Saronic Harbors Archaeological Research Project (SHARP)

2009 Season Report

Introduction

The Saronic Harbors Archaeological Research Project (SHARP) carried out the third of three field seasons from 18 May to 27 June, 2009, as a project of the American School of Classical Studies, with permits from the Greek Ministry of Culture and the Institute of Geology and Mineral Exploration (IGME permit #2268 26/05/2009). We would like to thank the ΛΖ΄ ΕΠΚΑ, the 25th Byzantine Ephorate, and the Enalion Ephorate for their cooperation and support. Our research continued to focus on the Mycenaean settlement at Korphos-Kalamianos; in 2009 we also conducted archaeological surface survey in the surrounding territory (Figure 1).

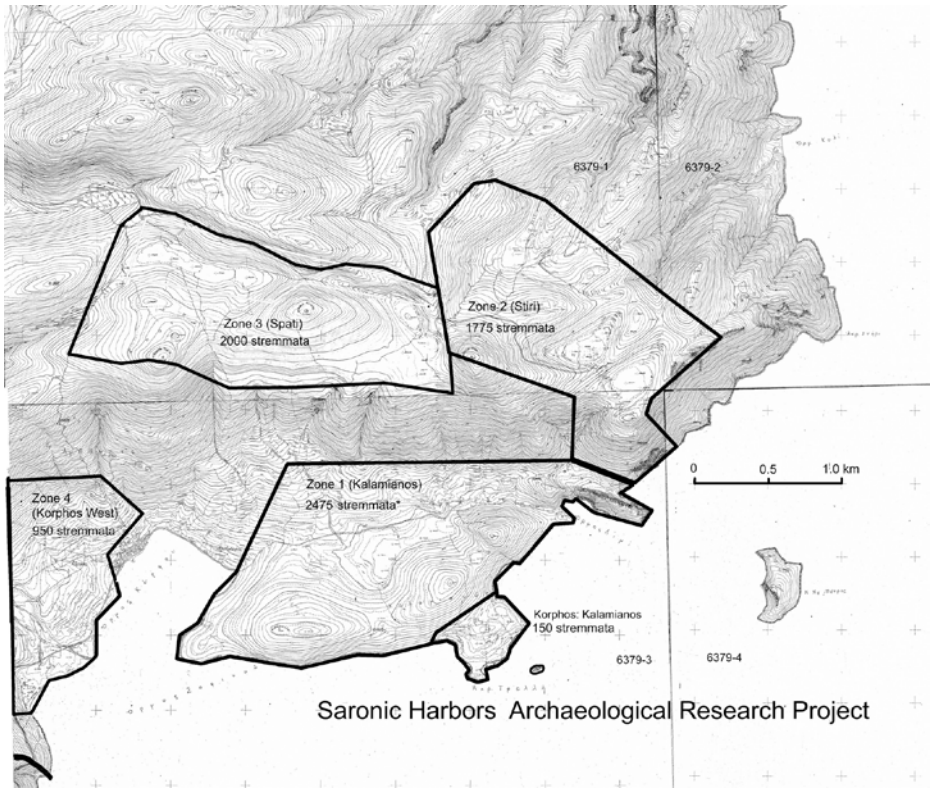

Figure 1. Korphos-Kalamianos and SHARP survey zones.

Kalamianos was a major harbor settlement of the Mycenaean palatial period, with a large, planned urban center that anchored a region of Mycenaean activity extending well beyond the site itself. The Kalamianos site is unusual in that the architectural foundations and lower walls of an entire Mycenaean town are exposed because of extensive loss of soil into the sea on the gently sloping terrain of the site. The region is rich in additional Mycenaean period sites.

In 2009 our main priorities were the following:

1. Continue the systematic study of the architecture at Korphos-Kalamianos, including a thorough inventory of the architectural remains and an accurate plan of their location; detailed documentation of the architecture through written descriptions, drawings, and photographs; precise architectural survey of selected buildings and complexes using an Electronic Total Station; detailed plans of selected buildings drawn at scales of 1:20, 1:50, or 1:100; and aerial photography;

2. Continue systematic archaeological surface survey on the site and in the region around it in order to detect spatial patterns in Late Bronze Age activity, and to collect small samples of artifacts for chronological and comparative purposes;

3. Continue geological and geomorphological study to characterize the geological and hydrological resources available in the Korphos area, and to address questions of long-term geomorphology, such as movement and loss of sediment at Kalamianos.

In this report we summarize the main activities of SHARP for 2009.

