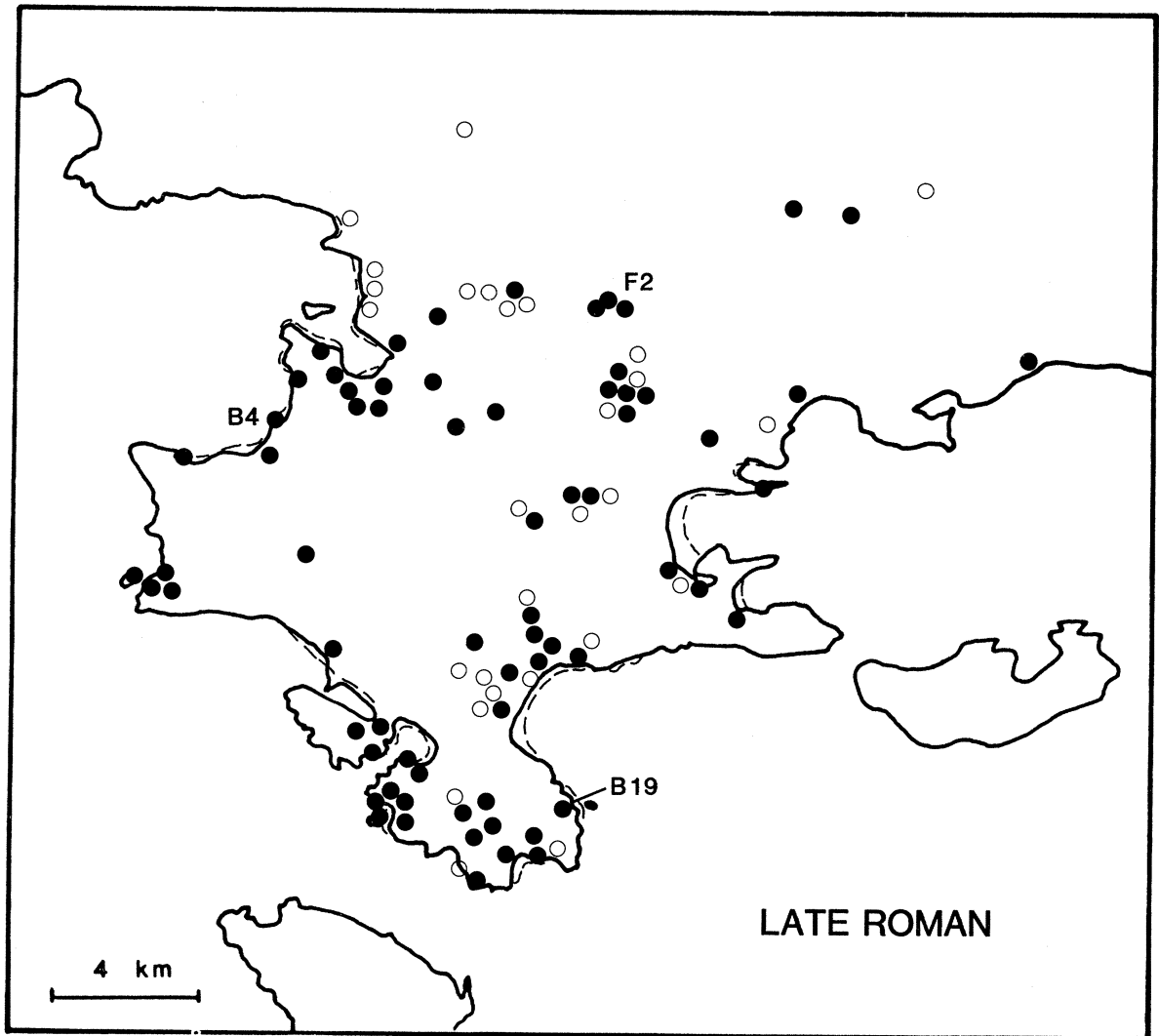


FIG. 12. Late Roman. The broken line shows the shore at *ca.* A.D. 600 (source: van Andel and Lianos, 1983).

territory. Moreover, the impression of economic depression, population loss, and site abandonment in late Hellenistic Greece is reinforced by references in historical sources (e.g. Polybios). Traces of this contraction in the Southern Argolid were evident to Pausanias as late as the 2nd century after Christ.

This situation had turned around before the 3rd century after Christ (Fig. 12). In the time between the reigns of the Emperors Constantine and Phocas, sites increased markedly in number (up to *ca.* 98 sites, 69 certain) and are widely dispersed to most parts of the area surveyed. It is too soon to say to what phase or phases of the Late Roman—Early Byzantine period this expansion properly belongs, but it was generally an era of prosperity and peace: many sites are coastal and evidently unfortified. Many must date to the relatively prosperous era from Arcadius to Justinian in the 5th and 6th centuries (Cheetham, 1981). Despite the similarity of the settlement pattern to the late Classical period, the functions of

