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THE SYDNEY CYPRUS SURVEY PROJECT (SCSP) – FIRST PRELIMINARY SEASON (1992)

Reprinted from

Report of the Department of Antiquities, Cyprus 1992

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THE SCSP: SIGNIFICANCE AND GOALS

From the Bronze Age through the Graeco-Roman era (and again in the Byzantine-Late Mediaeval periods), Cyprus played a central role in the production and distribution of copper throughout the metals-hungry Mediterranean world. Copper and bronze served many needs—functional, artistic, ceremonial, and martial—and the trade in copper became a key component of an ever-expanding Meditteranean regional economy. Participation in the long-distance trade in metals was of vital economic and socio-political significance. It is notable, therefore, that Cyprus's primary copper ore production area—stretched along an arc from the southeastern to the northwestern foothills of the Troodos (Fig. 1)—has never been studied in its regional context. The northern Troodos piedmont, moreover, has been postulated as a meeting ground for regional cultures from the north and south (Stanley Price 1979, 70; Held 1990,13) but has never been studied explicity as such. Although archaeologists have long acknowledged the importance of this area for studying long-term change in site location and settlement hierarchy, especially in relation to mineral and agricultural resources (e.g. Stewart 1962, 299; Catling 1964, 139, 141; Frankel 1974, 48-51; Constantinou 1982), no systematic archaeological survey has ever been conducted. Even geological surveys in the important mineral-bearing Lower Pillow Lavas of this region have gone unrecorded.

The SCSP will remedy these omissions by undertaking an intensive, systematic, stratified archaeological survey in the north central Troodos foothills, in a region where many of Cyprus's copper ore deposits are located, and where the agricultural plain begins. The area of focus—along the igneous-sedimentary contact zone—is a 14x4km. stretch of land between the modern villages of Politiko and Mitsero (Fig. 2). The survey is designed specifically to examine site location and settlement hierarchy through time, in relation to both metallurgical (primarily copper) and agricultural resources.

The rapid disappearance of Cyprus's traditional landscape through modern farming, irrigation, mining, road construction, and tourist development, along with severe slope erosion and deposition, represents a rapidly-closing window of opportunity, and makes systematic, problem-oriented survey a pressing need. Cypriot archaeology, furthermore, has in the past been characterised by an emphasis on individual site or tomb excavation at the expense of regional, contextual views. To redress these problems, the SCSP has developed a systematic methodology for data recording and mapping, predictive modelling (Geographic Information Systems [GIS] technolo-

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* *ACKNOWLEDGEMENTS*

The Sydney Cyprus Survey Project (SCSP) conducted its first, preliminary season of fieldwork on Cyprus during May-June of 1992. This season's work was funded by grants from INSTAP (Institute for Aegean Prehistory, New York) and from Macquarie University (Sydney, Australia). The SCSP is sponsored by Macquarie University, and was licensed to survey by the Cypriot Department of Antiquities (Dr Demos Christou, Director).

The 1992 SCSP team consisted of the following individuals: A. Bernard Knapp, Macquarie University, Sydney (Director); Steve O. Held, Zürich (Early Prehistoric sites); Ian Johnson, Sydney University, Sydney (Computing, Mapping, GIS); Eberhard Zangger, University of Heidelberg (Scientific Director). Pitsa Kenti, Stuart and Laina Swiny, and Dr Lenia Georgiadou-Morisseau (Cyprus Geological Survey) generously gave further assistance and advice in the field.

The SCSP is collaborating closely with the Cyprus Geological Survey, and we are most grateful for the enthusiasm and assistance offered by Dr George Constantinou, Director of the Geological Survey, Senior Geologist Dr Andreas Panayiotou, and Dr Costas Xenophontos. Dr Stuart Swiny, Director of the Cyprus-American Archaeological Research Institute (CAARI), provided invaluable advice, support, and accommodation at CAARI during the pilot season. The SCSP thanks all these individuals and their respective institutions, which made it possible to fulfill the aims of the 1992 (pilot) season, and to lay the groundwork for the 1993-1995 survey seasons.

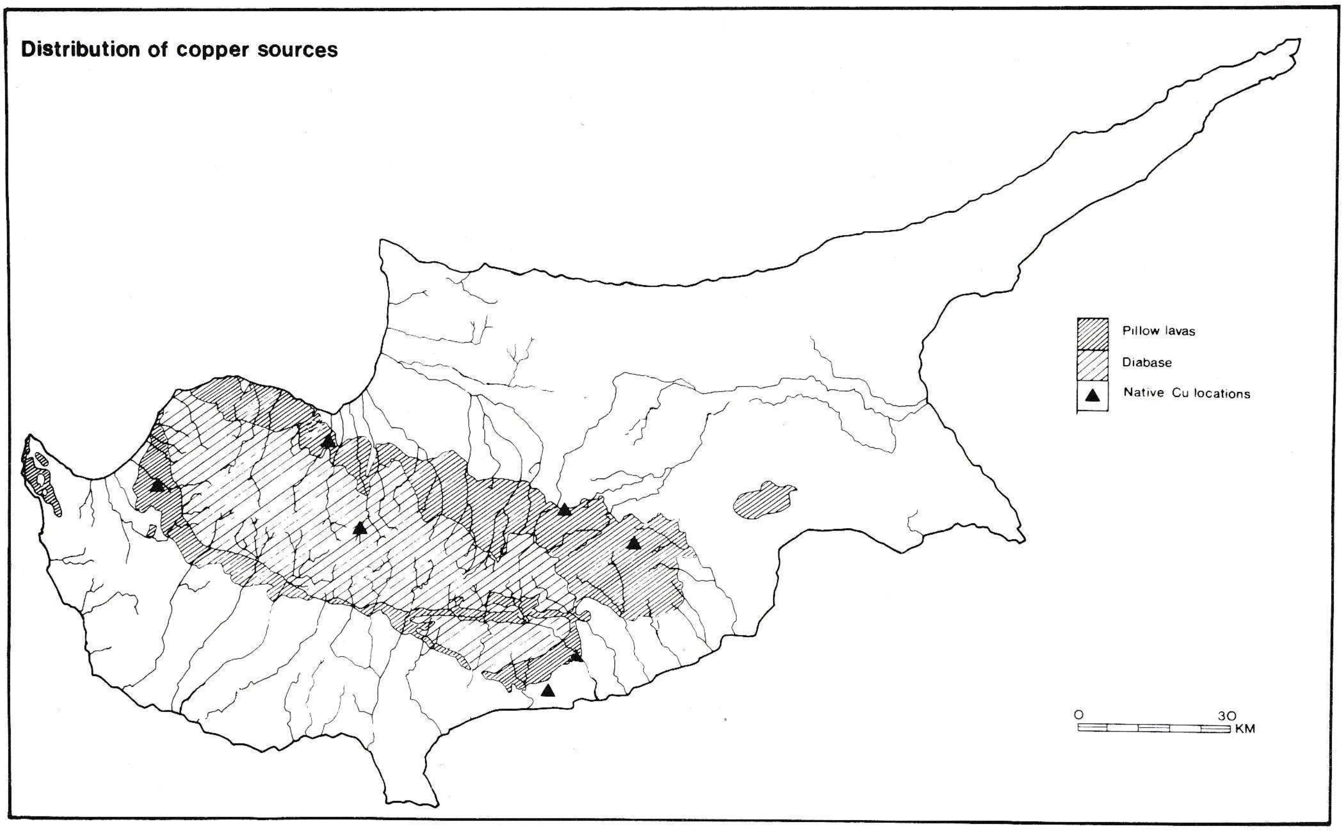

Fig. 1. Distribution map of primary copper ore sources (Pillow Lavas) and native copper locations on Cyprus (based on map in Peltenberg 1982, 56 fig. 3).