Systematic Documentation of Architectural Remains

In order to document the architectural remains at Korphos-Kalamianos in a comprehensive way, we devised a five-part strategy:

1. A systematic inventory and mapping of the architectural remains throughout the site;

2. Detailed architectural documentation of selected areas and buildings through architectural survey and drawing;

3. Detailed architectural documentation of buildings and features through written descriptions and photographs;

4. Systematic surface collection of material from the structures, both within the bounds of walls and in the walls themselves, to provide chronological and functional information;

5. Aerial photography of the Kalamianos site from a tethered balloon.

Architectural Inventory and Mapping

By 2009 we had succeeded in compiling an inventory of the majority of architectural features visible throughout the 9-hectare area, in the form of a database of all features (ancient walls; terrace walls–both modern and ancient; and natural, solution-enlarged fissures in the limestone bedrock) accompanied by a GIS map. We incrementally replaced the low-precision GPS survey of architectural features (measurements taken with hand-held GPS units with a ±4 m accuracy) compiled in the 2007 with a high-precision GPS survey of the majority of the architecture, and the resulting GIS map represents one of the most detailed large-scale plans of

a Mycenaean town. We continued in 2009 to refine this plan with additional GPS measurements and with the use of an Electronic Total Station (Figure 2).

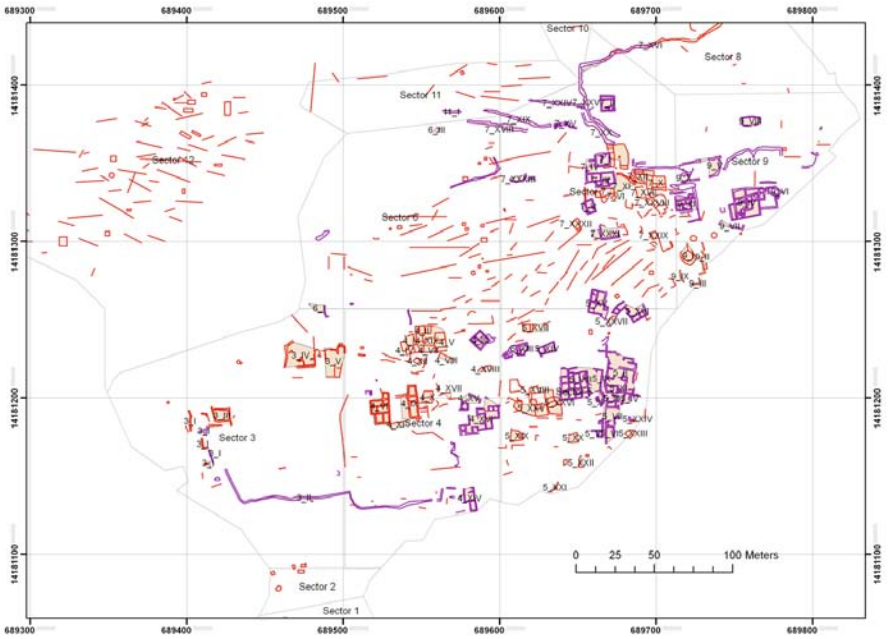

Figure 2. Map of architecture at Kalamianos, at end of 2009 season.

In 2009 we again systematically explored areas poorly understood or with poor visibility (the western and northeastern parts of the site: Sectors 3, 6, and 8/9) in order to ascertain whether there truly were few structures in these areas or whether they had been missed in previous seasons. In Sector 6 one building (6-I), some stretches of fortification wall, and a threshing floor (6-II) were identified. In Sector 8/9 no new structures were identified, but Structure 9-VIII was clarified. Perhaps the most significant result from this work was the tracing of the fortification wall along the southern boundary of Sectors 3 and 4, Wall 3-6026.

During the process of mapping with the GPS equipment, mapping with the Total Station, or documenting the buildings, new walls were identified. These new walls were assigned numbers and added to the database and the GIS. There remain parts of the site that we have not studied in detail beyond inventorying, but we are confident that we have a representative sample of the architecture. The major obstacles to our inventory and documentation continued to be thick vegetation and the state of preservation. Trees, shrub, and grass were trimmed in order to facilitate the documentation. The buildings varied greatly in their state of preservation. In some cases walls were preserved to 0.75 or 1.25 m, up to a maximum of 2.0 m, but in other cases there was only a tumble of stones with few or no visible wall segments.

In 2009 we completed a detailed DGPS microtopographic map of the site, begun in 2007. The rationale for the microtopographic survey is our recognition that the Mycenaeans built their structures on a series of terraces, some of them natural and some artificially transformed to suit the needs of the town for construction space. To understand this relationship, we need

finer topographic information than is provided on the Greek army 1:5000 topographic maps. This detailed topographic information will allow us to model our GIS and architectural drawings in three-dimensional space.

Architectural Survey and Drawing

A second strategy for documenting the architecture was to provide a detailed measurement survey and drawing of structures at Kalamianos utilizing a Total Station. In 2008 we succeeded in mapping a large area in Sector 5 and one in Sector 9, in addition to major portions of the fortification wall. In 2009 we mapped additional sections of Sectors 4 and 5, large stretches of the fortification wall, and clarified large portions of Sectors 7 and 9, in addition to updating maps of previous work throughout the site. The data from the Total Station survey were plotted in the GIS, and preliminary drawings were edited in the field. The resulting drawings of the sectors present a wealth of detail, including extent of tumble and collapse both inside and outside the structures, locations of possible doorways or thresholds, and relative confidence in the extent of the walls.

