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Excavations at the Neolithic settlement of Makri, Thrace, Greece (1988-1996) - A preliminary report

"Your memory will always
travel with us through
The Thracian plains".
To Maria Pilar Fumanal

INTRODUCTION

The present state of research in Aegean Thrace - the narrow strip of land which lies between the Nestos and Evros rivers, in the northeastern extreme of Greece - are still vague (fig. 1) (Efstratiou 1996, 567). Despite its apparent importance as a contact zone between the Balkans and Anatolia from early prehistory onwards, Aegean Thrace was never properly investigated. The pioneer survey work by G. Bakalakis and D. French in the late '50s and early '60s, was, unfortunately, not followed by any systematic research despite some occasional attempts to address general habitation issues in the area (Theochares 1971). Moreover, the well-known type site of Paradimi - a mound excavated with trial trenches in the Rhodope plain - has left many important stratigraphic problems, as regards prehistoric developments in the region, still unsettled (Bakalakis and Sakellariou 1981). A number of small-scale prehistoric excavations which were carried out in Thrace during the 1960's and the 1980's, as for example the sites of Lafrouda and Proskinites, remain unpublished (Efstratiou 1993, 33) (fig. 2); as a result, the cultural sequence in Thrace, still relies heavily on published data from sites in neighbouring geographical areas such as Sitagroi (Renfrew *et al* 1986), Dikili-Tash (Treuil 1992) and Paradeisos in eastern Greek Macedonia (Hellstrom 1987). It is only recently, that a systematic survey work, initiated by the Ephorate of Komotini, has started building a coherent picture of prehistoric developments in the area, revealing some new and unexpected finds (Ammerman, Efstratiou and Adam 1994). The importance of the Makri campaigns is thus related not only to the fact that they are the only systematic prehistoric investigations in Aegean Thrace, but also to the fact that it is the first time when a secure neolithic sequence can be established in this particular region of southeast Europe (Steadman 1995, 13).

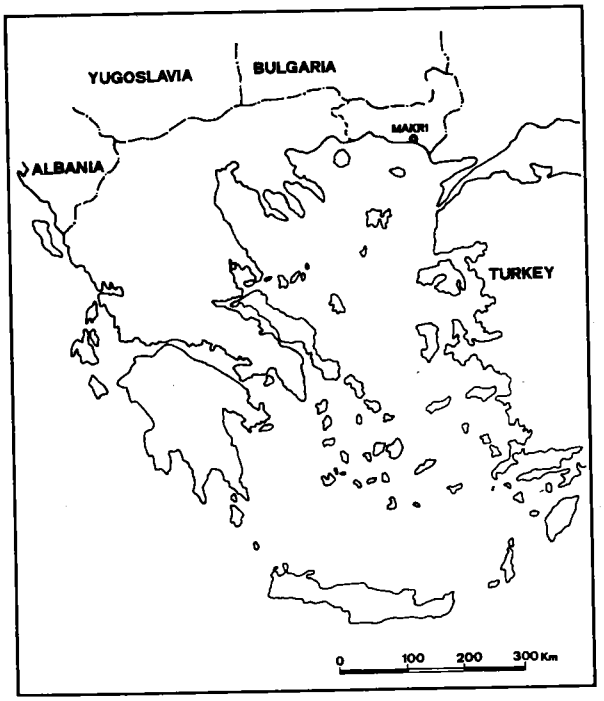

Fig. 1. The map of Greece and the position of Makri in Thrace.

Prehistoric Makri is a coastal site, built on top of an

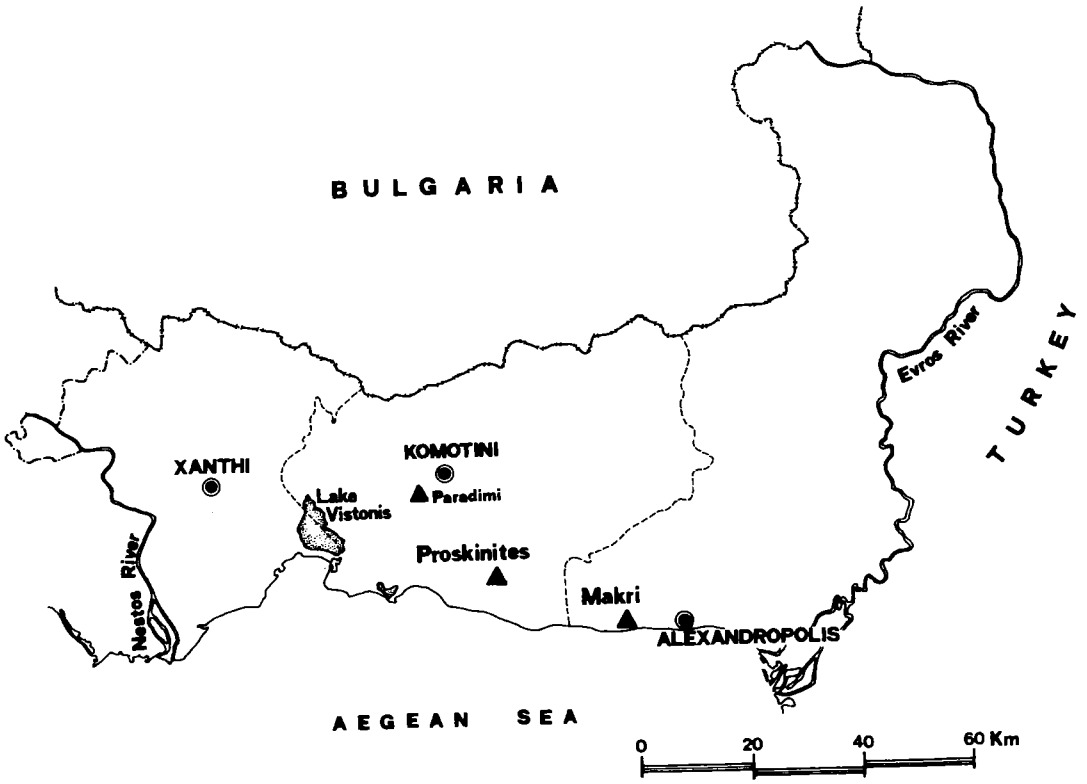

Fig. 2. Aegean Thrace with the main excavated Neolithic sites.