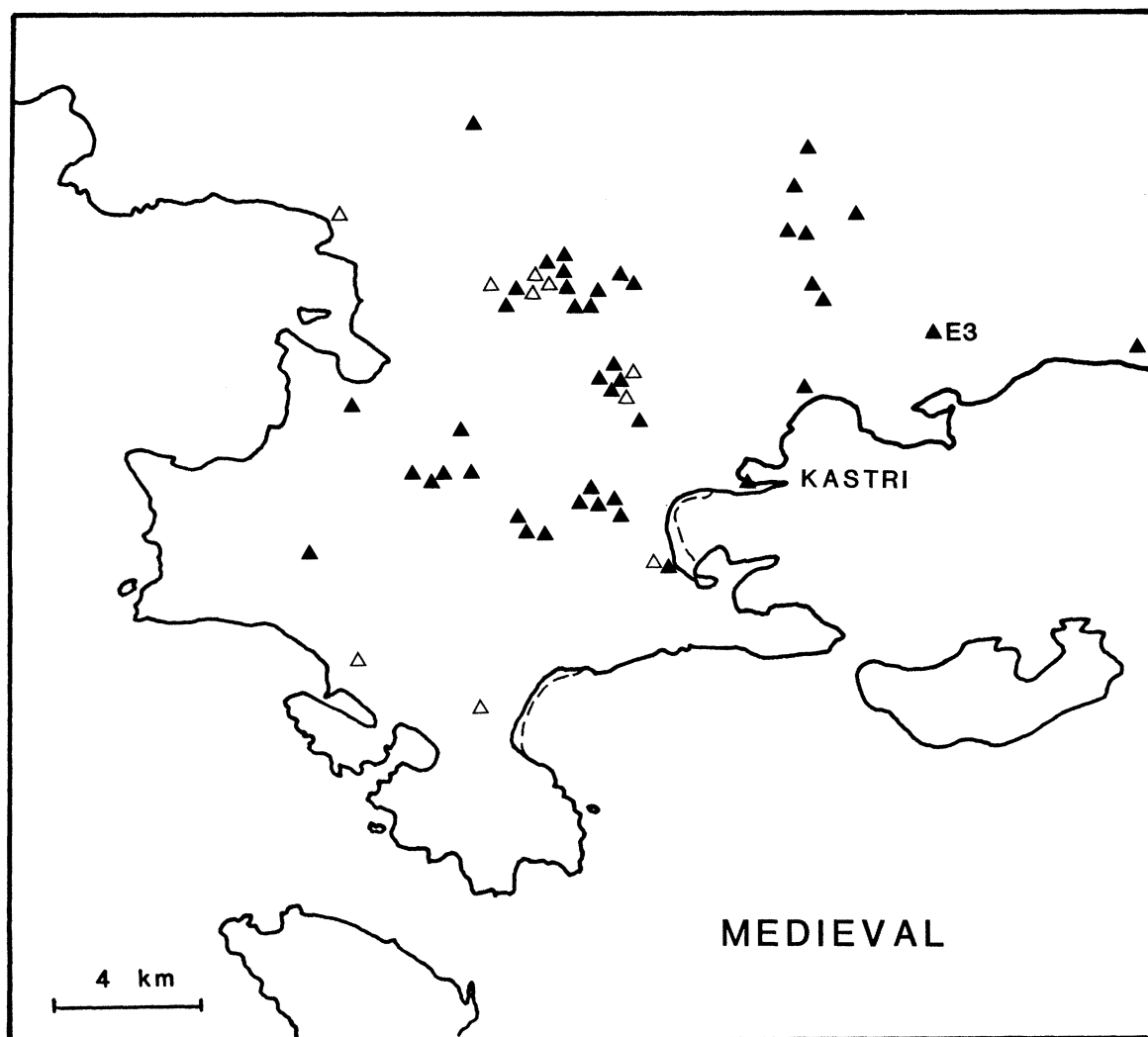


FIG. 13. Mediaeval. The broken line shows the shore at *ca.* A.D. 1300 (source: van AnDEL and Lianos, 1983).

the later Roman sites differ in many respects. Hermion was the only town of any size, while at Halieis and elsewhere there were large estates, *villae rusticae*, with small settlements of *coloni ascripticii* (Rudolph, 1979). There were also other sites (e.g., the large sites of B4, Panayitsa and F2, Papoulia) which were evidently small villages, presumably with free inhabitants. Scattered farmsteads were still to be found, many on the sites of late Classical farms. Kilns for producing roof tiles, amphoras, and other pottery are known from at least five coastal locations.

Then, for the fourth time, a peak in settlement and presumably population is followed by rapid and nearly total abandonment. Caught in the squeeze of Slavic-Avaric invasions from the North and a gradual erosion of Byzantine authority in the Aegean during the late 6th—early 7th centuries the Southern Argolid economy collapsed. Coins of Phocas were

found at B19, a coastal kiln site, and at Halieis (Rudolph, 1979) where there were traces of destruction by fire. Whether the abandonment was rapid or somewhat slower than our evidence suggests, a century or more followed for which no sites or even stray artifacts have been identified. Historical sources are of no help: if transhumant shepherds still wintered in the Aderes or a few people eked out a living in some sheltered valley, they were of no interest to the outside world. We must remember, however, that Pausanias mentioned people living in places where there is nothing now to catch the eye of the archaeologist, and we can never assume that the region was completely abandoned. Continuity in the use of place names from Classical antiquity also argues against total abandonment in the intervening ages (Jameson, 1976). Archaeologically it is nevertheless another dark age.

Settlers returned in the Middle Byzantine period (Fig. 13), perhaps as early as the 9th century as part of Nikephoros' policy of resettlement, which was continued under the Macedonian dynasty (Cheetham, 1981). The fortifications at Kastri (Ermioni) were repaired early in the period. Settlements and chapels (up to 55 sites, 45 certain) were built in the inland valleys behind Kastri, in the Fournoi valley, and on the Iliokastro plateau, where they were out of sight of the sea. The Southern Argolid was added to the Frankish realms in the early 13th century, and sometime later the peak above Thermisi (E3) was fortified, undoubtedly to control the near-by salt pans (McLeod, 1962). By the end of the century the town of Kranidi, safely located in the central interior, was in existence, although it is probably much older, and Kastri (Ermioni) was a fortified village. Down to the Greek War of Independence, however, we have little or no direct archaeological evidence for the shifting cultural influences that characterize later Mediaeval Greece. From historical accounts we know the Argolid was politically part of the Morea and was ruled from the Argeia by Frankish and then Venetian overlords in the 13th–16th centuries (McLeod, 1962; Cheetham, 1981). The population of the Southern Argolid was augmented by an influx of Albanian-speaking settlers (perhaps taking advantage of depopulations following the Black Death?) in the 14th–15th centuries, and the *Arvanites*, as they are called, are still a dominant element of the population. In the 16th century the Southern Argolid was acquired by the Ottoman empire. The area was again in Venetian hands from 1685 until its reconquest by the Turks in 1715. The Southern Argolid, no doubt because of its proximity to the powerful islands of Hydra, Spetsai, and Poros, was involved from the beginning in the War of Independence (Jameson, 1976).

A detailed consideration of the complex history of the Argolid in these times is not undertaken here. We assume that the population of the region rose and fell following the general pattern seen in the Peloponnese and that its population and economy were tied to larger settlements in the Argeia and to the islands of the Saronic Gulf (Topping, 1972, 1976; Jameson, 1976). In general, the Southern Argolid was prosperous in these years, although always at risk from piratical raids, and was able to export wine, olive oil, red dye, cotton, and other agricultural products to the near-by centers of population.