New in 2009 to our strategy for documenting the architecture is the stone-by-stone drawing of the architecture at Kalamianos. Staff architects Giuliana Bianco and Philip Saperstein were assisted by up to seven assistants skilled in drawing or computer-aided design in drawing several major complexes or structures as well as some small buildings, both on Kalamianos and at Stiri. These drawings, at scales of 1:20 or 1:50, are the equivalent of “state plans” in archaeological excavations; only here of course the extant buildings are preserved above ground without any excavation. For the stone-by-stone drawings, Total Station points were marked on stones in the walls, and then a 1:20 or 1:50 outline of the wall with the points marked was printed out. The architects laid out a tape down the wall, and marked the location of the tape on the drawing. They then proceeded to measure in each stone in situ, or displaced but obviously belonging to the wall, using a plumb bob and rule. Areas of tumble or fill were noted by conventions. The pencil drawings were then scanned, combined into one sheet (often requiring several sheets because of the size of the structures and the scale used) (Figure 3), geo-rectified, and then digitized using Adobe Illustrator to trace the drawings. The Adobe Illustrator files were then imported into the GIS for display along with the other mapping data, and manipulated for publishable plans of the buildings.

In 2009 we succeeded in finishing stone-by-stone pencil drawings for Structures 4-III, 4-VI, 4-IX, 5-II, 5-VIII, 7-I, 7-X, 7-XII, the fortification wall from the North Gate area southeast to the Fissure 7-14 east of 7-X at Kalamianos and Structures 13-II (including a road-cut section through the building) and 13-VII at Stiri. During the winter of 2009–2010 these drawings were digitized. The road-cut section of of the tower 13-II at Stiri provides valuable evidence that the buildings at Stiri and Kalamianos may well have deposits beneath the tumble.

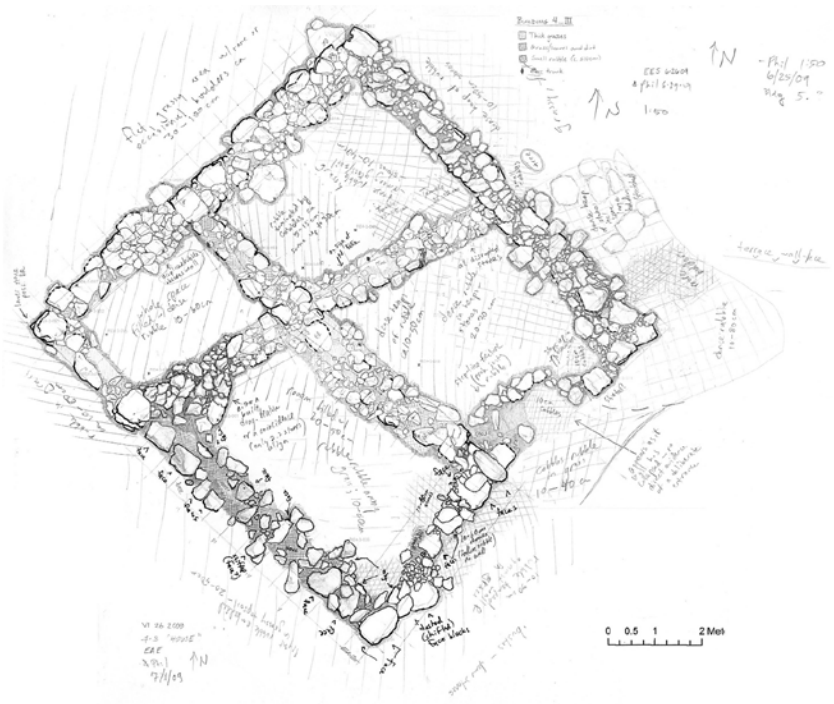

Figure 3. Stone-by-Stone Drawing of Building 4-III. Pencil by Philip Saperstein.

Building and Wall Documentation

A third component to the documentation of the architecture at Kalamianos was the detailed written description and measurements of the buildings and walls, accompanied by photographs, as in 2007. In 2009 we concentrated on those areas not previously cleared and documented, such as in Sectors 7, 5, and 4. In addition, the Documentation Team went to Stiri and documented three structures, 13-I, 13-II, and 13-III. The Architectural Documentation Form and a Wall Documentation Form developed in 2007, and modified in 2008, were used again in this phase.

The Architectural Documentation Form records verbal descriptions of the overall appearance of the building, nature and extent of tumble, nature and extent of corners and bonding, use of bedrock outcropping, and presence of vegetation that may have disturbed the walls. Occasionally new walls were identified and these were entered into the preliminary inventory as well.