Fig. 3. View of the excavation at the top of the mound. The military trenches openned during the two world wars can be seen (front left).

abrupt cliff-edge, 50m high, overlooking the Thracian sea, ten kilometres west of the town of Alexandroupolis and near the modern village with the same name. Prehistoric habitation remains at Makri include both a low mound and a nearby cave, the so-called "Cyclop's cave" (see section II). Because of the commanding position of the site, it was also used during the two world wars as an artillery base and a number of military trenches had been cut through the mound, causing great damage to the neolithic deposits (fig. 3). Both the mound and the cave were known from the beginning of the century for their archaeological remains and they were visited by many foreign and greek archaeologists who collected a number of neolithic sherds, some of which were published over the years (Casson 1926, 168, Bakalakis 1961, 15, Pantos 1974, 76).

The systematic excavations at Makri were initiated by the Ephorate of Prehistoric and Clasical Antiquities of Komotini in 1988 and lasted, with some interruptions, until 1996 (eight excavation and study seasons) (Efstratiou and Kallindzi 1994). The extensive excavation revealed an impressive neolithic settlement of the 6th millennium BC, with deep undisturbed deposits, well-preserved architectural features and rich remains. The Makri project is a joint venture of Greek archaeologists (Museum of Komotini, University of Thessaloniki) and foreign specialists from different Mediterranean countries (Spain, Italy), who have contributed immensly to the success of the excavation and the study of the material.

The preliminary presentation of the site which follows

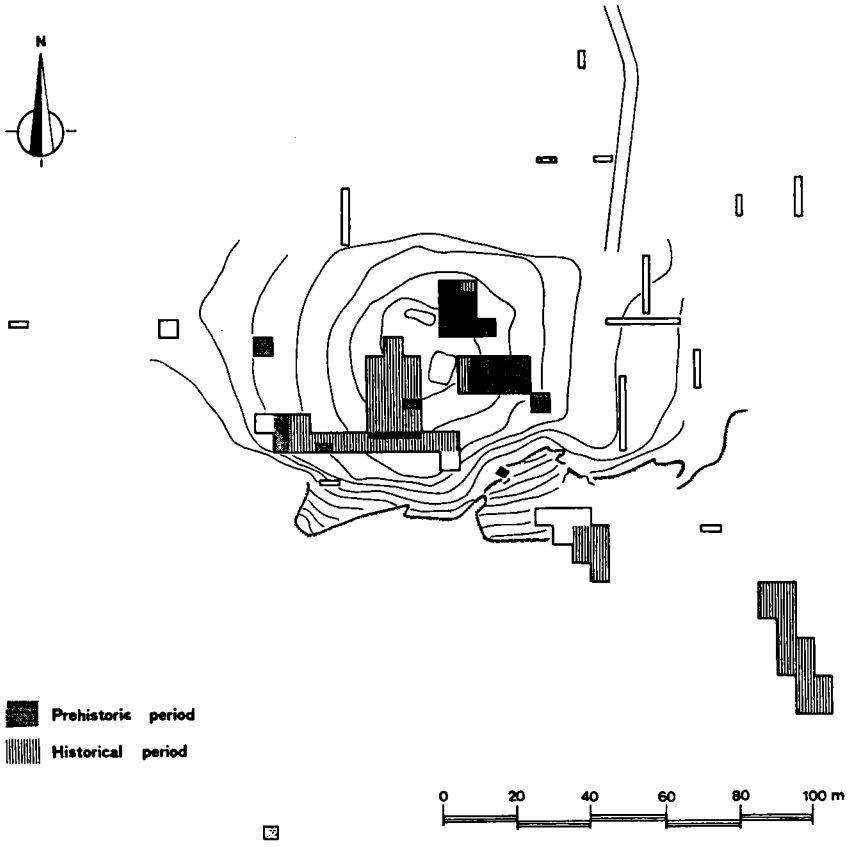

Fig. 4. The excavated areas in the mound of Makri and the trial trenches openned in the periphery of the site.

gives only a general picture of the results of the neolithic excavation and its importance within the context of regional prehistoric developments. Many categories of the material remains, such as portable finds (figurines, ceramic objects) will not be included because of the limited space available and their still incomplete study.

I.– THE EXCAVATION-THE STRATIGRAPHY
N. EFSTRATIOU

1.– A. The Excavation

The 4m high mound of Makri, the result of an accumulation of successive occupation layers, covers an area of at least 2.000 sq.m. These deposits belong not only to prehistoric but to historical periods as well since the site is known to have been inhabited during the clasical, roman and byzantine times (Efstratiou and Kallindzi 1996). The historical deposits are mostly concentrated in the western part of the mound while its eastern part, for some unexplained so far reason, has luckily escaped later disturbances (fig. 4). Prehistoric deposits in the western part had been cut through and greatly disturbed by later architectural features (stone-houses, fortification walls, etc), producing stratigrap-