We conclude this survey of settlement history with the developments beginning in the early 19th century and still to be observed in the present day (Fig. 14). Despite some ups and downs, the population of the Ermionis has grown during the modern period, and new settlements continue to be founded (S. Sutton, forthcoming). Present-day settlements are

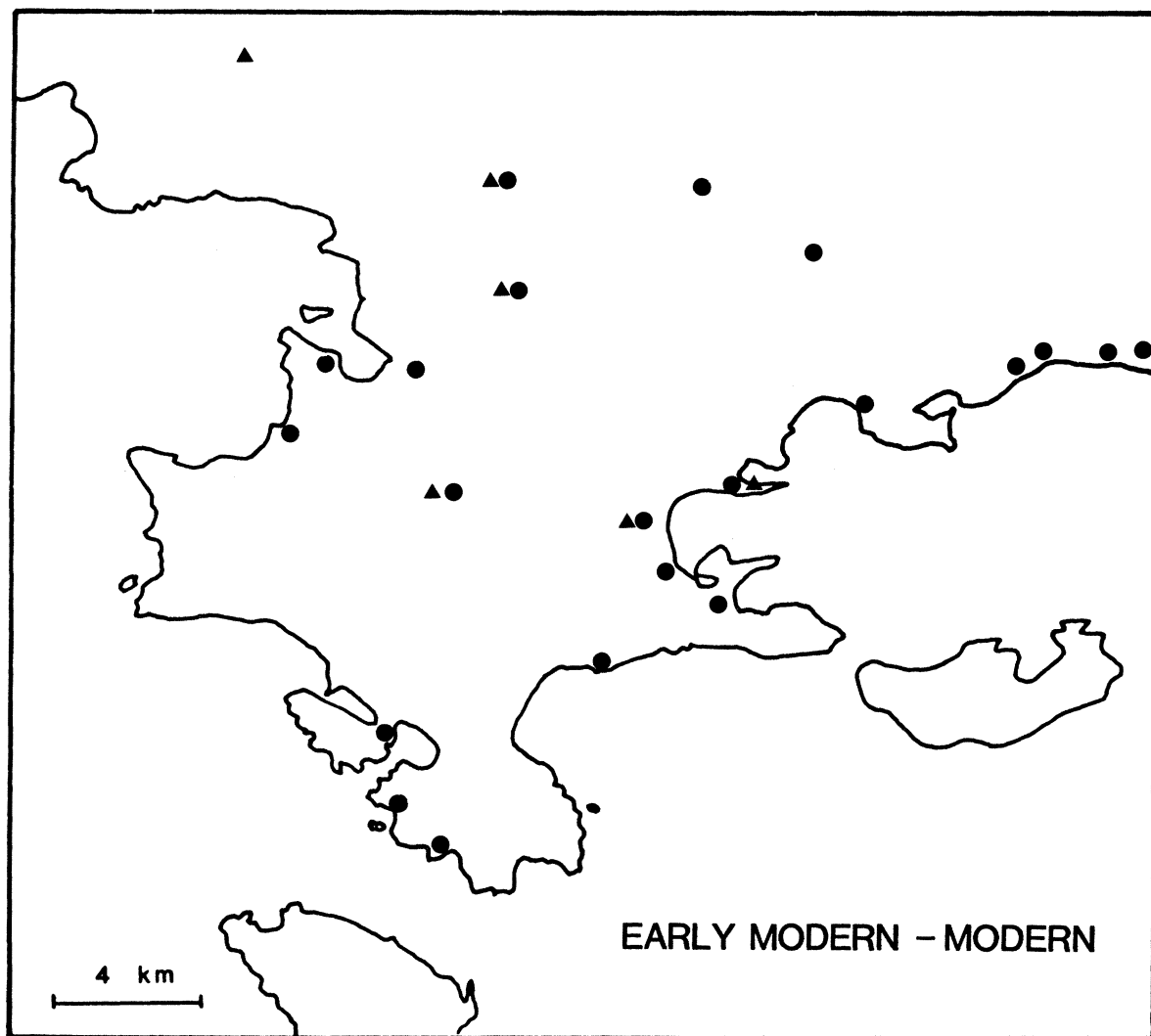


FIG. 14. Early Modern—Modern: ▲Early Modern. ●Modern. This map is not based on archaeological sites but on demographic data supplied by S. Sutton (see footnote 8).

widely dispersed once more to every part of the region. The pattern is a classic central-place market system with Kranidi as the center (although Ermioni shows signs of usurping that place) with second-order towns, villages, hamlets, and farmsteads dependent upon it. For the fourth or fifth time (depending on whether one counts the late Mediaeval period separately) the Southern Argolid is enjoying renewed growth, prosperity, and relative stability.

#### THE ECONOMIC BASIS FOR SETTLEMENT-PATTERN CHANGE

This summary of the settlement history for the Southern Argolid reveals a distinct trend, problems of preservation and sampling notwithstanding (Fig. 15). The discovery of

similar patterns elsewhere in Greece (Bintliff and Snodgrass, 1985; McDonald and Rapp, 1972; Wagstaff and Cherry, 1982) increases our confidence that the similarity is not fortuitous. The settlement pattern in the Southern Argolid appears to have alternated, over periods of varying length, from a nucleated to a more or less dispersed one and back again, interrupted two or perhaps three times by virtual abandonment (Table 2). The dispersed pattern, which we associate with periods of increased population and human activity, occurred at least five times before the modern period. Nucleation and dispersal are relative terms, however, that refer to different densities and spacing of settlements, and we cannot attribute changes in density directly to changes in population. More specifically, we assume that there is a greater number of sites in a dispersed pattern, and that this greater number reflects, among other things, a higher level of intensity of land use. By higher level of intensity of land use we mean that more land, including less productive or harder-to-reach portions, was brought under cultivation or was used for grazing. A greater number of sites, especially if many of them are larger settlements, does suggest a probable increase of population, but such a correlation must be considered as a hypothesis for the present.

Faunal and floral remains preserved in Franchthi Cave (Hansen, 1980; Jacobsen, 1976; Payne, 1975, 1985; Renfrew and Hansen, 1978) show that the economy of the Palaeolithic and Mesolithic was based upon big-game hunting and fishing, supplemented by the gathering of shellfish and plants. The scarcity of sites and artifacts and the seasonal nature of the plants and animals being exploited point to seasonal and perhaps sporadic settlement in the region for 40,000 years. Change came about 8,000 years ago with the Neolithic economy based upon domesticated sheep, goats, cereals, and pulses: a suite of domesticates derived principally from wild progenitors in Southwestern Asia (*sensu lato*, Dennell, 1983; Jacobsen, 1981). The village at Franchthi Cave is the first certainly permanent settlement in the region, and for as much as a millennium it was perhaps the only settlement. These early settlers were attracted to the shelter of the cave but probably even more so to the availability of a steady supply of water for their fields from near-by springs (now submerged by the sea). The inhabitants of the Franchthi village, perhaps no more than 100 or 150 persons, were more numerous than their predecessors, but this level of population would not have overtaxed the available resources.<sup>5</sup> Why did early farmers choose the comparative isolation of the Southern Argolid rather than regions with larger areas of arable and grazing land? In addition to the suitability of the cave as shelter, we postulate that the location of Franchthi Cave on the Argolic Gulf permitted trade and communication with other communities by sea. Communication was necessary if marriage partners were to be transferred between these small communities, and a number of items, for instance Melian obsidian, Aiginetan andesite, marble, flint, and less tangible commodities such as salt or styles of painted pottery, indicate active trading with the islands and the Northeast Peloponnese (Cullen, 1984; Runnels, 1983; Vitelli, 1974).