The Wall Documentation Form is an attempt to provide a systematic set of observations about each wall. A measuring tape was strung out along the length of a wall. At every one meter measurements of height and width, and observations of number of courses, relative sizes of stones on exterior and interior, presence of chinking, mortar, rillenkarren, calcium carbonate (CaCO3), and lichen, and use of bedrock outcropping were taken. Corner blocks and other significant blocks were often measured. The major change in field procedures in 2008 was the separate recording of courses, stone sizes, etc., for both the interior and exterior faces whenever possible. In addition, the largest stone at each one-meter interval for both faces was

consistently measured whenever possible. Photographs were taken of each wall so documented. Top views from both directions, views of exterior and interior faces when possible, and details of corners, joins, and major blocks were standard shots for each wall. An attempt was made to take photographs at uniform intervals along the length of the walls, in order that the photographs better correspond to the measurements taken at the one-meter intervals. In addition, rooms and general overviews of the buildings were taken. To provide a more comprehensive component on individual buildings in the database, all buildings at Kalamianos and Stiri were assigned numbers. All buildings at Kalamianos and Stiri that had been subjected to the Architectural Discovery Unit method of surface survey (see below), but not documented by any of the above strategies, were also assigned numbers. By numbering these undocumented buildings, someone using the GIS can determine whether a building on a map has been documented with additional information.

Aerial Photography

Two sets of aerial photographs were taken, one from a kite and the other from a balloon. Ben Gourley and Michael Charno, of York University, flew a kite with a camera mounted on it from the boat of the Enalion (Underwater Ephorate), up to a maximum height of 250 m, and many of their photographs include the shore and buildings at Kalamianos. The most useful set of aerial photographs were made by Kostas Xenikakis and Symeon Gesafides, using their tethered balloon, which can reach 600 m in height. Overall views of the entire Kalamianos site (Figure 4), overall views of sectors, and individual buildings were photographed over a period of two days. The resulting images will be geo-referenced and enable us to merge photographs, drawings, and maps of the buildings into comprehensive pictures of the structures and topography of Kalamianos.

Figure 4. Balloon photograph of Kalamianos by Kostas Xenikakis and Symeon Gesafides.

The Mycenaean Town at Kalamianos

Our architectural documentation program has succeeded in generating a detailed plan of an enclosed Mycenaean (LH IIIB) town, with its circuit walls, buildings, and streets, as well as detailed plans and descriptions of many of the structures contained within the walls. The aerial photographs help convey the scale and preservation of the architecture at Kalamianos. There are still many questions thatwe cannot answer without excavation, such as function of the individual buildings. Some noteworthy features of the architecture that resulted from this summer's research program:

• The entrance system in the north town wall has been refined to include a narrow passage to a checkpoint flanked by a tower, with a 90° turn to finally enter the town. Still unclear is the relationship between the earlier wall encircling the eastern hill and the later wall encircling the entire site. We have now been able to trace the enclosure wall on the south edge of the site as well as on the western and parts of the northern edge.

• Structure 7-I seems to be the major building on the site, as it uses more sophisticated architectural features than others. It possesses orthostates (blocks whose height and width are greater than their depth), at least one column base, one pier, and several antae/parastade blocks. It appears that the earlier circuit wall (the eastern one) was dismantled in part when Structure 7-I was constructed, or was incorporated into 7-I.

• Fissure 7-14 seems to have been greatly modified for ease of use. At the same time, access to this feature, which undoubtedly served as a source of fresh water, was controlled through walls and doorways into the space surrounding it. Indeed some cuttings in the bedrock suggest it may have been roofed.

Archaeological Surface Survey

We continued to work in our permit survey area of 7.35 sq km (Figure 5). In the final season of surface survey, we had the following priorities:

1. To fill in areas and locations in which we had done little or no survey to date, particularly to the west and southwest of Korphos village (zone 4);

2. To investigate in more detail some of the areas walked in Extensive Discovery Units (EDUs) in 2008, wherever features of potential significance were recorded;

3. To resurvey several Architectural Discovery Units (ADUs) at Kalamianos where extensive clearing of vegetation revealed new buildings and provided opportunities for the discovery and collection of additional artifacts;

4. To perform finer-grained survey (as ADUs or Localized Cultural Anomalies [LOCAs]) at sites of great interest, especially Stiri but also elsewhere.

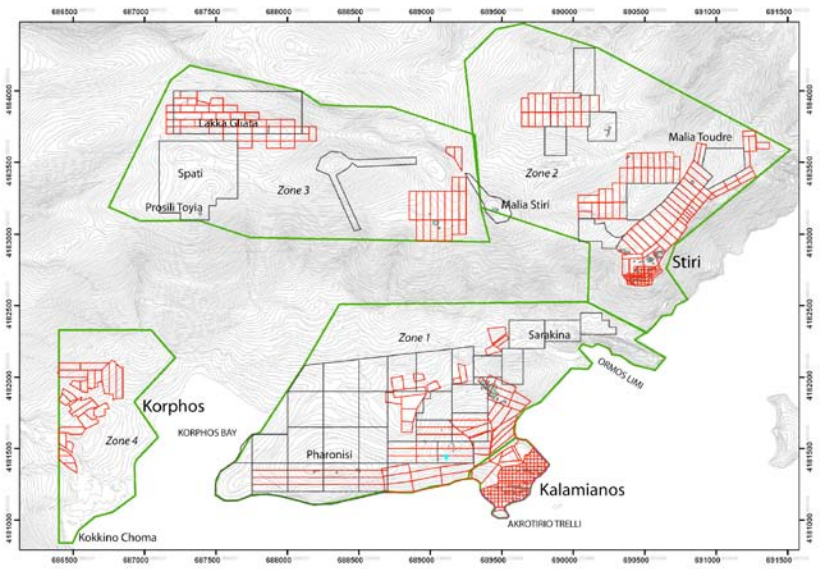

Figure 5. Map of the Korphos region, showing the SHARP survey zones (green), Discovery Units (red), Extensive Discovery Units (black), and Architectural Discovery Units (blue).