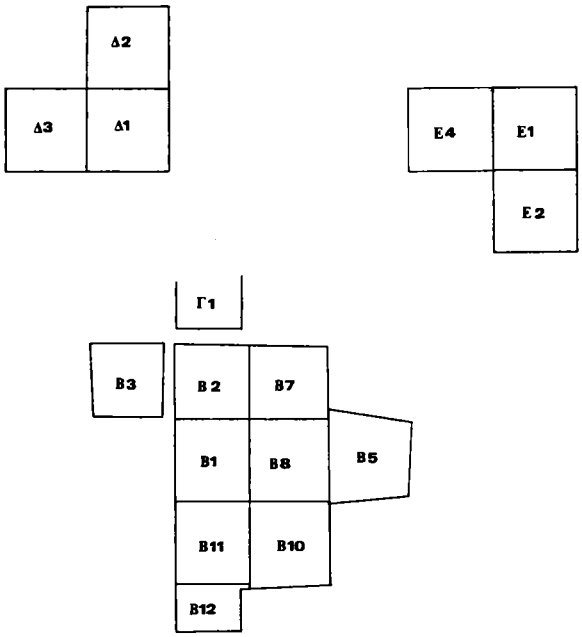

Fig. 5. Topographic plan of the excavated trenches in the three different sectors of the site: top (A), slope (B) and periphery (Γ).

Fig. 6. A view of the "complex area" at the centre of the settlement with clay structures preserved in excellent condition immediately below the earth surface.

hically, unreliable layers. Systematic excavation was focused on the eastern part.

The extend of the prehistoric occupation in Makri is not yet known and it constitutes an interesting and complex issue since it involves, apart from the actual mound and the recorded visible surface finds around it, a study of the geomorphology of the area and the openning of a number of test-pits in the periphery of the site (see below). Moreover, investigations carried out inside the cave and in its entrance, have shown that prehistoric habitation here was occassional and, most probably, seasonal.

The excavated area consists of 16 squares (5x5m) and covers three different sectors of the mound: the top (A), the slope (B), the periphery (Γ)(fig. 5). The purpose was to obtain a representative picture of the occupation layers, the distribution of the archaeological material in space and their possible differentiations related to habitation arrangements, functional differences, chronological variations, etc. The initial decision to preserve all the architectural remains of the site intact, in order to create an open-air museum, affected, in many ways the excavation procedures, especially when a number of impressive and well-preserved plaster floors, post-framed houses, clay structures and other impressive finds, started coming to light (fig. 6). As a result the different squares reached different depths and only in a few of them was the neolithic deposit excavated to bedrock. Basic stratigraphic requirements, however, demanded the excavation of two deep squares (B5 and Γ1) at the centre of the mound, where a full record of the successive natural layers and cultural strata, as well as a conclusive ceramic sequence for the whole site, was produced (fig. 7, fig. 13 of sector II by Fumanal and Ferrer). These findings, were adjusted and modified by data from three other squares from the periphery of the mound which, although much smaller in scale, were also dug to bedrock (E1, E2, E4).

1.– B. The Stratigraphy

At the end of eight years of investigation and study seasons, certain stratigraphic observations can finally be made. Although preliminary - awaiting for the final synthesis of all the material evidence - the stratigraphy presented below, gives an accurate picture of the succession of natural layers, the spatial appearance of specific architectural features and the distribution and sequence of cultural traits.

The methodology of the excavation employed was adapted to the specific requirements of the site mentioned above and it was flexible enough, in the sense that it was continuously modified, as the understanding of the geomorphology and the depositional dynamics of the site, were becoming clearer. It involved the removal of earth in horizontal spits, 10 cm in thickness, which were later combined taking into consideration the natural layers, the occasional disturbances, the separately excavated "closed units" such as storage areas, pits, platforms, burials and finally, the search for fixed spatial features which could lead to the recognition of architectural/building phases (plaster floors, post-holes, destruction strata etc). Geomorphological observations and micro-sedimental analysis at the site, contributed greately to the understanding of the nature of certain stratigraphic units, something which, consequently, affected the way they were excavated, i.e. quick removal of thick neolithic deposits found between two habitation floors, or floor renewal phases removed in thin layers.

The study of the stratigraphy of Makri in terms of habitation, architectural or building phases and cultural periods proved to be a complex process, since it involves the definition and the understanding of some basic stratigraphical features and their accurate interpretation; this is not an easy task, especially in the context of a preliminary report where the synthesis of the different categories of material is still in progress. This may affect the clarity of some issues addressed below, but it is a risk worth taking.

A number of issues are worth mentioning at this point before proceeding with the stratigraphy : **i.** the homogeneity of the pottery tradition, as a whole, in Makri, in terms of shapes, decoration and technology, is striking and it does not help in the distinction of clear-cut stratigraphical entities, with the exception of the two main cultural phases.

Fig. 7. The stratigraphy of the Γ1 deep square (south profile) where the complete stratigraphic sequence of Makri I and II can be seen.

Minor ceramic variations do occur, but they are not particularly helpful for defining phase by phase changes except in very few cases (section IV); it is possible, however, that the detailed pottery study, which is still in progress, may alter this, **ii.** most of the stratigraphical evidence, as has been already stated, comes mainly from squares B5 and Γ1, which are the only ones to have reached the natural bedrock together with a number of other relatively deep trenches such as B7, B11 and Δ2; unfortunately in most of the other excavated squares and because of the well-preserved floors and clay structures encountered, we decided to be preserve, excavation stopped at an early stage, revealing only parts of the neolithic deposit, **iii.** a "destruction stratum", consisting of carbonized material and debris from fallen constructions, such as mudbricks, parts of wooden roofs and stones which appear in considerable depth all over the site, has actually helped to isolate a number of distinct depositional units, **iv.** these depositional units include a number of well-constructed and preserved plaster floors which in their turn define separate habitation phases; moreover, some of these floors help to establish the horizontal stratigraphy of the site and the much needed contemporaneity among the different strata, **v.** habitation phases among excavated units, often, do not coincide with the architectural ones especially in the case of the great number of renewal phases in floor surfaces, **vi.** it seems that certain stratigraphical differences which appear in some squares - ie. different numbers of habitation or architectural phases - can be attributed to variations in the overall arrangement of space and not to chronological or cultural differences (Efstratiou and Urem-Kotsos 1996), and finally, **vii.** micro-sedimentological analysis has helped to identify short but important occupation gaps which otherwise would have been impossible to observe.