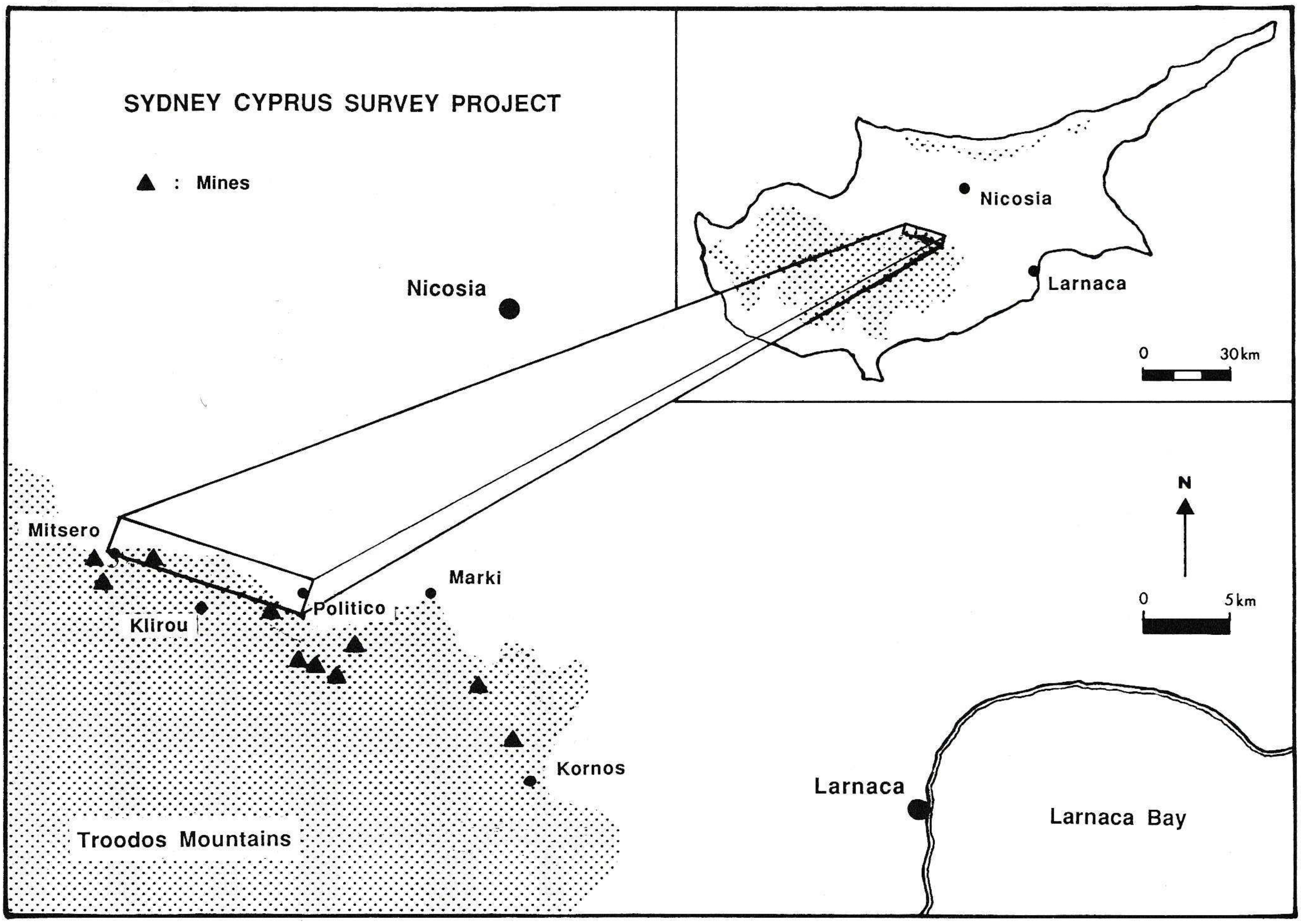

Fig. 2. General map of Cyprus showing approximate location of SCSP region, with location of (modern) copper mines (drawn by C. Sumner).

gy), and geoarchaeological field research, in order to:

1) examine the areas's resource potential;
2) look at site locations and settlement patterns in relation to different resources; and
3) place sites and cultures of all periods in their spatial, regional, demographic, and economic context.

The project team is fully interdisciplinary, and includes specialists in geoarchaelogy, palynology, archaeometallurgy, lithics, social anthropology, ceramic ethnoarchaeology, Cypriot archaeology and survey, and an archaeologist specialising in GIS. The archaeological materials recorded should make it possible to:

1) reconstruct the landscape of a prehistoric industrial society, and characterise—to the extent possible with survey material—the social, economic, and political structure of Bronze Age communities in an early market economy;
2) trace the long-term development of such communities, their economies, and the metal industry;
3) produce population estimates and reconstruct settlement hierarchies by assessing site size, number, and density in each period, and site change through time (Chalcolithic to the present);
4) assess site location and function through time in a regional context, with respect to environmental features;
5) determine the interrelation between industrial and agricultural sites (to assess in part a proposed Bronze Age settlement hierarchy of industrial sites, agricultural villages, and urban emporia);
6) examine the socioeconomic impact of mining, and its long term relation to other forms of production (pottery), through ethnographic work by a social anthropologist and an ethnoceramicist;
7) examine archaeological variability in metal or pottery production and trade, in part by coordinating results with another, nearby, excavation and survey (Frankel and Webb 1992);
8) refine intensive survey methodology (especially with GIS techniques), which will improve the quality and increase the quantity of various types of data from all periods of Cypriot (pre)history.

The work of the SCSP represents the first systematic attempt to define site hierarchy, population size, and site organisation anywhere in the Troodos. In archaeological terms, this area is still *terra incognita*, particularly for the Chalcolithic-Bronze Age periods of Cypriot prehistory. Within or just beyond the general region of the SCSP, earlier surveys (e.g. the Cyprus Survey; Wallace 1982), looted cemeteries, and one excavation (Karageorghis 1965) have revealed several Prehistoric or Protohistoric Bronze Age sites. David Frankel's preliminary survey in the Alykos River Valley, just east of the Politiko-Mitsero survey region, indentified two "prehistoric" lithic scatters, and settlement or cemetery sites from the Bronze Age, Iron Age/Archaic, Classical/Roman and Mediaeval/post-Mediaeval periods (Frankel and Webb 1993).

The hilly terrain of the pillow lavas in the south of the survey area, and the more level agricultural zone on the fanglomerate to the north, necessitate flexibility in fieldwalking. The stratified systematic sample aims to assess the variation in archaeological material across distinct geomorphological and topographic settings. This sampling will permit the development of a predictive model using an empiric correlative approach (Johnson and Turner 1991). The model will be used to evaluate factors that structure site patterning; the nature of, and degree of threat to, the historical landscape; and conservation priorities for salvaging a representative sample. It will provide probabilistic indicators of key locations for detailed research, as a means to answer specific questions relevant to the project's research design.