<sup>5</sup> The estimates of population for the pre-Neolithic would range from *ca.* 30–50 persons by comparison with recent hunter-gatherers. Jacobsen (1981) has estimated the population of Franchthi Cave on the basis of the presumed density of 100 people per hectare of settlement. His estimate of 100–400 persons for most Neolithic sites in Greece cannot be far wrong.

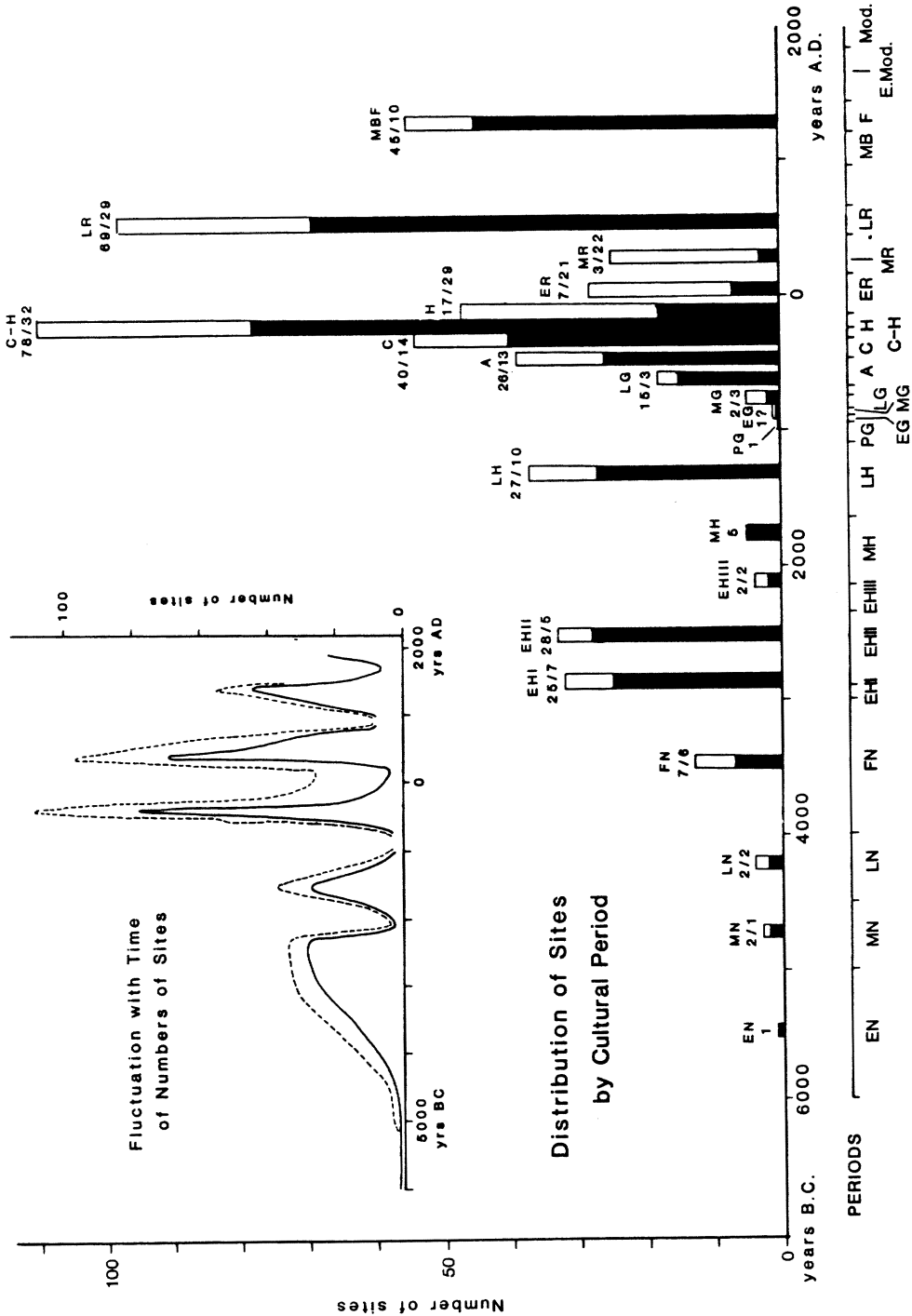


FIG. 15. Site distributions by cultural periods. For abbreviations of periods see Table 3. The first number over the bar indicates the number of components with confirmed dates; the second number indicates components represented by fewer than five dated artifacts and thus considered as probable only.

TABLE 2: Nucleated and Dispersed Settlement Patterns

<i>Archaeological Period</i>	<i>Settlement Type</i>
Neolithic	nucleated
Early Bronze Age	dispersed
Early Helladic III—Middle Helladic	nucleated
Late Helladic	dispersed
virtual abandonment?	
Geometric	nucleated
Archaic—Late Classical/Early Hellenistic	dispersed
Hellenistic—Middle Roman	nucleated
Late Roman	dispersed
virtual abandonment?	
Mediaeval	nucleated
Modern	dispersed

In the 5th and 4th millennia (Late and Final Neolithic), new settlements attest to a change in the use of the land and probably to the natural increase of population. The doubling or even tripling of the number of settlements in Greece in the late 4th and early 3rd millennia (EH I) and the growth in size and complexity of the EH II *magoules* in the mid(?) 3rd millennium have been attributed by Renfrew (1972) to the introduction of the cultivated olive and vine. The lack of olive in the local pollen record and of the tools (e.g. press beds) for processing olives or grapes, however, have led us to ascribe the EH I–II economic growth to the introduction of long ships and metallurgy and to the expansion of internal Aegean trade (Runnels, 1985; Runnels and Hansen, 1986). We estimate that population was increased in the Early Bronze Age by as much as a factor of six, and the hierarchical relationship of settlements suggested by the differentiation of sites into villages and smaller satellites reflects a new interest of an elite in status and power.<sup>6</sup> The economy of EH I–II was based upon cereal agriculture, expanded across the best deep soils through the agency of a population increased to supply labor (Pope and van Andel, 1984; van Andel, Runnels, and Pope, 1986). With an increased demand for labor, families would no doubt find it useful to increase the number of offspring, perhaps by relaxing any rules originally intended to limit the growth of families such as prohibitions on reproduction or concerning infanticide and senilicide. Immigration and slavery are other possible sources of labor.