Considering the above evidence the stratigraphical sequence at Makri is characterized by two distinct depositional units, several metres thick (fig. 7); these correspond to two different cultural periods, a short **early Makri I** and a much longer **late Makri II**, which are separated by a well-defined "destruction layer". This is confirmed by noticeable ceramic changes in the shape and decoration repertory (Urem-Kotsos and Efstratiou 1993, 617) (section IV). Each of these two depositional units - a thick Makri II and a shallow Makri I - include a number of habitation phases, which correspond to architectural phases.

Makri II, constitutes the main cultural period of the settlement, it appears in all the spatially arranged neolithic deposits - top (A), slope (B) and periphery (Γ) sectors - and includes four habitation phases (fig. 7). The latter are basically defined by an equal number of well-constructed and preserved plaster floors, found in most of the excavated

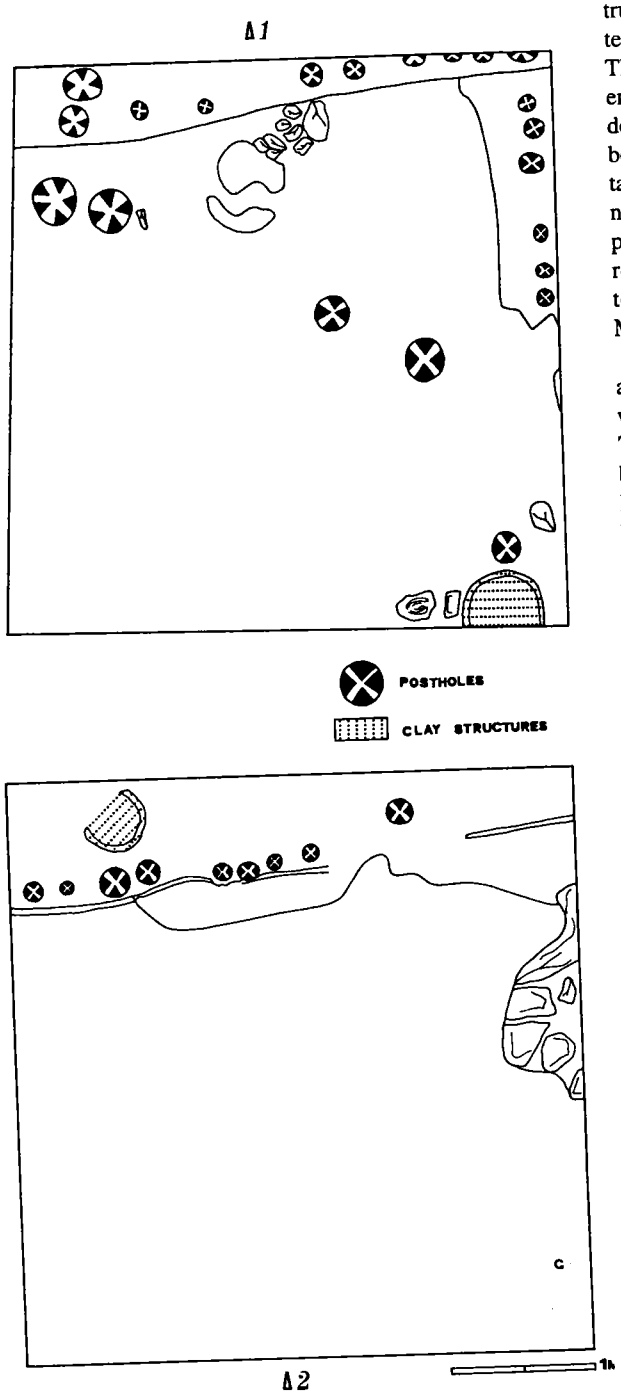

Fig. 8. The post-framed house in the residential area of the settlement (sector B).

squares, and on which the horizontal stratigraphy of the site and the contemporaneity of the deposits, is based; this has been established despite the large number of floor reconstructions, which appear in different depths and are associated with the four main plaster floors of the excavated units. The main neolithic strata of Makri II are those found between the four successive floors; they represent extremely rich deposits which were either the result of levelling processes, before a new house floor was built, or they constitute habitation debris associated with everyday activities. The thickness of the Makri II deposit and the individual habitation phases, varies in places - from 2.5 to 3m and 30 to 50 cm respectively - depending on the slope of the mound, the total area exposed and the extend of later disturbances. More specifically :

Phase One, includes the deposit between the topsoil and the first floor, especially in the area of sector A (top), which was free of later disturbances (B2 and B7). **Phase Two**, was located in both sectors A (top) and B (slope), between floors one and two and includes squares B1-B8, B2, B7, B10, B11, Γ1, Δ1, Δ2, Δ4. **Phase Three**, occurs in both sectors A (top) and B (slope), between floors two and three and in squares B2, B7, B10, B11, B12, Γ1, Δ1, Δ2, Δ4. Phase Four of Makri II is marked by a destruction, probably a widespread conflagration which seems to have affected the whole of the settlement. Evidence of this destruction layer - a burnt level, 5 to 10 cm thick, and associated with a much thicker stratum (35 cm) consisting of the remains of plaster floors, fragments of sun-dried mud-bricks, carbonized material from wooden posts, probably from roofs, pottery, animal bones, sea-shells and sealed off by fallen stones - is found in most of the deep trenches (B5, B7, Γ1) of sectors A and B of the site. The same destruction layer of Makri II, is also documented in squares B10, B11, B12, Δ2, Δ4, without, however, being always fully exposed.