Geoarchaeology

The geoarchaelogical investigations of the SCSP aim to reconstruct the palaeoenvironmental record preserved in Holocene deposits and soils. The driving forces of landscape change, and the interrelation between archaeological site distribution and natural environment, will be evaluated. Because site distribution, function, and preservation are controlled chiefly by natural forces and mineral resources (van Andel *et al.* 1990; Zangger 1991), landscape reconstructions and the understanding of geomorphological processes are essential. The methods to be used include mapping of bedrock units, production of microtopographic maps, coring into Holocene sediments, soil descriptions, satellite or remote-sensing image interpretation, and microfossil analysis. The project's geoarchaeologist (E. Zangger) will establish climate and vegetational histories in collaboration with other specialists (palynologist, palaeoethnobotanist), using pollen analysis combined with a coordinated interpretation of geological cores. Palynological work has had limited success in Cyprus (cf. Gifford 1978; Rupp *et al.* 1986, 44; Le Brun *et al.* 1987, 303-305 [Renault-Miskovsky]), but it is precisely because so little palaeoenvironmental data has yet been garnered on Cyprus that this component of the project assumes importance (cf. Buchholz 1988). Zangger has now pinpointed a suitable locus, just north of our survey area, from which a pollen core may be taken. Finally, we shall employ the methodology ("phytoarchaeology") developed by Brooks and Johannes (1990) to examine the dynamic links between geobotany and the exploitation of ancient mines (see further below). In sum: the primary palaeoenvironmental goals of the SCSP are to provide key information on the region's vegetational history (a direct contribution to landscape reconstruction), its cycles of climatic change, and its long-term patterns of crop and mineral exploitation, and to relate these varying streams of information to regional cultural dynamics.

Archaeometallurgy

Cyprus is a still unexplored *El Dorado*. Copper-bearing deposits along the Troodos flanks have been worked intermittently for over 4000 years, but almost no survey work has been aimed specifically at mining and metallurgy (cf. Fasnacht 1991). Using insights gained from archaeometallurgy (Weisgerber 1989) and the archaeology of mining (Hardesty 1988), we consider various predictors of mining-site distributional patterns: e.g. an orebody's geographic distribution; the presence of water and other supporting resources (timber stands, agricultural land), and "gravity" components (access roads, transport systems, towns); the broad spatial extent of mining "sites". Because deforestation for fuel may have denuded primary copper production areas on Cyprus, some remnants of metallurgical activity might only be found buried deep beneath alluvial deposits triggered by erosion (Weisgerber 1982, 28). A focus on such issues and the use of appropriate field strategies—supplemented by ethnographic work into the social organisation of mining—are unprecedented on Cyprus and in the Mediterranean generally.

Ethnography and Ethnoarchaeology

Mining communities—despite their social, cultural and spatial isolation—are inevitably linked into broader transport, economic, and communication networks, by virtue of their ability to supply raw materials in demand. The social, material, and informational interaction spheres that linked Cyprus's mining communities to the surrounding world have never been studied in depth—ethnographically or archaeologically. Even if proximity to Nicosia has "diluted" the region's social stucture and traditions, the project's social anthropologist will examine these spatial, social, economic, and interactive factors in the context of the mining experience.

The opposite situation exists for the study of traditional pottery manufacture, where considerable ethnographic and ethnoarchaeological research has been conducted on production techniques in individual sites (e.g. Sallade 1989; London *et al.* 1990). Nonetheless, sharper insights into a society's pottery-producing system will result by examining—in a regional context—the interaction of potters, their products, and the communities that consume these products. Using for comparison selected petrographic analyses of regional, macroscopic pottery groups (derived from the survey and from other archaeological work in the region), the project's ethnoceramicist will examine recent raw material use within and around the former pottery-producting village of Klirou, as well as from kiln sites of itinerant potters. This work will be linked to raw material prospection, and enhanced by interviewing villagers on pottery consumption patterns. This integrated approach has proved very successful on Crete (Day 1989, 1991); on Cyprus, it will offer another perspective on diachronic changes in pottery production systems, and information on the dynamics of "cross-craft" (metals and ceramics) interaction (McGovern 1989). All ethnographic results will be integrated carefully with relevant material indices from the survey.

Overall then, Cyprus is a prime area for examining diachronic relationship between metallurgical resources, production, and trade, on the one hand, and on the other the emergence of complex social and economic systems. In particular, the project will test and refine several hypotheses proposed by Knapp (1986, 1988, 1990) to explain the role of copper production, consumption, and distribution in the emergence of social hierarchies, and in the politico-economic development of Bronze Age Cyprus.

SCSP FIELD STRATEGY

The aims of the 1992 season, now completed successfully, were:

1) to reconnoitre thoroughly the survey area, a 56 square km. stretch of land between Politiko and Mitsero, along the north central flanks of the Troodos Mountains;
2) to establish the field methodology and sampling strategy (unit size and layout) for the 1993-1995 seasons;
3) to set up the project's databases (for survey units/finds, and sites) and to prepare the corresponding forms for use in the field; and
4) to make logistical arrangements for the project's three field seasons.

In designing our survey of the study area, the SCSP had to work within a number of practical constraints. Unlike most of Cyprus, the best topographic map available for our survey area is at the 1:50,000 scale (No. 11—Paleometokho, last updated in 1973). This map is inadequate for locating transect and survey quadrats, and gives only a generalised sense of topography. Many changes to the road and track network have also occurred since its publication. Cadastral maps (1:5000) are available, but give only limited identifiable landmarks (other than potential field boundaries) or topographical information (on stream courses, some ridgelines and breaks in slope). Furthermore, the geographical referencing of these maps does not tie into the UTM system used by the topographical maps and by our GIS. Consequently, the cadastrals cannot be used to navigate or to record survey information for entry into the GIS.

It has, therefore, been necessary to develop a way of using the approximately 1:10,000 scale aerial photographs (1963 series—Cyprus Lands and Surveys Department) as our basic navigation and survey recording medium.[1] Two different approaches have been defined, to be used interchangeably as field conditions dictate: (1) quadrat recording; (2) plot recording.

1. QUADRAT RECORDING (100m. square, UTM aligned)

Each one-hectare quadrat will be surveyed as a unit; the archaeological material observed and the dominant environmental characteristics of the unit will be recorded in the survey database. Quadrats will be defined in the field by establishing a known starting point, using a Global Positioning System (GPS), then walking on a N/S compass bearing (allowing for declination) and pacing each quadrat. Periodic checks on transect alignment and quadrat spacing will be carried out using the GPS. Transect boundaries will be marked on the air photos to ensure contiguous cover when adjacent transects are surveyed. Data will be entered directly into the GIS database using the quadrat UTM references.

2. PLOT RECORDING

Using the 1963-series aerial photographs, viewed in stereo, it is possible—with some effort—to divide the landscape into individual field plots, or into topographically and environmentally uniform plots in less developed areas. Each plot is characterised by roughly uniform landuse, vegetation, slope and aspect, and is dis-

1. The 1970 series at approximately 1:15,000 scale does not provide such crisp detail as the 1963 series. Recent 1992 Royal Air Force coverage at approximately 1:10,000 scale is still restricted, and is unlikely to be available to the SCSP.