<sup>6</sup> Only very approximate estimates of past levels of population are possible when surface sites are the main evidence for past settlement. A full discussion of the population history of the Southern Argolid based on several lines of evidence, but principally on the numbers and sizes of the archaeological sites, is presented in Jameson, Runnels, and van Andel (footnote 3 above). The very tentative preliminary calculations used here are as follows: probably fewer than 50 people in the Palaeolithic through Mesolithic, and only 100–400 through the whole of the Neolithic. Population rose in the Early Bronze Age, perhaps to *ca.* 1,900, a level that was approximately the same in the Late Helladic. From a very small level in the Geometric, perhaps 1,000, population rose to a level higher than 7,500 by the end of the 4th century B.C. There was also a Late Roman peak of perhaps less than 6,500 persons. Between the periods of peaks, population levels declined considerably, to 500 or less in EH III and MH, less than 4,000 in the later Hellenistic to Middle Roman period, and to *ca.* 3,000 in the Mediaeval period. The present-day population has gone from *ca.* 6,600 in 1829 to *ca.* 12,200 today.

The subsequent EH III nucleation accompanied by contraction in settlement, and probably population, is to be attributed to the general destruction and resettlement that mark the end of the 3rd millennium in the Northeast Peloponnese. Recovery was slow until *ca.* 1600 B.C., after which there is evidence of a return to a dispersed settlement pattern. The Late Helladic economy was, on present evidence, quite similar to that of EH I–II. The olive and vine may now play a part, as they did in other regions, e.g. Messenia (McDonald and Rapp, 1972), but we have no direct local evidence for them. The most pressing question at this time is the relationship of the inhabitants of the Southern Argolid to the centers of power in the Argeia. We assume that they were dependent in some way on the good will of the larger centers of power in the Argive plain, but it is injudicious to be more specific. Ultimately the LH settlements of the Southern Argolid perished in the same destructions which overwhelmed the Argive sites in the 12th century.

When we turn to the resettlement in the Geometric period and the subsequent dispersal of sites in the Archaic and Classical periods, our ideas of economic activity can be somewhat more definite. Agriculture based upon cereals, sheep, goats, vines, and the olive was undoubtedly the economic mainstay. The discovery of more than 30 press beds and weight blocks at Halieis and the many scattered farmsteads documented by the survey indicates an increase in the production of olive oil by the later Classical period. This increase was perhaps in response to an increasing population in the towns and cities of the Argeia, Lakonia, Attica, and farther afield, especially since many new sites were established on steeper, coarser alluvia of less quality, not hitherto exploited, and suitable mainly for olive or vine (Jameson, 1977/1978; van Andel, Runnels, and Pope, 1986). Salt panning, purple-dye manufacture, mining, boat building, fishing, and trading must all have played their part in an economy integrated with the rest of the Greek world (Jameson, 1976). At its peak, the population of the Southern Argolid was probably increased over that of the Bronze Age by a factor of about four.<sup>7</sup>

Much the same economy characterized the later Hellenistic period down to early Imperial times, although population and settlement were sharply reduced and were restricted mainly to the better deep soils in use since the Early Bronze Age. The Late Roman revival, with an increase of population to levels similar to the late Classical and early Hellenistic period, was based on agricultural production with the addition of local manufactures such as amphoras (Megaw and Jones, 1983). Olive oil may have been the principal product if we are to judge from the common occurrence of large olive crushers (*trapeta*, *ca.* 14) and press beds at the *villae rusticae* and farmsteads, and, once again, first exploitation of more steep land of less quality, e.g. in the Fournoi headwaters. We assume that the towns and villages were replaced by smaller villages and villas, and slaves by serfs, but otherwise the economy was much the same as in the Greek period, and collapse came again through the agency of external disruption.

Recovery after the 9th century after Christ was based again on agriculture, the products of which could be traded to towns around the Aegean. Subsequent economic opportunities

<sup>7</sup> Jameson, Runnels, and van Andel (footnote 3 above).



avored vineyards (e.g. the 17th–18th centuries; Topping, 1976), sponge fishing, shipping, herding, and olive-oil production (Jameson, 1976; Gavrielides, 1976; Koster and Koster, 1976). The modern economy, to conclude this brief outline, is based on a combination of shipping revenues, agricultural production for the Athenian and European markets (especially olive oil, fruit, and vegetables), tourism, and some small-scale boat building, mining, and fishing. With the exception of tourism (and even here there are precedents), the possibilities of economic development have changed little over the millennia, although the emphasis on one form of production over another may have shifted.

The Southern Argolid is not rich in fertile soil or other natural resources, being provided with several good harbors but little else. Cut off from the rest of the Peloponnese by the Aderes mountains, its orientation has been traditionally to the sea through trade, boat building, fishing, and emigration (Jameson, 1976). When farming is practiced at the subsistence level with pre-modern techniques, only a modest population can be supported, dependent on outside contacts for many necessities. Intensification of agriculture is possible: olives, vines, and animals can be put on terraced slopes or on soils and hillsides that become increasingly marginal, but these efforts require considerable input of labor to be profitable (Forbes, 1982). The evidence for special manufactures is slight: small quantities of copper and iron may have been mined in antiquity, and Classical sources attest to the production of purple dye. In sum, two factors determine the economic potential of the Ermionis: increased economic/commercial growth requires access to the coast and the sea, and agricultural intensification requires increased labor input (Jameson, 1977/1978).

There is one other important consideration: economic growth in any period also requires access to external commercial markets where the products, including services such as shipping, could be sold or exchanged for other goods. This condition must have held for all periods in the Southern Argolid, no matter what definition of wealth, principle of land tenure, or social system prevailed. Considerable wealth could be produced locally but only in a narrow range of forms, and the inhabitants of the Southern Argolid would always be obliged to turn outward for exchange and the conversion of one form of wealth to another.