The deposit of **Makri I** which is founded on the bedrock, is almost 1. 10 m thick, and is characterized basically by six successive layers consisting of clayish earth, silty-clay, carbon, gravel and traces of floor surfaces (fig. 7). The construction and the frequence of the occurrence of some of them, might be a cause of doubt as to their anthropogenic nature, rather giving the impression of naturally deposited layers; indeed it seems that the micro-sedimentological analysis has confirmed this hypothesis (see section II). The neolithic deposit of Makri I, is rich in finds, food remains as well as architectural data, mainly dissolved mud-brick walls, post-holes and carbonized material.

Unfortunately, Makri I was not found in any other square of the site, for reasons which have already been stated; this early cultural phase exists, so far, only in the sector at the top of the mound (A) - square Γ1 - leaving many questions regarding its nature, extend or duration, still unanswered.

Particularly interesting was the attempt to incorporate some of the well-defined excavational units of Makri II to specific stratigraphical entities; this was particularly important for understanding the site's cultural sequence and the spatial organization of the prehistoric community (see sec-

Fig. 9. The large long house found in the periphery of the site (sector Γ).

Fig. 10. The neolithic burial found in the top sector (A) of the settlement.

tion III). These were: **i.** the impressive so-called "complex area", which was found at the centre of the settlement, in sector A (top) and which belongs to the second habitation phase (fig. 6), **ii.** the post-framed house which was located on the slope, in sector B (slope) and is part of the architectural remains of the third phase (fig. 8), **iii.** the sizeable long structure found in the periphery (sector Γ) (fig. 9) which belongs to the second or third phase and finally, **iv.** the burial ground which was located underneath a plaster floor, in sector A (top), which belongs to the third habitation phase (fig. 10).

Thus, the prevailing occupation pattern of the main cultural period of the settlement (Makri II), includes four habitation phases. The richer neolithic deposits come from phases two and three which must constitute the main occupation period; the remains of the fourth phase are equally plentiful but they seem to be affected by the widespread destruction which marks the transition from Makri I to II. The possibility of a habitation gap between the second and third phases of Makri II, suggested by certain sedimentological indications, has not been confirmed by other evidence. The succeeding period, Makri I, is much less well-documented. The six successive floors which have been recognized do not seem to represent separate phases and it is most probable that they constitute the only habitation phase of Makri I.

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II. THE NEOLITHIC SITE OF MAKRI. SEDIMENTOLOGICAL STUDY

M.P. FUMANAL and C. FERRER

1. INTRODUCTION

The archaeological site is located near the small village of Makri, 10 km west of Alexandroupolis, on the Thracian

littoral (Eastern Greece, Fig. 1 and 2, Efstratiou, this volume). As for its tectonic structure, this area is formed by a succession of horst and graben which follows the alignment of a system of distensive faults parallel and normal to the coast. The lithology which outcrops close to the area is Mesozoic and, more specifically, belongs to the lower members of the Makri Unit (IGME, 1977 and 1982), made up of limestones, dolomites, shales and other metamorphic rocks (Fig. 11).

The village was founded on a broad, slightly concave platform which corresponds to a stepped waterfall travertine deposit, built on a shale and philite substratum. This kind of formation is not frequent along the Thracian coasts and appears isolated between Maronia and Alexandroupolis. In its distal end, it is linked to the coastline through a rough travertine cliff presenting a front with two successive stepped levels, approximately at 40 and 15 m over the sea. Locally, the different growth phases of a travertine usually favour swamping, thus creating an attractive environment for the establishment of the Neolithic people.

The adjacent submarine shelf shows a very low gradient bathymetry (Nautical Chart), being less than 50 m deep until it reaches the Samotracia reliefs (Van Andel, and Shacketon 1982; Lambeck, 1996). However, the - 100 m isobath is parallel to the coast, just to the south of this island, forming a distinct drop of tectonic origin (Fig. 12).

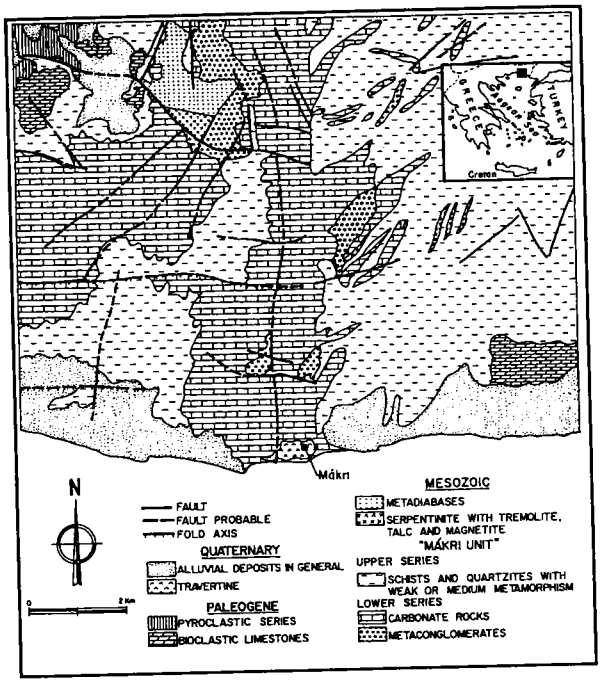

Fig. 11: Geological Scheme of study area.