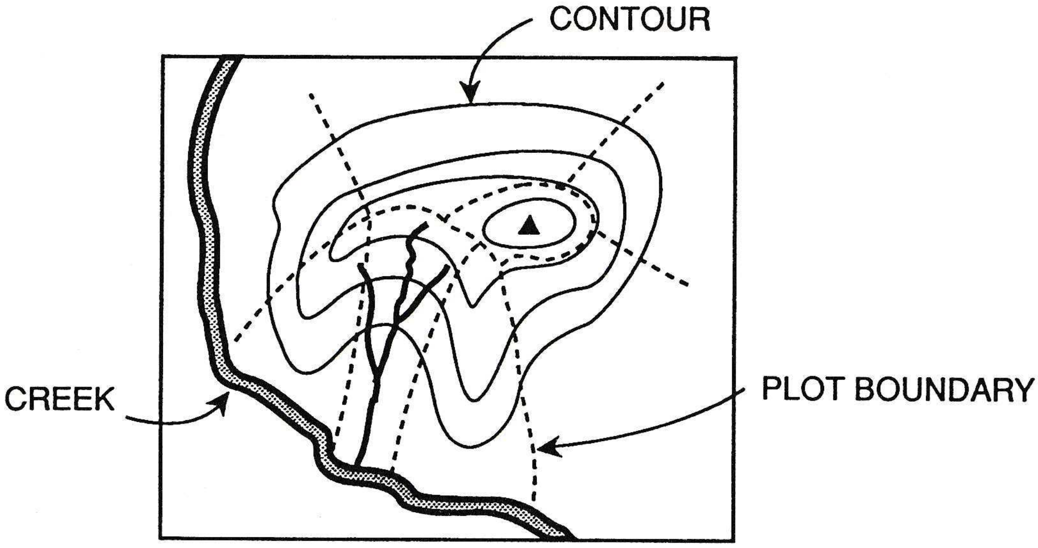

Fig. 3. Schematic representation of hypothetical "plot" boundaries, contours, and other natural features (based on drawing by Ian Johnson).

tinguished from neighbouring plots by a change in any of those characteristics (Fig. 3). In practice, landuse and boundaries, as well as roads, trees, buildings, etc., may have changed in the thirty years since the aerial photos were taken, so that corrections to plot boundaries are required in the field. Additional divisions will be made where major internal variations in archaeological material are found within a plot.

The plot strategy uses these topographically and environmentally "homogeneous" plots as sampling units (Fig. 4a). Although harder to record and to analyse than a sample of arbitrary square quadrats based on the UTM grid, these irregularly shaped units have certain methodological advantages, given the diversity of terrain in the survey area. While the plots ensure maximum diversity between recording units and minimum redundant data, a grid of arbitrary quadrats will either record substantial amounts of redundant data (where the units are much smaller than the scale of landscape variation—e.g. Fig. 4b), or will lose information on landscape variability (as unit size approaches or exceeds the scale of landscape variation—e.g. Fig. 4c).

In the field, we will delineate each sampling unit on enlargements (1:6,000) of the aerial photos, and record environmental, topographic, and archaeological information for each unit. The sampling unit outline will be digitised into the project's GIS directly from the air photographs (using the central portion only of each photograph to reduce parallax, and rubber-sheet transforms based on GPS readings of recognisable landscape features to provide geographic location). The area of each sampling unit will be determined from the digitised outline (with corrections for scale variation due to altitude). Using these techniques, we should be able to estimate plot areas within 10%, and the spatial location of sample units within about 50 metres.

CHOICE OF RECORDING TECHNIQUE

This twofold strategy was chosen as the result of intensive reconnaissance in a highly diverse topographical, geological, and cultural landscape. Where human-made or natural features allow ready division of the landscape into plots using the aerial photographs, and where these plots can be readily indentified in the field, we will use the plot recording method. In areas lacking easily defined and identifiable features, we will use the quadrat recording method.

Both recording techniques will be used within a sampling framework of 100-metre-wide transects. For the quadrat method, the transect and the quadrats are coincident. For plot recording, any plot falling more than 50% within the sampling transect will be included in its entirety (Fig. 5a). This approach reduces the oversam-

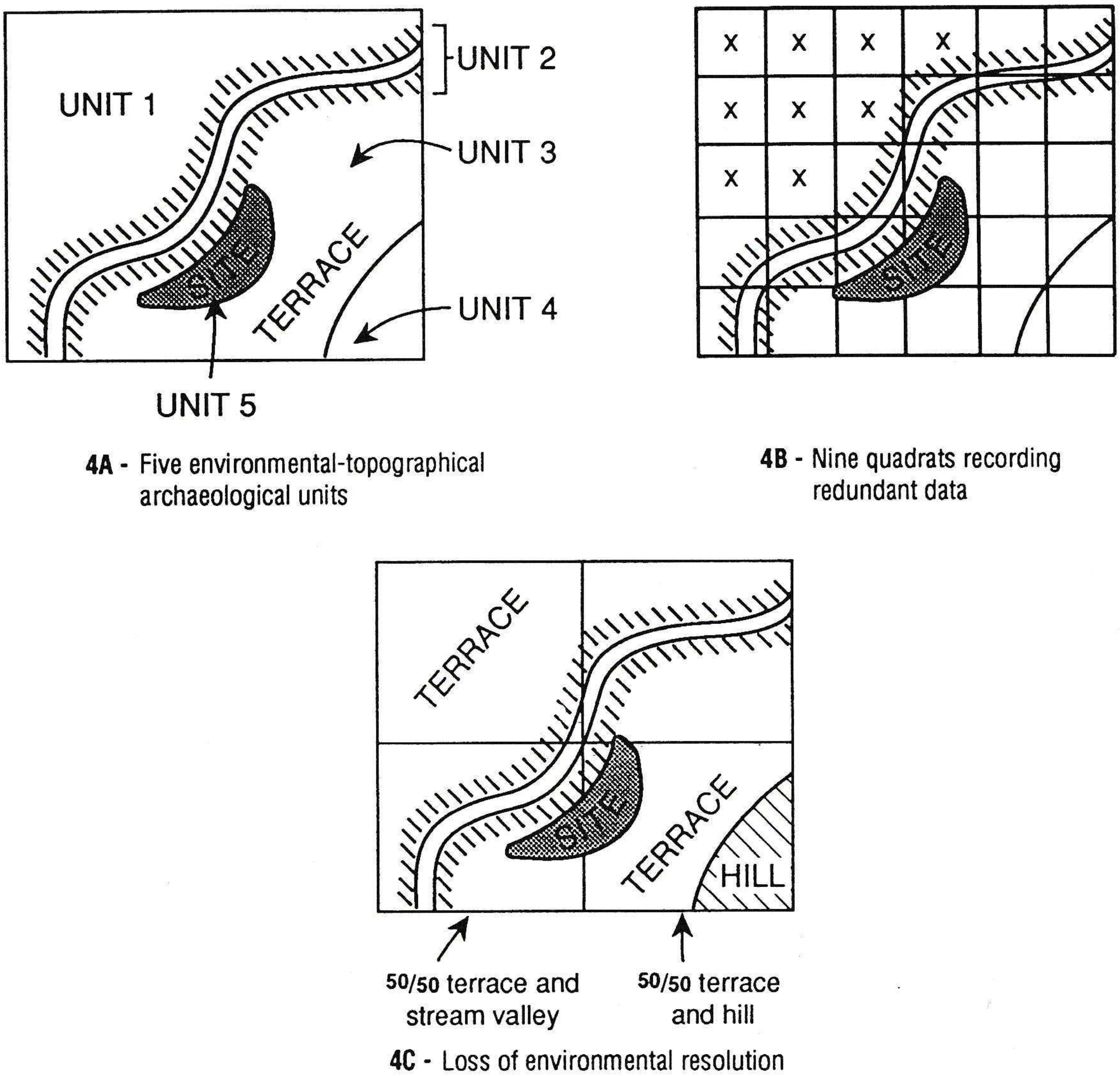

Fig. 4. Schematic representation of hypothetical environmental, topographical and archaeological units (4A), indicating quadrats that may be too small (4B) or too large (4C) to provide information on landscape variation (based on drawing by Ian Johnson).

pling of larger plots which would occur if all plots intersected by the transect were included (Fig. 5b); oversampling of larger plots would tend to bias the sample towards areas of lower environmental diversity, e.g. large lowland agricultural fields at the expense of small plots in dissected country.