Here, then, is a general principle for understanding settlement-pattern change in the Southern Argolid: whenever markets were accessible by sea, even if only the population centers of Attica, the Argeia, or the off-shore islands, intensification of agricultural and other production was feasible, and the population would increase over time to meet the demand for labor. New settlements would be placed near the terraced slopes and on less promising or more distant patches of soil to increase output, while other resources were exploited (salt, wood for ships, and fuel). In time, a dispersed pattern of settlement with many evenly spaced sites would result. The disruption of the external markets, the interference with sea travel, or both, would lead inevitably to economic decline. Population would fall to a level sufficiently low to be sustained by subsistence agriculture. Nucleated settlements were located close to the best arable land to allow the population to minimize movement to and from the fields. This model may be called for convenience a “dependency model” of settlement-pattern change.

Analysis of contemporary demographic data provides one piece of evidence to support

this hypothesis. Many parts of rural Greece have been experiencing a decline in population over a period of 170 years as people have moved to Athens and a few other urban centers (with more than one third of the population of Greece), a pattern common to developing countries (Dimen and Friedl, 1976). The Southern Argolid, an exception, has witnessed a period of moderate growth, both in population and in number of settlements in these same years, nearly doubling in size since 1829 (from *ca.* 6,600 to 12,200 people, and from 11 to 21 settlements).<sup>8</sup> It is also noteworthy that the emerging pattern of settlement in the Ermionis, while retaining one or even two larger centers as regional markets, has tended towards the dispersal of population into villages and towns in all parts of the region. This phenomenon is attributed to the active role in maritime trade played by local inhabitants from the beginning of the 19th century and to the variety of economic avenues available today to articulate the economy of the Southern Argolid with the larger economic world.<sup>9</sup>

The settlement history of the island of Melos has also been described as an alternating pattern of dispersal and nucleation (Wagstaff and Cherry, 1982). The explanation for this pattern, however, is somewhat different. In Melos, nucleated phases of settlement seem to correspond to periods when the island was closely linked to external polities that exerted direct economic and political control over the island. In these times population was concentrated in the nucleated settlements and was greater than during periods of autonomy and dispersed settlement. To bring the population together in one or a few settlements serves, according to Wagstaff and Cherry, to articulate the economy of the island to the controlling outside polity and may be described as a “colonial model”. This is similar to the argument we are offering in this paper, except that the periods of nucleation and dispersal in Melos do not always coincide with those of the Southern Argolid. Indeed, the patterns are virtually mirror images: periods of prosperity and settlement growth in Melos produce a nucleated pattern and correspond to periods of dispersed settlement in the Southern Argolid which we have also interpreted as periods of growth. Similar cultural and economic dynamics may be at work in both cases, but the individual histories of the two areas, the result of different natural resources and locations, seem to be responsible for the cultural differences between them. In short, the different history of settlement-pattern change in the Southern Argolid may be due to the existence, at least since the Early Bronze Age, of three good harbors oriented towards the Argolic Gulf, the Saronic Gulf, and the Aegean, and the proximity of the Southern Argolid to the rest of the mainland.

It is perhaps too early to say why different regions of Greece should have settlement histories with different configurations in response to similar external economic and political conditions. The two areas in question show that each small region is likely to require its own analysis to elucidate the particular circumstances that have conditioned its settlement history.

<sup>8</sup> Our discussion of the modern period and use of the concept of “dependency model” (which is not used in a strict theoretical sense) owe much to unpublished reports on the modern demographic history of the Southern Argolid kindly made available to us by Susan Sutton (Indiana University-Purdue University in Indianapolis) and to many discussions with Sutton, Michael Jameson, and Hamish Forbes. We are also pleased to acknowledge the very useful ethnological contributions, based on several years of combined fieldwork, by Harold Koster and Nicolas Gavrielides.

<sup>9</sup> For a more detailed historical analysis, see Jameson, Runnels, and van Anandel (footnote 3 above).

The foregoing represents what we can call an *external* dynamic, *viz.* the agricultural potential of the Argolid and its proximity to markets have determined its economic and political fortunes, a fact recognized some time ago by Jameson (1976). While in most periods politically autonomous, a growing economy and large population have been dependent upon access to external markets for their agricultural produce and a supply of new technologies and manufactured goods. The configuration of the local settlement pattern as dispersed or aggregated is thus a local response to external conditions. Settlement pattern can also be said to respond to an *internal* dynamic. Limp (1983) has argued that alternating dispersal and nucleation of aboriginal settlements in the north-central United States can be linked to the variable costs of different resources (in this case, food). Settlements were located according to decisions to optimize the exploitation of a particular resource while minimizing the cost of its procurement (usually the costs of acquiring, transporting, and processing the resource with a given technology). One conclusion can be drawn from Limp's argument: where desired resources are highly concentrated there is a strong attraction, or "pull", acting like gravity to aggregate population to that center. Bintliff (1977, 1982) has argued that good arable land in the Argolid and elsewhere in Southern Greece is the most important resource that determines settlement location because of its scarcity and unequal distribution. We agree with this assessment for the Southern Argolid to some extent, although we do not wish to discount the importance of water and a defensible position. When external markets are lacking, the concentrations of best arable land (taking into account factors of defense, water, etc.) exert a powerful attraction on the existing population. The inhabitants will select sites for settlement that maximize access to those soils and minimize the costs of food production and distribution (primarily transport costs). The over-all number of sites will be decreased. The introduction of new possibilities, however, in the form of access to markets, new domesticates, or new technologies such as terracing or the plow, will encourage the inhabitants to exploit more distant, isolated, and marginal soils as well as to intensify the use of existing fields.

The historical specifics of settlement in the Southern Argolid, the "internal" dynamic, can in part be understood by reference to the classic economic dynamics of industrial siting described by Weber (1929 [1958]).<sup>10</sup> Settlements, if we view them as agricultural production centers, will be placed so as to minimize the costs of transport and production. These "production centers" will in theory be placed close to markets when production uses resources, such as certain minerals, that do not lose any significant portion of their weight in the production process. These "centers" will move to positions closer to the supply of resources, however, as the amount of bulk lost in processing them increases. The addition of other resources, like fuel for the production of metals, will complicate the decision of where to place the "production center". Wherever agricultural production is involved, arable land is the primary resource, and thus land, a fixed resource, will determine the optimal siting of the agricultural "production center".

<sup>10</sup> We have chosen Weber's analysis for the sake of the simplicity of the assumptions used in his theoretical model. They seem to us to be more useful for an evaluation of the small-scale site-distribution patterns preserved in the Southern Argolid. Much more sophisticated, and complicated, models have been found necessary by economic geographers, and these models have largely superseded Weber's work where analysis is extended to much larger units such as nations.