Discovery Unit (DU) Survey in New Areas

The main new area of survey was the territory immediately west and southwest of the village of Korphos (survey zone 4). The village has expanded rapidly in the last few decades, and we found that much of this zone is now covered with buildings and fenced properties. There is, however, a swath of open olive groves west of, and overlooking, the village. We concentrated our survey effort there on the gently sloping terraces above the village and extended survey onto the lower slopes of the high ridge above them. We walked a total of 22 DUs in zone 4, most with reasonably good visibility. The material we recovered belongs primarily to the historical periods, and Late Roman seems to be the main period represented. The amount of Late Roman is sufficient to suggest a modest settlement or a series of villas overlooking Korphos Bay. There is a small amount of Final Neolithic to Early Bronze Age pottery. Generally, however, this pattern may signal a shift in settlement away from the Kalamianos area after the Bronze Age. We do not yet know whether Korphos Bay was a usable anchorage in the Bronze Age, but it is possible that it became a suitable deep-water harbor after subsidence events that at the same time rendered Kalamianos unusable for that purpose. Unfortunately, this is one of the few strong occurrences of post-Bronze Age habitation in the survey area, so it is difficult to piece together an historical sequence when we lack entire periods of hundreds of years (1200–500 B.C., for example), and when historical periods that are present, such as Late Roman and Classical, appear in only a few places.

At Lakka Gliata (also known as Spati on the 1:5,000 topographic maps), we renewed survey on the basin floor and the lowest slopes to the north. In 2008, we had walked two large EDUs, 87005 on the hill of Prosili Toyia, and 87007, covering most of the basin floor and the low slopes to the north, as well as a single DU, 82133, at the western end of the basin floor. The survey began with the investigation of a Classical period LOCA (Localized Cultural Anomaly), 89002. Included in this LOCA are a large scatter of 5th–4th century material, especially Corinthian and

Laconian rooftiles, and a rock-cut water installation focused on a large water-bearing fissure, which may be of the same date. The water installation may have supplied water to a small agricultural hamlet focused on the basin. The water installation was mapped using DGPS equipment, but has not yet been drawn. This is the only Classical period site that we identified in the survey area. Nine DUs were walked within the basin floor and on the lowest slopes north of it. The counts were generally quite low, most units yielding fewer than 10 artifacts. This is not surprising, first since the basin collects sediment and ancient artifacts if present may be buried, and second because the basin floor surely was used in antiquity as today for crops rather than habitation or other activities that would produce significant artifact densities. Only one unit, 90112 on the low slope above the basin floor, produced higher counts. There, a ruined modern structure (ADU 89003) has generated a scatter of rooftiles and a small amount of pottery. Another feature is apparently a dam made of stones and piled earth, crossing the basin from north to south. The dam creates an area of deeper sediment and slightly higher elevation in the easternmost part of the basin. The difference in elevation is less than a meter, and it is easily seen when viewing the feature in cross-section at its southern end. The date of the dam is uncertain, although Tim Gregory observed that it is not characteristic of modern or early modern construction

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Reinvestigation of Extensive Discovery Units (EDUs)

One of the main purposes of Extensive Discovery Units (EDUs) is to estimate the archaeological potential of large areas so that resources directed to finer-scale investigation can be applied efficiently and effectively. In 2009, we followed up EDU investigations of 2008 with closer examination of three areas: Pharonisi; Prosili Toyia / Spati; and Sarakina. Pharonisi is the east–west trending ridge west of Kalamianos that at its western end forms the eastern shore of Korphos Bay. We walked 9 DUs on and around the peak of the ridge, where in 2008 several features (walls, structures, and large cairns) had been recorded. The cairns were of particular interest because Early Helladic II pottery had been collected from them in 2008. It thus seemed likely that these features are similar to those discovered by Pullen and Tartaron at Vayia in the Corinthia and Vassa in the Argolid and published by Tartaron, Pullen, and Noller in *Antiquity* in 2006. The survey confirmed several of these cairns, including ADUs 85079, 85086, 85087, 95001, 95009, and 95010, to have likely construction dates in EH; other cairns (ADUs 95003 and 95004) have uncertain chronologies. There are also piles of stone that are clearly the result of modern stone clearance from fields. A number of terrace walls and structures on the Pharonisi ridge using large-stone rubble construction probably date to the Bronze Age, though few of them produced conclusive artifactual evidence. Most have well developed rillenkarren and other karren features such as pitting, indicating long exposure on the surface perhaps on the order of thousands of years. ADU 95007 is a structure of several rooms connected to a well-built double-rubble wall that is in all respects characteristic of Mycenaean buildings at Kalamianos. This complex is located at the eastern edge of the ridge close to Kalamianos, and is situated on the south-facing slope permitting views to the sea and to Kalamianos.