FIELDWALKING METHOD

The survey has two principal aims: (1) to detect the background artefact scatter, and to estimate its density and correlation with topographic and environmental characteristics of the landscape; (2) to define "sites" as local peaks in artefact density and to detect them within the landscape. Our fieldwalking strategy is designed to address both these issues.

Within each plot or quadrat, the ground will normally be covered by a team walking parallel at five-metre intervals and doubling back as necessary. We feel that five metres is the maximum spacing for reliable coverage and recording of the off-site artefact scatter, and for reliable detection of special-purpose sites which may be spatially discrete and of small dimensions.

In the second and third years we may cover some areas at wider team spacing, e.g. ten metres, depending on the results of the first year's survey and the need to increase coverage at the expense of detail. We would regard this increased spacing as a site detection mechanism,

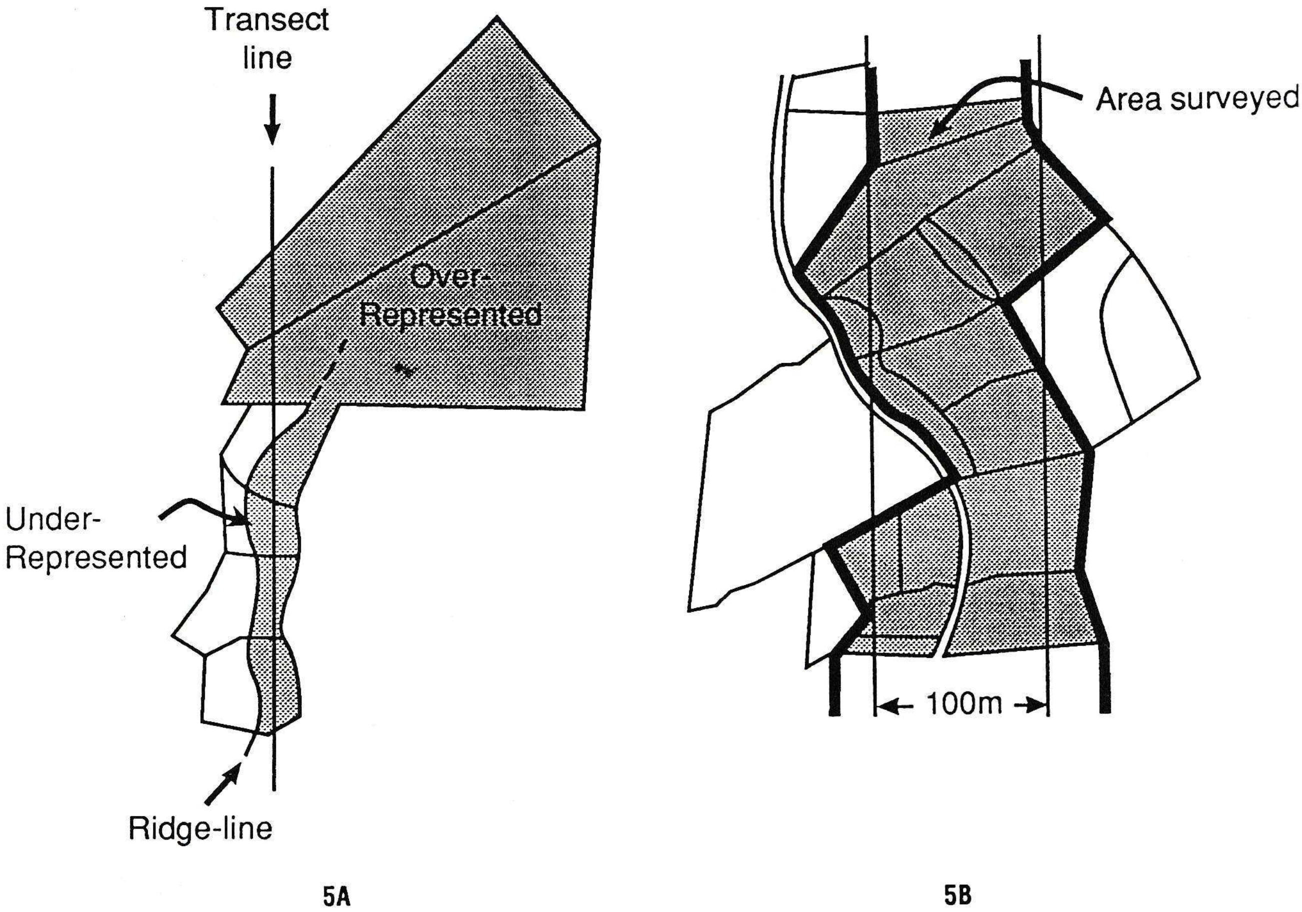

Fig. 5. Schematic representation of "plot" recording with 100m. transects (5A), showing how SCSP sampling strategy will avoid over- or under-representation of certain types of "plots" (based on drawing by Ian Johnson).

justified by observation of characteristic site size, allowing us to obtain a more complete coverage of the survey area and to facilitate the correlation of sites with landscape reconstruction by our geoarchaeologist.

It may be necessary at times to skip units (e.g. standing crops) where we have reason to believe that they can be surveyed more effectively later in the season. In order to resurvey these units, and to take advantage of harvesting and ploughing, we may organise one field season in autumn.

ARTEFACT COLLECTION

The SCSP will collect only portable diagnostic material, which will be labelled first by survey unit and, where applicable, by archaeological site. All other cultural material will be counted and recorded *in situ* by survey unit, for entry into the project database on a daily basis. Collected artefacts will be washed and their attributes will be recorded in the project database to allow both analysis and production of a printed catalogue of the material.

SAMPLING STRATEGY

A second major constraint that has helped to determine our survey strategy is the field time available to us. Assuming full funding of the project over the years 1993-1995, we shall have approximately 3000 person-hours of survey time. Given that the SCSP study area is about 5000 hectares, and assuming that about 40% of the study will be inaccessible for various cultural, agricultural, industrial, and logistic reasons, we must cover approximately one hectare per person per hour for "total" coverage of the available area. This figure translates into approximately 2km.-per-hour coverage of a five-metre-wide transect. Whilst such a figure may be practicable in open fields, it is unlikely that we shall be able to maintain such intense coverage over the entire survey area, particularly when the time required to locate and plot survey units in the landscape is taken into account. We therefore expect to be able to sample 30-50% of the available area, i.e. up to 30% of the total survey area. It must reiterated, however, that our goal is to attain "total" coverage, i.e. up to 60% of the SCSP study area.

In our first full season (1993), we are aiming at approximately 12% coverage through a series of regularly spaced transects at 500 metre intervals (although these transects will cover 20% of the area, we expect mines, construction, restricted access and standing crops to reduce this to approximately half). By covering the entire area on a sample basis, rather than one section of the area comprehensively, we shall obtain enough information to allow a stepwise design of the sampling procedure for the following years, whilst avoiding the dangers of failing to cover the entire study area for unpredictable reasons.