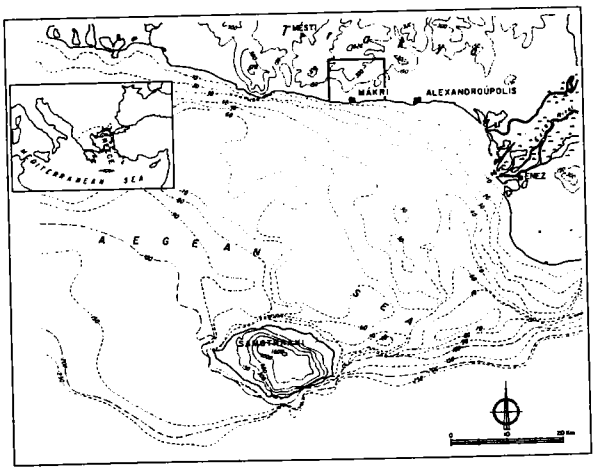

Fig. 12: Bathimetric Map of Makri area.

2. METHODOLOGY OF STUDY

Our work is based on the sedimentological analysis of the most significative profiles in the area excavated by the archaeologists. The main objective is to study the building materials employed in the Neolithic village (floor complexes, walls, etc) and their possible evolution or deliberate modification over its occupation.

The methodology used in sedimentological analysis is the classical one, commonly employed in geoarchaeological studies (Laville, 1975; Miskowsky, 1974; Fumanal, 1986 and Ferrer, 1993; etc). It comprises texture determination, calcimetries, organic matter contents, study of microfacies with binocular magnifying glass, etc. The data obtained have been given statistical treatment (cluster) in order to divide the studied samples into assemblages.

3. DESCRIPTION OF THE DEPOSITS

Stratigraphical profiles were obtained in several reference points, located both in the inside of the settlement and in a broad sector which apparently belonged to the outer perimeter of the site. These profiles are:

A) General outer profile - OUTER MAKRI (Γ1 grid) - Fig. 4, 5 and 7, Efstratiou, this volume and Fig. 13. It belongs to a deposit approximately 1 m away from the inner rooms of the village. It shows no traits typical of inner floors or their related collapses. Thus, it looks like an area adjacent to the complex of buildings.

B) In profiles INNER MAKRI (B12 and B2 grids) - Fig. 4 and 5 Efstratiou, this volume -. It is made up of three consecutive occupation floors spreading on a filling formed by the collapse of the inmediately preceding dwellings (*tell* process), except for the case of floor complex grounds 3 and 2, between which a 20 cm thick sediment layer appears. Each

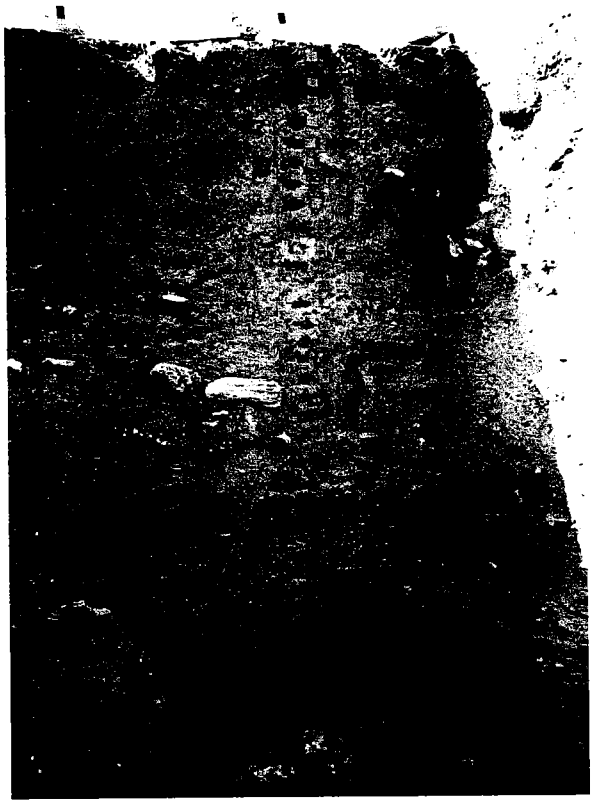

Fig. 13: Photo of Outer Profile.

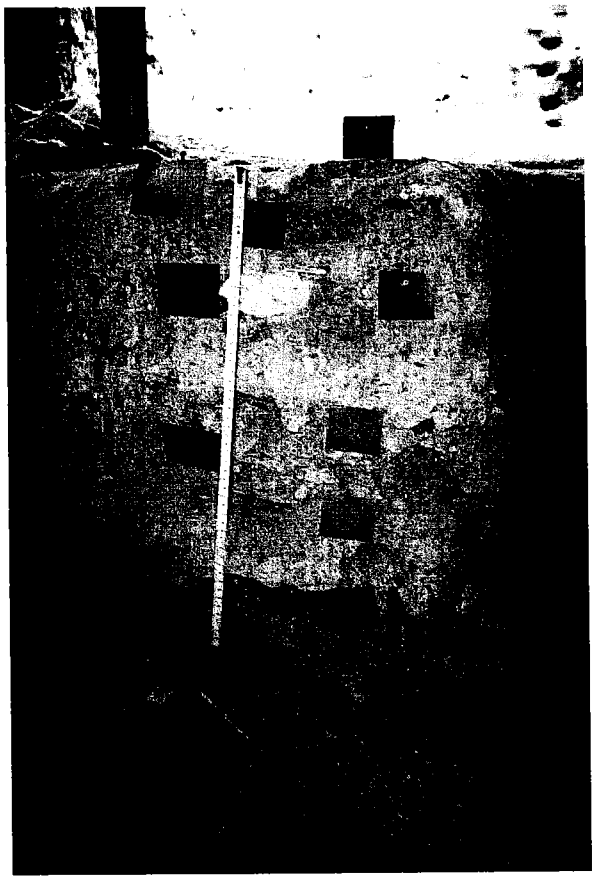

Fig. 14: Photo of Floor 1. Inner Profiles.

one of the studied units comprise the following (Fig. 14):

- A collapse or filling of anthropic material.
- A more or less rough rework which renders the former collapse more regular and forms the new occupation platform.