Finer-scale survey of the Pharonisi ridge confirmed, in a more detailed way, vigorous activity in both Early and Late Helladic. The cairns in which EH pottery was found are smaller than those at Vayia and Vassa, but have the same form and content and thus provide further evidence for

this site type. Similar cairns were also found in 2008 in the basin west of Malia Stiri (Gidomandra). The second area we reexamined was the north-facing hillslope rising above Lakka Gliata, south of the basin. In 2008 a number of architectural features had been noted in EDU 87007 on this slope and on the top of the peak called Prosili Toyia. ADU 85100, a large-stone double-rubble enclosure just over the peak on the south-facing side, was documented in 2008. Apart from this, we had a list of 15 targets to examine, and in the process we identified two other stone enclosures. Most of the 15 were isolated stretches of walls of indeterminate date, selected for examination based on large stone size and/or double-faced construction. A few were structures, and of these, ADUs 95062 and 95064, are of particular interest. ADU 95062 is an elliptical enclosure with thick double-rubble walls, like many others distributed around the survey area. The dimensions of the enclosure are approximately 24 meters in the longer axis and 19 in the shorter. ADU 95062 may have worked as a pair with ADU 85100. The latter faces south with a sea view toward Kalamianos and the Saronic, while the former looks north, downslope toward the presumed east–west corridor of movement through this area. From these two enclosures traffic could be monitored through the region and signals relayed. ADU 95064 is probably also such an enclosure, but it has a more unusual, rectangular shape and is not as well preserved.

The final area reexamined was the coastal lowland region between Kalamianos and Stiri, called Sarakina. Sarakina comprises flattish, fertile basins spreading out east to west and collecting sediment from slopes to the north and south. At its eastern end, a striking sheer cliff forms a promontory extending southeast into the sea. This cliff divides two small embayments, Ormos Limi to the south and a tiny, unnamed beach to the north. Ormos Limi is currently the headquarters for a fish-farming operation. We selected 10 targets within EDUs 87012, 87013, and 87014 for revisit, including fissures, walls, and small structures. We created new ADUs 95066 and 95067. Of these, ADU 95066 is of note: this is another of the elliptical stone enclosures. In this case, some sections of the wall are not preserved, but those that are show a well-built, double-faced and rubble-filled construction with walls over 1.5 meters thick. The position of this enclosure, if one of its functions was as a lookout tower, is interesting. It sits atop a small rise with a viewshed mainly to the sea at Ormos Limi and east and west along the lowland basin; the Mycenaean site at Kalamianos is effectively hidden behind a large hill. But it is also intervisible with the south-facing EBA settlement at Stiri, and well positioned to monitor the steep passage up to Stiri from Sarakina. Although this may seem an unlikely route, it is exactly here that the footpath made its final ascent from Korphos up to the Panayia church in recent times before the road was cut up the mountainside. Thus it is possible to imagine how this enclosure may have worked in the wider system of communication and monitoring.

Resurvey of ADUs at Kalamianos and Stiri

Clearing of vegetation at Kalamianos has continually revealed new structures and rooms, and enhanced access and visibility in known buildings. Four days during the season were devoted to resurveying previous ADUs in the following newly cleared buildings: 4-II, 4-III, 4-V, 4-VI, 4-VII, 4-IX, 4-XV, 5-II, 5-VIII, 5-XIII, 5-XIV, 5-XV, 7-I, 7-II, 7-X, 9-IV, and 9-VIII. The buildings were searched using our standard method of making two collections: one from the interior space of the buildings and one from inside the cores of the walls. Many of the buildings yielded large new

collections, while in others little or nothing new was found. Where artifacts were found, they conformed well to previous investigations in that Mycenaean material was overwhelmingly predominant. The exact provenience of the artifacts as well as their mostly uniform chronology from the later stages of LH III A to the end of LH IIIB, indicates that the collections are sufficiently "pristine" to allow limited discussion of functional attributions for specific rooms and buildings and more general locational patterning on the site. The benefit of resurvey has been to increase the size and variety of the sample so that hypotheses about function and other social dimensions can be better formed in advance of excavation.