In the second and third years of the survey, the study area will be stratified according to broad geological categories and the landscape classes they produce. Our database of surveyed units will serve to guide our sampling strategy, in order to ensure representative coverage of environmental and topographic variability within each strata. For example, if it is determined that north-facing hillsides on steep slopes are significantly under-represented in our sample with respect to their occurrence in the landscape then sampling will be directed towards areas which will tend to increase the representation of these categories. Such areas will be identified through the use of our GIS. While our ultimate goal is to survey all "available" land in the study area, the adoption of a stratified systematic design allows meaningful results to be obtained at any cutoff point, in case unexpected circumstances or underestimation of the survey time required cause us to fall short of our goal.

DATA RECORDING AND ANALYSIS

Information on survey units and sites will be recorded in databases which have been set up using the *Minark* Database Management System (Johnson 1984). These databases will be linked to a GIS holding topographic and environmental data digitised from published maps, and spatial data relating to the units surveyed by the project. The main data layers in the GIS will form a Digital Elevation Model (DEM) derived from the 1:50,000 scale topographic map and bedrock geology derived from the 2" geological map. Both of these layers will necessarily be very generalised at the scale of our survey units, owing to the source documents. We hope that we may be able to obtain an improved DEM based on 1:5,000 topographic maps (which *may* become available within the period of the project).

Other layers will include springs (marked on the cadastral maps, and also derived from local knowledge), drainage networks, and geobotanical cover. The road network, churches, monasteries and villages will also be included as spatial referents for maps generated from the GIS. Verification of GIS data will be carried out in part by cross-checking field observations of topographic or botanical information against corresponding values for the same locations derived from the GIS, in order to determine the effects of generalisation resulting from the scale of the source documents. Verification of digitised survey unit locations will also be carried out using a program of GPS measurements.

The GIS will be used not only to generate maps for reporting and publication, but also to track the progress of the survey. Reports will be generated comparing the distribution of topographic and environmental characteristics (e.g. slope, aspect, basal geology, distance to water) of the survey sample with the distribution of these characteristics for the entire survey area. These reports will be generated on at least a weekly, if not daily, basis during fieldwork.

The GIS will also be used to analyse the locations of sites recorded during the survey, to determine whether these differ significantly from the null hypothesis that they are distributed without regard to environmental or topographic features of the landscape. If the null hypothesis is rejected, we will examine the correlation of site location with landscape characteristics, and compare the patterning with models of site location proposed for the area.

We shall also make use of satellite data, based on a *Landsat TM* image, geocorrected and classified for lithological, and if possible geobotanical, discrimination (generously provided by the Forestry Department Remote Sensing Centre, through the intercession of Dr Andreas Panayiotou). The use of *Landsat TM* spectral data in combination with GIS opens up possibilities for site or landuse prediction (Joyce 1992; Wiseman 1992). For example, certain types of landcover typical of mining sites (or of any other cultural activity) may be represented in the *Landsat* images by specific "spectral signatures" or clusters of pixels ("picture elements" detected by sensors or satellites). On the ground, geobotanical methods of exploration (Brooks and Johannes 1990) complement such spectral information; we plan to enter this type of geobotanical information into our GIS. Using the GIS software, then, we shall review the *Landsat* digital data that comprises pixels for mining (or other human activity) sites, on the assumption that it will be possible to identify, or to predict, the possible location of other mining sites, quarries, metallurgical production loci, and the like. Although the available *Landsat* images are too coarse (30 metres to a pixel) to identify buried buildings, a research team from the University of Minnesota using a similar technology has been able to locate tombs, limestone quarries, and irrigation channels in the Greek Peloponnesos (Joyce 1992, 44, 46).

THE EARLY PREHISTORIC COMPONENT *(Steve O. Held)*

The northern Troodos foothill zone has been described as a potentially important region for early prehistoric surveys on Cyprus (Held 1990, 13), and although all but one of the early prehistoric sites listed (see below) lie just outside the project area, their presence strengthens the prospect that further sites exist between the villages of Mitsero and Politiko. This region not only contains a major river (the Akaki) that may have attracted sedentary settlement without beign as extensively altered by modern landuse as the Pedhieos River to the east, it also occupies an economically strategic position between the sedimentary and alluvial bottomlands of the southern *Mesaoria* and the pine forests of the igneous Troodos piedmont. While the geological significance of the igneous-sedimentary transition for mining sites of PreBA and later date lies primarily in the copper ore of the Lower Pillow Lavas, for the early prehistoric (EP) period it means that local sites had easy access to prevalent types of lithic raw material, both in the form of river-transported igneous rocks, and as chert embedded in the Lefkara chalk formation that fringes the Upper Pillow Lavas across the entire study area. The Pedhieos, Akaki, and Peristerona river valleys, moreover, may have acted as early arteries of transmontane contact with contemporaneous settlements along the island's southern seaboard (Stanley Price 1979, 70).

Given the project region's location on a major geographic boundary, and its potential function as an interaction sphere between the north-central and southern populations of the island, the EP component of the SCSP aims to explore concepts related to past human activities at an ecological and cultural interface. The availability of choice in such heterogeneous "contact zones" can be expected to reveal more about economic adaptation and social interaction than in a homogeneous environment, wherein the uniformity of natural and human contexts minimises or eliminates the options of its inhabitants.

From the perspective of predictive modeling in archaeology, the procedural logic of the EP component is not couched in a monolithic principle, but relies instead on a mixture of deductively and inductively derived approaches (Kohler 1988). Empirical correlation of past locational behaviour with the spatial structure of resources, based on the results of a recent islandwide analysis of EP site distribution (Held 1989, Chapter 3), will be used deductively to predict the regional distribution of archaeological material from environmental categories in a test of the macroregional pattern. Inductive modeling, by contrast, will be useful to assess the archaeological sensitivity of areas inaccessible to surveyors (see above).

Furthermore, the suitability of a multilayered GIS for the development of this type of model—but not for that of a deductively derived model (Kvamme and Kohler 1988, 531)—means that the spatial information management planned for the SCSP can later be used to construct a formal explanatory model for the entire Northern Troodos Interface. The goal of such an endeavour is to predict site locations and the occurrence of certain categories of artifacts and raw matrerials in areas adjacent and similar to the one covered by the survey: namely, the regions between Politiko and Margi to the east and between Mitsero and Katydhata to the west. For example, in view of the recent polarisation of data recovery (through field survey, excavation, and analysis) in the southwest of Cyprus and the fossilisation of archaeological knowledge about the northern third of the island during the last 20 years, a reliable forecast of the distribution of Sotira Culture (SCU) sites, and of the relative frequencies of southern Red Lustrous/Combed and northern Red-on-White Broadline (including ripple- and reserve-patterned) wares in surface scatters between the Peristerona and Karyiotis valleys, would at least allow a preliminary assessment of the degree of information across the Central Massif in the 5th millennium cal BC.