4. INNER MAKRI. THE OCCUPATION FLOORS.

4.1. Stratigraphy

Room Floor 3 (Lower)

Possibly, it is the oldest occupation level found in area B12 (Makri II, Phase Four - Section I, Efstratiou in this volume-). However, it can not be taken as the base level for sure, because of a 0.5 m drop between the bedrock, visible in the **Outer Makri** profile, and the base of this profile (named Boreas-N). It is divided into five units, 51 cm thick altogether, described from the inferior part to top, which is located at -281 cm from point zero (Fig. 15):

Level 3A. Consist on silts and sands 15 cm thick. Colour is light brownish grey 10 YR 6/2 following Munsell Colour Charts. Found in aggregates scarcely resistant to finger pressure. Includes shell, charcoal, bones, ceramics and adobe fragments.

Level 3B. Similar thickness. Pale brown (10 YR 6/3) silts and sands with plentiful adobe remains. Also shells, charcoal, bones and pottery found.

Level 3C. 6 cm thick. Pale brown (10 YR 6/3) fine sediment with shells and bones. This is the steppable surface.

Level 3D. Intermediate layer between two occupation soils. Pale brown (10 YR 6/3). Similar characteristics to the previous one. 8 cm thick.

Level 3E. 7 cm thick soil (second steppable surface) on top of the series. Yellowish grey clays rich in carbonate with dispersed gravel and some shell and bone fragments. Possibility of plaster with one-side patina.

Room Floor 2 (Intermediate)

It is a filling (collapse of the previous series) a bit less

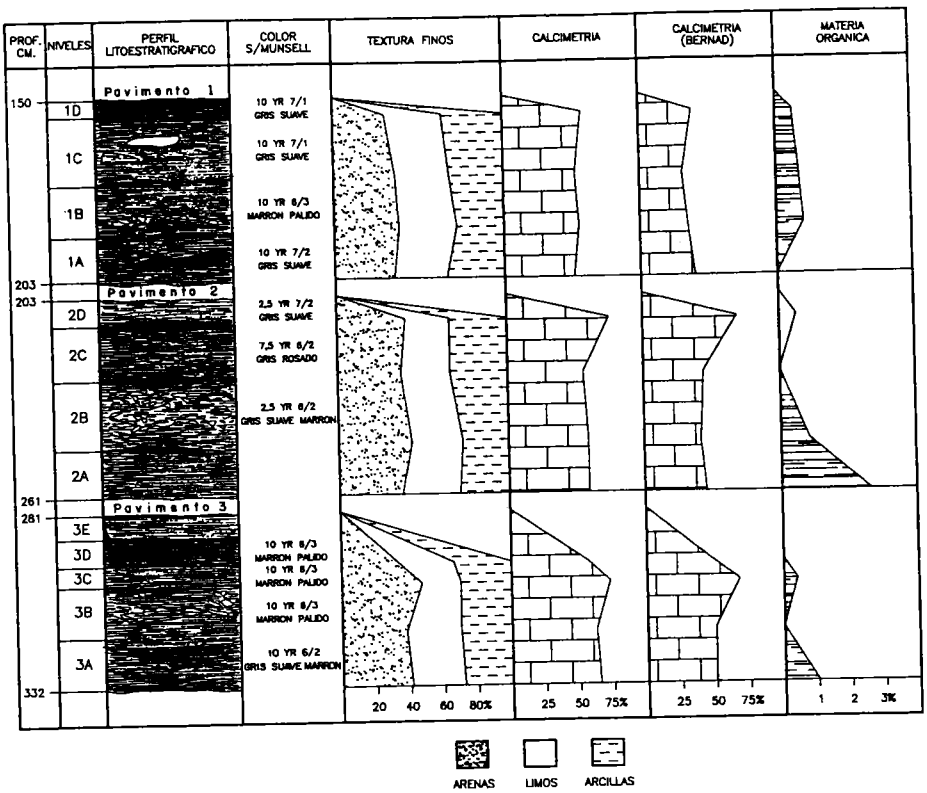

Fig. 15: Lithostratigraphic profile of Inner Profiles.

diverse than pavement 3. Top at -203 cm from point zero, 59 cm thick altogether (Fig. 15). Makri II, Phase Three in archaeological study.

Level 2A. 10 to 15 cm thick brownish grey (10 YR 3/2) clays with whitish aggregates (possibly rests of adobes). Presence of charcoals and shell and bone fragments. Limestone boulders and quartzs.

Level 2B. Textural composition similar to the previous one. Light brownish grey (10 YR 6/2), enriched with sharp-edged fragments of quartzite and sandstone. Pottery and shells. 20 cm thick.

Level 2C. Pinkish grey (7.5 YR 6/2) silts and clays. Hardened aggregates more than 1 cm thick. Bone, shell and charcoal fragments. Few boulders (small), but an apparently transformed silex flake is found. 16 cm thick.

Level 2D. Thin (6/7 cm), pale grey (2.5 Y 7/2) layer of silt and clays. Shell and charcoal fragments. Described as an occupation floor.

Room Floor 1 (Upper) -Fig. 14-

Adobe fragments and pot remains very similar to those found in pavement 2 appear (Makri II, Phase Two). Top located at -150 cm (-0.31 cm with respect to the present floor). Overall thickness 55 cm, subdivided into the following levels (Fig. 15):

Level 1A. Light grey (10 YR 7/2) clays very similar to those in 2 A. Pottery, bone and charcoal fragments. Few, occasionally quartzite boulders. 15 cm thick. Includes a fire level.

Level 1B. Brown (10 YR 6/3) clays and silts of thickness similar, to the previous one (1A) with plentiful hardened clay aggregates which contain diverse materials (Wall and/or adobe remains). Altered limestone boulders and gravels. Bone and shell fragments.