At Stiri, the survey team resurveyed ADUs 85005 and 85071. ADU 85005 is Building 13-I in the main Mycenaean complex, which had been recently cleared of vegetation for drawing. The new investigation, consisting of 10 sub-ADU units, produced 15 sherds and 1 lithic, but 12 of the sherds came from sub-ADU 10. ADU 85071 is a complex of at least two buildings and an enclosure wall, physically separated from the main Mycenaean complex but surely part of the same settlement. ADUs 85070 and 85071 straddle the mountain road from Korphos to Stiri, and in fact the road cut right through two buildings in 85071. In spite of this destruction, there is a positive side in that the road-cut scarp reveals a beautifully preserved section of the Mycenaean building. This section has been photographed and drawn by Giuliana Bianco. The section clearly shows, from bottom to top, the large stones of an earlier structure, the small stones for leveling and packing beneath the floor, a clear compacted floor surface, collapse material (possibly mudbrick and/or roofing material) with pottery sitting on the floor and mixed in the material above it, and finally stone collapse from the walls. ADU 85071 was divided into 15 sub-ADUs, from which 39 sherds and no lithics were collected. Nineteen of the sherds came from the scarp sub-ADUs (12–15). This section is of great interest because the thickness of the cultural deposit, the excellent stratigraphy, and the preservation of pottery *in situ* on the floor give us great hope that similar preservation is possible at Kalamianos. From above, the building looks very much like any building at Kalamianos: partially extant stone walls with interiors filled with stone collapse.

Fine-grained Gridded Survey at Stiri and Kalamianos

The Early Bronze Age site on the south-facing slope below the geodetic marker at Stiri is, after Kalamianos and the Mycenaean settlement at Stiri, the most substantial and significant site in our survey area. The site was discovered and investigated in a series of DUs (82002, 82005, 82013, 82014, 82015, 82016) in 2008. The site spreads over a total area of more than two hectares, and includes terrace walls (of later, Mycenaean date), as well as intact walls and collapse debris where buildings must once have stood. These architectural features are accompanied by very high artifact counts, dominated by Early Helladic pottery, of which many feature sherds give good indications of date and function. Because of the unusual density of architecture and artifacts, we decided to superimpose a grid of 25 x 25 meter cells over the site, to be walked as DUs as was done at Kalamianos. The DUs are 92001–92032 (but DU 92025 was not walked). The results of the gridded investigation underscore the initial impression of a very significant Early Bronze Age habitation site. The chronological high point of the occupation was in EH II. The amount of pottery counted far outstrips any other site in the survey area (including Kalamianos): taking the original DU investigation and the gridded survey

together, a total of more than 4,000 sherds. Some of these will not be EBA, but the overwhelming majority is. The combined total of approximately 146 lithics—divided between obsidian blade segments and flakes on the one hand and fragments of ground stone implements of andesite and similar stone on the other—most likely date to the Bronze Age and strengthen the impression of a living, working community.

Two important questions are how and why an EBA community would place a settlement on a rather steep slope. The question of how seems to be answered by the series of large-stone terrace walls that retain terraces, though certainly not flat ones, on the slope. We had initially assumed, even in 2001, that these terrace walls belonged to the Mycenaean period, but that assumption is in need of reconsideration. These large walls seem to work together with platforms of some type constructed below them. These platforms are often associated with broad fields of stone collapse, undoubtedly the remains of collapsed buildings as in some of them walls are still preserved, and they are generally rich in EH artifacts. Thus, it is possible to identify with confidence the original locations of EBA buildings. Still, many of these structures were built on sloping ground and we do not know exactly why this was preferred.

The question of why is just as interesting. In the EH II Aegean, we might expect a coastal/maritime orientation and the main viewshed of the Stiri slope is south to Kalamianos and the Saronic Gulf beyond. At Kalamianos, there was a probably contemporary EH settlement focused near the modern shoreline and extending well into the sea, where the EBA shoreline is now being identified by the Canadian- Enalion synergasia. The concentration of obsidian near the shore at Kalamianos represents an import and initial processing locus of Melian obsidian. In addition to relations with Kalamianos that may have involved monitoring the Saronic from the vast panorama of the peak above the slope settlement, the EBA occupation should be understood as an agropastoral community. Both obsidian and EBA pottery are found in the poljes surrounding the Panayia ridge. Moreover, the artifacts collected in DUs and ADUs in the Mycenaean settlement at Stiri include a modest but perceptible background of EH material. It is not difficult to believe that the EBA settlement was even larger, spreading down into the saddle north of the peak. If so, the settled area may approach 4 hectares or so in EH II, making it a significantly large settlement for its period.

Finally, we discovered that 29 DU grid cells at Kalamianos, mainly in sector 7 but also extending into sectors 5 and 9, had not been walked in 2007 or 2008 as we thought. These were completed over two days (DUs 90052–90081). They produced 233 pottery sherds and 18 lithics, as well as 8 new ADUs (95053–95060). The ADUs in turn yielded 75 pottery sherds and 8 lithics. This work completed the intensive survey of the Kalamianos site.

Conclusion

The archaeological surface survey in 2009 accomplished the goals set out at the beginning of the season. All of the survey zones have now been reasonably explored, and the most significant sites and other ancient features identified within them have received intensive and detailed treatment. In three seasons, we have achieved our overarching objective of gaining a better understanding of the Kalamianos site and its hinterland. The survey has produced a rich

regional context for comprehending the data that future excavations at Kalamianos will generate.

Differential Global Positioning System (DGPS) Survey

In order to accurately map sites and features difficult to access or impractical for electronic total station survey, we employed two DGPS teams in 2009. The first of these was led by Ben Gourley and Michael Charno of York University in the United Kingdom, and the second was directed by Richard Rothaus of Trefoil Cultural Services of Minnesota, USA.