In order to address these concerns, the EP component will enter the field research phase with the following predictions and questions:

Predictions:

1. Major, or settlement, sites will not as a rule be located above the 400m. asl contour (one of the few exceptions to this island-wide pattern, Mitsero-*Kryadis*, happens to lie in the study area).
2. Few, if any, minor sites or off-site artifact scatters as defined in the survey design will occur above the 600-m. contour (the falsifiability of this hypothesis is limited by the fact that only a small percentage of the survey region exceeds this altitude).
3. Because of the correlation between pine (*Pinus brutia Ten.*) forest and hilly topography, areas under a pine-thyme-rock rose vegetation cover are least likely to contain cultural residues in the first place; due to a combination of low visibility and low obtrusiveness of the expected archaeological evidence, such areas will more likely obscure material that may be present than any other type of surface except the Pedhieos River floodplain (only a small part of which is covered by the NE corner of the survey area).
4. As a corollary prediction, the occurrence of sites in hilly, pine-clad terrain on the Lower Pillow Lavas and Basal Group (i.e, in the southern part of the survey region), will be restricted to narrow river terraces and is ulikely to include major settlements (as exemplified by Politiko-*Mazovounos*).
5. Settlement sites are anticipated to lie within 200m. of a perennial water supply, and more specifically within a range of 100-200 m. In cases where an easily identifiable source lies at a greater distance (e.g. Eliphotes-*Ova*, now *ca*. 700m. from a major spring), a search should be able to locate less obvious but more accessible sources, such as dry springs and former streams. As elsewhere in the Mediterranean, local shepherds, goat herders, and farmers tend to be a goldmine of hydrologic information not found on available maps.
6. The proximity of the region to upland forests, with the modern pine-dominated woods assumed to have been preceded in the early Holocene by a climax consociation of pine, oak, and wild olive (Jones *et al*. 1958), should combine with the exceptional role of forest-dwelling Persian Fallow Deer (*Dama mesopotamica*) in the subsistence base of all three successive EP cultures (Watkins 1981; Croft 1991; Held 1992a, 136-7) to boost the ungulate component of local faunal assemblages and thus raise the incidence of deer remains on sites. Although the surficial survival rate of bone will be marginal by comparison with other artifacts, especially lithics, higher-than-usual bone frequencies at one of the known sites (Kato Moni-*Monarga*—observed by E.J. Peltenburg and one of us [SOH] during a visit in 1982) already dictate that the systematic survey pay special atten-

tion to the recovery and analysis of fanual remains.

7. Should the investigations succeed in locating settlement clusters such as the one near Kato Moni (Kato Moni-*Kambia*, Kato Moni-*Monarga*, and Orounda-*Stavros tou Koundi*), their component sites can be expected to belong to consecutive periods, following a pattern characteristic of the island's EP period (Peltenburg 1985, 1-2). If the diagnostic surface material of two or more sites allows no temporal differentiation, they are likely to represent functionally discrete uses of the landscape within a single site catchment. For example, in view of the short distance (about 500m.) and lack of conclusive ceramic or other material differences between Kato Moni-*Monagra* and Orounda-*Stavros tou Koundi*, it may be postulated that the latter represents not a subsequent settlement but merely the use by the former of tillable, well-drained land on one side of the Peristerona River.

Questions:

1. Is there a correlation between the distribution of EP settlement sites and either of the two principal soil types of the region, i.e., the fertile Red Earth on the northern sedimentary zone and the less fertile, shallow Brown Earth on the southern igneous zone?
2. Is the diachronic pattern of site distribution linear, i.e. restricted to the major river courses, or dispersed across the north-south grain of the land?
3. Does the frequency of chipped stone (chert) among artifacts reflect an abundance of crypto-crystalline rock in the local Lefkara chalk?
4. Do the ceramic wares at SCU sites reflect influence of the northern or the southern variant of this culture, or both (Peltenburg 1978)? The main criterion here is the relative frequencies of southern monochrome/combed pottery, on the one hand, and northern painted pottery, on the other.
5. Similarly, do Erimi Culture (ECU) surface assemblages show ceramic affinities with sites in the Paphos District, as was noted for a piedmont site further west, late ECU Ambelikou-*Ayios Yeorgios* (Bolger 1987)?
6. Are there other artifacts or manuports whose presence attests interregional interaction—such as worked or unworked antigorite/picrolite, a popular EP raw material that does not occur naturally in river drainages of the northeastern Troodos (see Hancock and Fox 1992; Peltenburg 1991; Xenophontos 1991)?

The techniques implemented to address these and other problems of EP site distribution in the region will both follow and exceed those outlined earlier within the framework of the project's overall research design. New EP sites and off-site material will be recorded in the course of regular, diachronic surveying and the standardized method of data processing before being analyzed separately. It would be overly optimistic, however, to expect a large number of new sites from a survey of just over 50km.^{2}, given that the average density of EP sites in the Nicosia District ranges from approx. 1/100km.^{2} to almost 1/900km.^{2}, depending on the period and type of site (Held 1989, 481-3). And yet, average densities obscure the effects of geographic and ecological factors on landscape use: hilly terrain of the kind predominating in the region has in fact been shown to have by far the highest site density of any topographic zone on Cyprus (Held 1989, 431, Table 19), and closely spaced or clustered sites other than those already recorded may therefore exist, especially with an SCU an ECU affiliation. Of major singificance would be the discovery of a Khirokitia Culture (KCU) site, since no reliably identified remains of this aceramic culture are known in or near the northern Troodos foothills, even though they encircle the eastern end of the Central Massif.

In addition to the regional survey, a key feature of the EP component is the thorough investigation of the six sites described below, by means of systematic surface recording. Each will be gridded, pinflagged, and—in keeping with the minimum collection strategy adopted by the SCSP—plotted rather than excised from the archaeological landscape. Any bone, lithic, and ceramic samples will nonetheless be taken for the purpose of specialist analyses. Pending excavation of one of the sites in the future, such an approach permits the most cost-effective retrieval of preliminary data with which to meet the interpretive objective of the early prehistoric investigations.

Conclusion

Bronze Age—Evidence recovered by the SCSP will be brought to bear on several propositions previously developed or discussed in a series of papers by Knapp:

1. a well-developed site hierarchy existed along the igneous-sedimentary interface by about 1700 B.C. and functional differences between sites should be clear (Knapp 1993);
2. sites in the northeastern Troodos should reveal little evidence of foreign contacts compared to the rich, PreBA north-coast cemeteries (and their presumed urban counterparts—Knapp 1990);
4. PreBA sites in the survey area should produce tools and implements associated with intensified copper production, as well as artifactual, ecofactual and perhaps bioarchaeological evidence for innovations associated with the "secondary products revolution" (Sherratt 1981; Knapp 1990);
5. PreBA, and especially ProBA sites should reveal evidence for the spread of elite technologies ('luxury' and metallurgical products), and their relationship to resource control and social status (Keswani 1989; Knapp 1993);
6. there should exist an increasing gap through time between the nature of and evidence for domestic or village pottery production (increasingly centralised), and the nature of or evidence for urban-oriented metallurgical production and exchange (increasingly dispersed amongst local elites).

Long-Term—The SCSP seeks to achieve a better understanding of settlement structure and long-term history in a key resource (mineral-agricultural) zone, and to demonstrate the importance of Bronze Age settlement (Chalcolithic sites are predicted to represent the earliest extensive habitation in this area) as part of the long-term human exploitation of the northern Troodos region. The data generated and resources used by the SCSP will provided new insights into several factors associated with politico-economic development and social change on Bronze Age Cyprus, and into the subsequent, socio-economic trajectory of ethnographically-known mining and pottery-producing communities. This interdisciplinary effort will also (1) provide an important contribution to the study of Cypriot prehistory, (2) present a long-term material and ethnographic perspective on Cypriot social and cultural history, and (3) add a significant new chapter to survey methodology on Cyprus and in the Mediterranean.

SCSP: SITES RECORDED DURING 1992 SEASON

These sites were located during extensive reconnaissance of the SCSP area; those located using one of the methodologies described above are indicated by an asterisk (*). Sites beginning with 5000 numbers have been recorded previously, and were revisited by the SCSP. Sites SCY0008-9 were brought to our attention by Stuart Swiny, who also directed us to them.