This reasoning allows us to consider production costs as an independent variable of settlement economics and, contrary to prevailing opinion, to consider population as a dependent variable. Simply stated, we assume that population is increased or decreased by the choices of families or individuals responsible for decision making in response to changes in the demand for labor under any given production strategy (Renfrew, 1982; Runnels, 1985). With the stimulus of external markets, agricultural production will be increased, largely by application of new technology when available (e.g., the plow or the olive crusher), by cultivation of new lands, and with the additional input of labor. To meet the demand for labor, population is increased as a result of the aggregate of choices of individuals, families, or corporate groups to increase their size by such means as allowing for younger marriages, eliminating infanticide, or encouraging immigration. When markets are cut off, usually as the result of widespread economic depression, war, or piracy, the first production cost to be "cut" is population, and for this reason we conclude that economic decline is followed closely by population decline.

It was in the Bronze Age that the inhabitants of the Southern Argolid first exploited their economically strategic location near the sources of power and the centers of population in the islands and in southern and central Greece as a whole. It is no coincidence that the first dispersion of settlement in the Southern Argolid occurs with the emergence of the first Early Bronze Age "towns" in the Argolid and the islands. The Southern Argolid is too dry and its soils are too poor and rocky to support more than a modest number of inhabitants on its own. The labor needed to wring a surplus in grain, wool, or olive oil is too great to undertake unless there is an economic incentive for doing so. Thus the pattern of dependence upon outside economic forces was first seen no later than the Early Bronze Age and the pattern of settlement has continued to change in tune to the ebb and flow of these forces until the present day. The Southern Argolid has never been a center of political or economic power, indeed it is a relatively insignificant area, yet its vicissitudes serve as an index to measure the state of affairs of a larger world, growing in times of prosperity and security and wasting away when the fortunes of larger states decline.

TABLE 3: Chronological Periods

Middle Palaeolithic (MP)	>50,000—ca. 35,000 B.P.
Upper Palaeolithic (UP)	ca. 35,000–10,500 B.P.
Mesolithic	10,500–8,000 B.P.
Early Neolithic (EN)	6000–5000 b.c.
Middle Neolithic (MN)	5000–4500 b.c.
Late Neolithic (LN)	4500–4000 b.c.
Final Neolithic (FN)	4000–3000 b.c.
Early Helladic I–II (EH)	3000–2350 B.C.
Early Helladic III—Middle Helladic (EH III—MH)	2350–1650 B.C.
Late Helladic (LH)	1650–1100 B.C.
Geometric–Archaic (G–A)	10th–5th centuries B.C.
Classical (C)	5th–4th centuries B.C.
Late Classical—Early Hellenistic (C–H)	ca. 350–250 B.C.
Late Hellenistic—Middle Roman (H–MR)	3rd century B.C.—3rd century after Christ
Late Roman (LR)	4th–7th centuries after Christ
Mediaeval	
Middle Byzantine—Frankish (MB–F)	9th century—ca. A.D. 1388
First Venetian—Turkish	A.D. 1388–1686
Second Venetian—Turkish (Early Modern)	A.D. 1686–1821
Modern	A.D. 1821–present

## REFERENCES

- Bialor, P. and M. Jameson, 1962, "Palaeolithic in the Argolid," *AJA* 66, pp. 181–182
- Bintliff, J. L., 1977, *Natural Environment and Human Settlement in Prehistoric Greece* (*BAR* Supplementary Series, S28), Oxford
- , 1982, "Settlement Patterns, Land Tenure and Social Structure: A Diachronic Model," in *Ranking, Resource and Exchange. Aspects of the Archaeology of Early European Society*, C. Renfrew and S. Shennan, edd., Cambridge, pp. 106–111
- Bintliff, J. L. and A. M. Snodgrass, 1985, "The Cambridge/Bradford Boeotian Expedition: The First Four Years," *JFA* 12, pp. 123–161
- Boyd, T. D. and W. W. Rudolph, 1978, "Excavations at Porto Cheli and Vicinity, Preliminary Report IV: The Lower Town of Halieis, 1970–1977," *Hesperia* 47, pp. 333–355
- Caskey, J. L., 1960, "The Early Helladic Period in the Argolid," *Hesperia* 29, pp. 285–303
- Cheetham, N., 1981, *Mediaeval Greece*, New Haven
- Cullen, T., 1984, "Social Implications of Ceramic Style in the Neolithic Peloponnese," in *Ancient Technology to Modern Science*, W. D. Kingery, ed., Columbus, Ohio, pp. 77–100
- Dennell, R., 1983, *European Economic Prehistory: A New Approach*, London
- Dimen, M. and E. Friedl, edd., 1976, *Regional Variation in Modern Greece and Cyprus: Toward a Perspective on the Ethnography of Greece* (*Annals of the New York Academy of Sciences* 268)

- Forbes, H. A. and H. A. Koster, 1976, "Fire, Axe, and Plow: Human Influence on Local Plant Communities in the Southern Argolid," *Annals of the New York Academy of Sciences* 268, pp. 109–126
- Forbes, H. A., 1982, *Strategies and Soils: Technology, Production and the Environment in the Peninsula of Methana, Greece*, diss. University of Pennsylvania
- Gavrielides, N., 1976, "The Impact of Olive Growing on the Landscape of the Fourni Valley," *Annals of the New York Academy of Sciences* 268, pp. 143–157
- Hansen, J. M., 1980, *The Palaeoethnobotany of Franchthi Cave, Greece*, diss. University of Minnesota
- Jacobsen, T. W., 1976, "17,000 Years of Greek Prehistory," *Scientific American* 234, pp. 76–87
- , 1981, "Franchthi Cave and the Beginning of Settled Village Life in Greece," *Hesperia* 5, pp. 303–319
- , 1984, "Seasonal Pastoralism in Southern Greece: A Consideration of the Ecology of Neolithic Urfaian Pottery," in *Pots and Potters, Current Approaches in Ceramic Archaeology*, P. M. Rice, ed. (Institute of Archaeology, *Monograph XXIV*), Los Angeles, pp. 27–43
- Jameson, M. H., 1969, "Excavations at Porto Cheli and Vicinity, Preliminary Report I: Halieis, 1962–1968," *Hesperia* 38, pp. 311–342
- , 1974, "The Excavation of a Drowned Greek Temple," *Scientific American* 231, pp. 110–119
- , 1976, "The Southern Argolid: The Setting for Historical and Cultural Studies," *Annals of the New York Academy of Sciences* 268, pp. 74–91
- , 1977/1978, "Agriculture and Slavery in Classical Athens," *The Classical Journal* 73, pp. 122–144
- Keller, D. and D. Rupp, ed., 1983, *Archaeological Survey in the Mediterranean Area* (BAR International Series 155), Oxford
- Koster, H. A. and J. B. Koster, 1976, "Competition or Symbiosis? Pastoral Adaptive Strategies in the Southern Argolid," *Annals of the New York Academy of Sciences* 268, pp. 275–285
- Limp, W. F., 1983, "An Economic Model of Settlement Aggregation and Dispersal," in *Ecological Models in Economic Prehistory*, G. Bronitsky, ed. (Arizona State University, *Anthropological Research Papers* 29), Tempe, Arizona, pp. 18–45
- McDonald, W. A. and G. R. Rapp, ed., 1972, *The Minnesota Messenia Expedition*, Minneapolis
- McLeod, W. E., 1962, "Kiveri and Thermisi," *Hesperia* 31, pp. 378–392
- Megaw, A. and R. Jones, 1983, "Byzantine and Allied Pottery: A Contribution by Chemical Analysis to Problems of Origin and Distribution," *BSA* 78, pp. 235–263
- Murray, P. and P. N. Kardulias, 1986, "A Modern Site Survey in the Southern Argolid, Greece," *JFA* 13, pp. 21–41
- Payne, S., 1975, "Faunal Change at Franchthi Cave from 20,000 B.C.—3,000 B.C.," in *Archaeozoological Studies*, A. T. Clason, ed., Amsterdam/New York, pp. 120–131