Gourley's team targeted 9 ADUs in relatively remote settings. Primarily, these were small stone enclosures of Bronze Age date with high, commanding views of the sea or of the east–west upland corridor from Stiri to the west toward Sophiko. The ADUs are as follows: 85070 and 85071 (Stiri); 85075 (Malia Toudre); 85060 (Panayia-Stiri); 85091, 85077, and 85076 (Malia Stiri); 85100 (Prosili Toyia); and 85101 (Kokkino Choma). These were mapped successfully and now are in the project GIS. Two or three additional enclosures were identified after Gourley's team left, at Prosili Toyia and Sarakina. These are discussed in the archaeological survey section above and can be accurately mapped in the future. The benefit of having these plotted more accurately than with hand-held GPS devices is that we can study orientation, viewshed, and other attributes that will illuminate the part that each may have played in a wider system of communication and monitoring points in the landscape. Because we now have more than a dozen distributed throughout the survey area, we can model their intervisibility and possibly predict where more of them may be found. It has been important, but not easy, to try to establish a chronological framework for them. The weight of the evidence suggests that they are of Early Bronze Age date, since the few artifacts that are found within them are virtually all of FN–EH type. This date is supported by physical attributes (well developed karren features, double-faced and core-filled construction) and a lack of historical artifacts (especially rooftiles).

Richard Rothaus' team used a Thales DGPS in several modes, including mobile mapping and kinematic. This team accomplished several projects. The first of these was to finish the microtopographic plan of the Kalamianos site. Using this very detailed topographic information, we will be able to generate a precise Digital Elevation Model (DEM) over which we can drape the architecture and other features of the site. A second microtopographic plan was made of the basin at Lakka Gliata. This was done in part to test the equipment, but it will also contribute to a better understanding of the ancient dam that runs across the basin (see archaeological survey section above). A much larger project undertaken by Rothaus' team was to plot the terrace walls, structures, and collapse fields of the EBA settlement on the south-facing slope at Stiri (described above in the archaeological survey section). This project required several field days and two teams, one to mark clearly the features to be mapped, and the other to operate the DGPS equipment. This work will be invaluable in helping to accurately assemble the different elements of the settlement. It is an essential part of the exhaustive document we have generated for this important site. Finally, the team worked on re-georeferencing our area in the GIS. The SHARP GIS is based on the old version generated by the Eastern Korinthia Archaeological Survey (EKAS), obviously with many modifications and changes. But different

layers of the GIS, including the 1:5,000 topographic maps, the aerial photographs, and the satellite data, were never perfectly aligned, causing noticeable displacements. To create a better geographic fit, Rothaus used various stable monuments on the landscape, as well as some DGPS points taken by Ben Gourley's team that are expected to be accurate within a centimeter. The processing was done, with some minor problems that have since been resolved.

Summary of Geological Investigations

The two main goals of this field season were:

1. Complete the mapping of bedrock geology and landforms for the entire SHARP survey area;

2. Conduct an analysis of the neotectonic history of the fault blocks along the coast, from Korphos to the shoreline south of Stiri.

The bedrock and landform mapping is complete. The bedrock in the region consists of Mesozoic limestone with well-developed karstic features (poljes, dolines, sink holes, solution-enlarged fractures, and microkarst features like pits and rills). Faults are common in the area with most having normal or oblique shear motion and south side down relative offset. Landforms include debris fans on the flanks of steeper slopes. These debris fans are active and it is likely that any Bronze Age surface is fairly deeply buried within any given fan. The landscape also displays prominent karst landforms, which are produced via limestone dissolution. This landscape consists of elongated valleys (poljes) and semi-circular sinkholes and dolines (filled sinkholes). A final map of the bedrock, faults, and landforms will be prepared later this summer. We undertook an analysis of the neotectonic history in an effort to better understand the relative and if possible absolute motion on faults near Kalamianos and Stiri. This area is broken into several fault blocks, each potentially moving with a different tilt or to a different degree of uplift/subsidence. We have collected orientation data of geological bedding at 182 locations from Korphos to Stiri. An analysis of the orientation data of beds will enable us to reconstruct how each fault block has moved relative to all other blocks. Most significantly we can determine if the Kalamianos block, which we know has subsided based on beachrock data, has tilted rather than having undergone simple vertical subsidence. One interesting find this summer has been the identification of a particular fault-related feature called slicken-lines, which form on a fault surface as the rock on one side of the fault is sliding over rock on the other side. This creates lineated mineral deposits that can be used to determine fault motion. A large fault east of Kalamianos, with a 4-meter scarp, displays slicken-lines on the fault surface. Given the normal degree of chemical weathering of limestone in the region the preservation of slicken-lines suggests that motion on the fault is relatively recent (post-Bronze Age most likely). The recent offset on the fault is at least 1.75 meters and this most likely represents the faulting event that caused subsidence of Kalamianos. The full analysis of fault block data is underway.