SCY0001

Village:	Aredhiou
Toponym:	*Koladhes*
Easting:	519700
Northing:	3878600
Material:	Pottery
Period:	Protohistoric Bronze

SCY0002

Village:	Maloundha
Toponym:	*Khariis*
Easting:	516050
Northing:	3878100
Material:	Pottery, Slag
Period:	Roman

SCY0003

Village:	Aredhiou
Toponym:	*Vamvakis*
Easting:	517700
Northing:	3879300
Material:	Pottery
Period:	Hellenistic, Roman

SCY0004

Village:	Klirou
Toponym:	*Kokkinoyia*
Easting:	513350

Northing: 3876300
Material: Slag
Period: Unknown

SCY0005
Village: Mitsero
Toponym: *Argaki tis Rhodias*
Easting: 509600
Northing: 3877500
Material: Pottery, Slag
Period: Roman

SCY0006
Village: Mitsero
Toponym: *Petramoutti*
Easting: 511600
Northing: 3878700
Material: Pottery
Period: Iron Age, Roman

***SCY0007**
Village: Mitsero
Toponym: *Kambos tou Kryiades*
Easting: 512200
Northing: 3878900
Material: Pottery, Ore, Slag
Period: Byzantine-Mediaeval

SCY0008
Village: Politiko
Toponym: *Argaki ton Kastron 1*
Easting: 522150
Northing: 3874350
Material: Pottery, Slag, Chipped Stone
Period: Roman

SCY0009
Village: Politiko
Toponym: *Argaki ton Kastron 2*
Easting: 521700
Northing: 3874300
Material: Pottery, Slag
Period: Iron Age

SCY5001
Village: Politiko
Toponym: *Lambertis*
Easting: 522540
Northing: 3875900
Material: Pottery
Period: Prehistoric Bronze; Protohistoric Bronze

LIST OF EP SITES IN OR NEAR THE SCSP STUDY AREA *(Steve O. Held)*

1. Eliophotes -*Ova* Altitude: 400m.
EP Site #: N 004 (SOH); N.11 (NSP)) Cultural Affiliation: SCU.
UTM Coordinates: 509400E/3880200N.
Site Location: Wide slope terrace.
Macrotopography/Bedrock Geology: Troodos piedmont-Mesaoria interface/Reef-limestone and/or gypsum
Summary Description: Large lithics and ceramics scatter on gently sloping, formerly cultivated field.
SCSP Observations (27/5/92): Site is confined almost entirely to lower, terraced part of slope ascending to Eliophotes-Kato Moni road. Lithics (chipped stone and groundstone) and ceramics (RL, CB) in abundance.
Spring in former village of Eliophotes continues to be used.
Refs: Dikaios 1953, 318; Stanley Price 1979, 92-93; Held 1990, 14.

2. Kato Moni-*Kambia* Altitude: 360m.
EP Site#: N/006 (SOH); N.15 (NSP) Cultural Affiliation: ECU.
UTM Coordinates: 507300E/3880600N.
Site Location: Large, gently sloping fluvial terrace.
Macrotopography/Bedrock Geology: West side of the Peristerona River Valley, *ca.* 0.5km. north of Troodos piedmont-Mesaoria interface/Upper Pillow Lavas, with sedimentary inlier (reef-limestone/chalk/chalky marl) immediately to the West.
Summary Description: Large surface scatter, as well as subsurface deposits of lithics and ceramics, in cereal fields cut by old Ayia Marina-Peristerona road.
SCSP Observations (8/6/92): Red Monochrome sherds (probably weathered RL) visible in scarp cut by road for *ca.* 50m., beginning after the side drainage which defines the site's southern perimeter. Field west of road could not be checked due to standing crop, lower field east of road was covered with straw and thus difficult to survey. Owing to poor visibility, few lithics and no occupation layer in evidence at time of visit.
Refs: *BCH* 90, 328; Nicolaou 1967; Stanley Price 1979, 93-4; Held 1990, 14.

3. Kato Moni-*Monarga* Altitude: 34m.
EP Site#: N/007 (SOH); N.16 (NSP) Cultural Affiliation: SCU/ECU.
UTM Coordinates: 508100E/3881900N.
Site Location: Prominent fluvial terrace at confluence of two streams.
Macrotopography/Bedrock Geology: Peristerona

River Valley, *ca*. 2km. north of Troodos piedmont-Mesaoria interface/Holocene alluvium, between localised areas of Upper Pillow Lavas on the eastern and western sides of the river valley.
Summary Description: Lithics, ceramics, and bone scatter in intensively cultivated fields overlooking Peristerona River and Kato Moni creek.
SCSP Observations (27/5/92); Less than 2% visibility at time of visit due to standing barley crop and dense vegetation cover under olives. Nevertheless, quantities of EP (RL) and some late historical ceramics in evidence along field boundaries, as well as groundstone and chipped stone (including a large, carefully retouched endscraper).
Refs: Nicolaou 1967; Stanley Price 1979, 94; Held 1990, 14.

4. Mitsero-*Kryadis* Altitude: 619m.
EP Site #: N/437 (SOH) Cultural Affiliation: SCU
UTM Coordinates: 512800E/3878500N.
Site Location: Isolated hilltop.
Macrotopography/Bedrock Geology: Troodos piedmont-Mesaoria interface/reef-limestone capping on chalk-marl-Upper Pillow Lava.
Summary Description: Surface and sub-surface occurrence of EP lithics (chipped stone and groundstone) and ceramics on eastern peak of hill; in addition to small Roman component.
SCSP Observations (27/5/92): Though uncultivated scrub, eastern peak near trigo shows continuing disturbance by National Guard which also affects the site. Additional RW-Broadline and RL sherds as well as lithics noted both on surface and in section.
Refs: Held 1989, 313-314; 1990, 14; 1992b, 84.

5. Orounda-*Stavros tou Koundi* Altitude: 340m.
EP Site #: N/018 (SOH); N.40 (NSP) Cultural Affiliatoon: ECU.
UTM Coordinates: 507600E/3881900N.
Site Location: Plateau edge above river valley.
Macrotopography/Bedrock Geology: West side of Peristerona River Valley, *ca*. 2km. north of Troodos piedmont-Mesaoria interface/lobe of Upper Pillow Lavas surrounded by Holocence alluvium to the east and Pleistocene "fanglomerate" to the west.
Summary Description: Lithics and ceramics scatter in cereal field and uncultivated area high above west bank of Peristerona River. This site overlooks the neighbouring EP site of Kato Moni-*Monarga* (see above).
SCSP Observations (8/6/92): In areas where scatter was not obscured by standing crop, lithics predominated over ceramics. Recognizable groundstone implements included a discoidal pounder and a small globular rubbing stone, whereas heavy weathering of sherds prevented the identification of diagnostic wares.
Refs: Stanley Price 1979, 99.

6. Politiko-*Mazovounos* Altitude: 465m.
EP Site #: N/438 (SOH) Cultural Affiliation: Indeterminate.
UTM Coordinates: 522100E/3873400N.
Site Location: River terrace.
Macrotopography/Bedrock Geology: NE Troodos foothill/Lower Pillow Lavas.
Summary Description: Chipped-stone scatter in level cultivated field.
SCSP Observations (28/5/92): Quantity of chipped stone (chert), incl. blades/flakes; no recognizable tools.
Some probable groundstone (igneous), and one heavily abraded red monochrome (?) EP sherd. No further ceramics found during subsequent revisit despite very good visibility.
Refs: Held 1989, 314; 1992b, 84-5.

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