- , 1985, "Zoo-archaeology in Greece: A Reader's Guide," in *Contributions to Aegean Archaeology. Studies in Honor of William A. McDonald*, N. C. Wilkie and W. D. Coulson, edd., Dubuque, Iowa, pp. 211–244
- Pope, K. O., C. N. Runnels, and T.-L. Ku, 1984, "Dating Middle Palaeolithic Red Beds in Southern Greece," *Nature* 312, pp. 264–266
- Pope, K. O. and Tj. H. van Andel, 1984, "Late Quaternary Alluviation and Soil Formation in the Southern Argolid: Its History, Causes and Archaeological Implications," *JAS* 11, pp. 281–306
- Renfrew, J. M. and J. Hansen, 1978, "Palaeolithic-Neolithic Seed Remains at Franchthi Cave, Greece," *Nature* 271, pp. 349–352
- Renfrew, A. C., 1972, *The Emergence of Civilisation. The Cyclades and the Aegean in the Third Millennium B.C.*, London
- , 1982, "Polity and Power: Interaction, Intensification and Exploitation," in *An Island Polity. The Archaeology of Exploitation in Melos*, A. C. Renfrew and J. M. Wagstaff, edd., Cambridge, pp. 264–290
- Rudolph, W., 1979, "Excavations at Porto Cheli and Vicinity. Preliminary Report V: The Early Byzantine Remains," *Hesperia* 48, pp. 294–324
- Runnels, C. N., 1983, "Trade and Communication in Prehistoric Greece," *Ekistics* 50, pp. 417–420
- , 1985, "Trade and the Demand for Millstones in Southern Greece in the Neolithic and the Early Bronze Age," in *Prehistoric Production and Exchange: The Aegean and Eastern Mediterranean*, B. Knapp and T. Stech, edd. (Institute of Archaeology, *Monograph XXV*), Los Angeles, pp. 30–43
- Runnels, C. N. and J. Hansen, 1986, "The Olive in the Prehistoric Aegean: The Evidence for Domestication in the Early Bronze Age," *Oxford Journal of Archaeology* 5, pp. 299–308
- Rutter, J. B., 1979, *Ceramic Change in the Aegean Early Bronze Age. The Kastri Group, Lefkandi I, and Lerna IV: A Theory Concerning the Origin of Early Helladic III Ceramics* (Institute of Archaeology, *Occasional Paper 5*), Los Angeles
- , 1984, "The 'Early Cycladic III Gap': What It Is and How to go about Filling it without Making it go Away," in *The Prehistoric Cyclades: Contributions to a Workshop on Cycladic Chronology*, J. A. MacGillivray and R. L. N. Barber, edd., Edinburgh, pp. 95–107
- Schiffer, M., 1976, *Behavioral Archaeology*, New York
- , 1983, "Toward the Identification of Formation Processes," *American Antiquity* 48, pp. 675–706
- Sheehan, M., 1979, *The Postglacial Vegetational History of the Argolid Peninsula, Greece*, diss. Indiana University
- Sutton, S. B., forthcoming, "The Franchthi Region in Modern Times," in *Landscape and People of the Franchthi Region*, Tj. H. van Andel and S. B. Sutton, edd., Bloomington
- Topping, P., 1972, "The Post-Classical Documents," in *The Minnesota Messenia Expedition*, W. A. McDonald and G. R. Rapp, edd., Minneapolis, pp. 64–80

- , 1976, "Premodern Peloponnesus: The Land and the People under Venetian Rule (1685–1717)," *Annals of the New York Academy of Sciences* 268, pp. 92–108
- Vitelli, K. D., 1974, *The Greek Neolithic Patterned Urn Ware from the Franchthi Cave and Lerna*, diss. University of Pennsylvania
- van Andel, Tj. H. and N. Lianos, 1983, "Prehistoric and Historic Shorelines of the Southern Argolid Peninsula: A Subbottom Profiler Study," *IJNA* 12, pp. 303–324
- van Andel, Tj. H., C. N. Runnels, and K. O. Pope, 1986, "Five Thousand Years of Land Use and Abuse in the Southern Argolid, Greece," *Hesperia* 55, pp. 103–128
- van Andel, Tj. H. and J. C. Shackleton, 1982, "Late Paleolithic and Mesolithic Coastlines of Greece and the Aegean," *JFA* 9, pp. 445–454
- Wagstaff, J. M. and J. F. Cherry, 1982, "Settlement and Population Change," in *An Island Polity. The Archaeology of Exploitation in Melos*, A. C. Renfrew and J. M. Wagstaff, edd., Cambridge, pp. 136–155
- Weber, A., 1929 [1958], *Theory of the Location of Industries*, Carl J. Friedrich, trans., Chicago
- Whallon, R., 1979, *An Archaeological Survey of the Keban Reservoir Area of East-Central Turkey* (University of Michigan *Memoirs of the Museum of Anthropology* 11), Ann Arbor
- Wilkinson, T. J., 1982, "The Definition of Ancient Manured Zones by Means of Extensive Sherd-sampling Techniques," *JFA* 9, pp. 323–333
- Young, J. H., 1956, "Studies in South Attica," *Hesperia* 25, pp. 122–146

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