Level 1C. 18 cm thick layer of light brown (10 YR 7/1) silts and clays with abundant aggregates. Includes shells, bones and pottery. A large adobe fragment shows iron oxides and clear vegetation prints.

Level 1D. 5/6 cm thick. Light brown (10 YR 7/2) silts and clays which form aggregates. A sharp-edged, altered limestone boulder. Bones and *Cardium* shells.

4.2. Sedimentological Study

Upon the study of semilogarithmic distribution curves (fig. 17), as well as histograms and statiscal indexes of the three floor complexes, we can infer that it is an homogeneus body with sand-silt-clayish texture and a "tail" in the fines which points to slow settling processes -levels 1B, 1C, 1D, 2B, 3A and 3B-.

In the three studied sequences, several samples show breaks in their distribution curves which we consider anth-

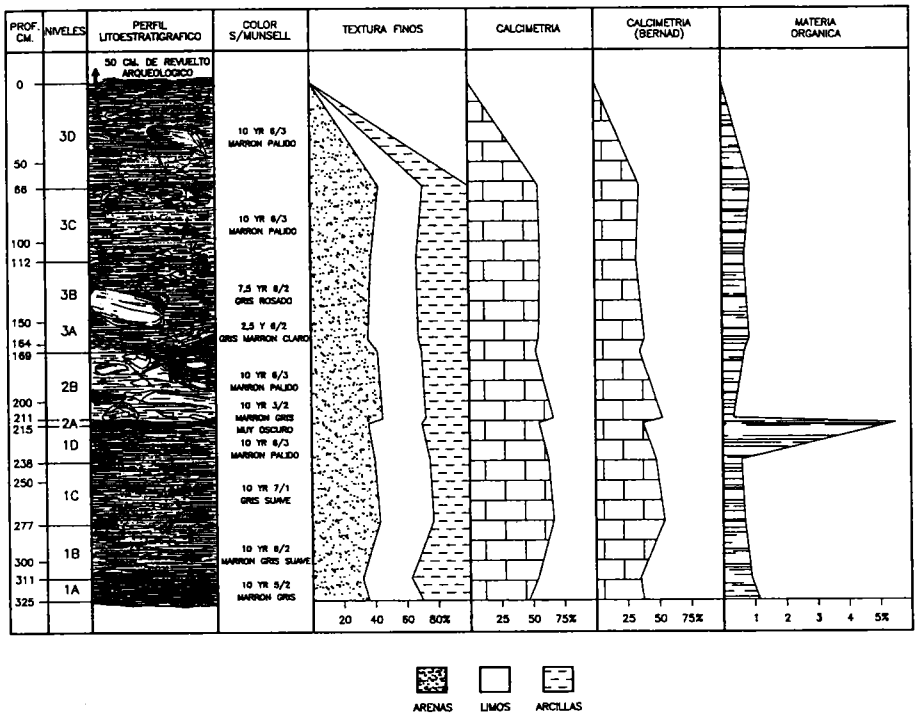

Fig. 16: Lithostratigraphic profile of Outer Profile.

ropogenic -levels 1A, 2A, 2D and 3C-. Others, however, show no coarse sands, which, at the beginning of their curves, generate straight segments -1B, 2C and 3D-.

The mean size oscillates between 4.83 and 5.38 phi, that is, silt Fraction. Distribution is symmetrical (skewness between -0.04 and -0.25) and, thus, classification is bad (3.21-3.51). Kurtosis value between 0.57 and 0.71 is consistent with the facts mentioned so far. Very platty curves.

All samples are clearly related in their origin. They are anthropogenic deposits coming from a natural sediment rich in coarse sand and showing a "tail" of fines due to slow settling processes, which reflect a scarcely selective hydrodynamic environment, related to the geomorphologic landscape where the village is founded (travertine platform with occasional rainwash and swampy conditions).

The morphoscopic study of the sands through the binocular magnifying glass shows also a great homogeneity, with carbonated materials eroded from the travertine building (Fig. 18) and micritic crusts prevailing. Only in samples 2C and 2D a higher content of limestones and shales is observed. In the analysis of samples treated with HCl greater differences are observed, with levels rich in sharp-edged quartzs and round shales (as in samples 3B, 2C, 2B, 1A and 1C).

5. OUTER MAKRI

5.1. Stratigraphy

This profile is 375 cm thick, the top 50 cm being a mixed and disturbed archaeological remain. The rest of the profile is made up of three big units described from base to top (Fig. 13 and 16 - Fig. 4, 5 and 9 of Efstratiou, this volume). The first unit corresponds with Makri I, the others with Makri II:

Level 1A. 14 cm thick greyish brown (10 YR 5/2) materials of sand-silt-clayish texture, with some limestone boulders and gravels. Marine shell (*Cardium*) and bone remains.

Level 1B. Similar texture, a bit more clayish, pale brownish grey (10 YR 6/2). Abundant remains of vegetable charcoal and calcareous sand. Gradual contact with 1C at the top. 34 cm thick.

Level 1C. 39 cm thick sandy texture sediments. Laminar structure with shell, charcoal and quartzite fragments. Light grey (10 YR 7/1).

Level 1D. Gradual contact with the previous one. Top of unit 1. 23 cm thick. Small limestone boulders. Laminar structures of silt and sand. Light brown colour (10 YR 6/3).

Level 2A. Corresponds to a fire. Top of dwelling. 4 cm thick dark greyish brown (10 YR 3/2) silts and sands. Most plentiful charcoal remains.

Level 2B. Made up of calcinated adobes coming from the collapse originated in the previous level. 42 cm thick light brown (10 YR 6/3) sands and silts. Hardened aggregates coarser than 1 cm, which probably were a former wall filling. Pottery, bone and continental gasteropod shell fragments. Charcoal disappears.

Level 3A. Being the base of a very homogeneus body,

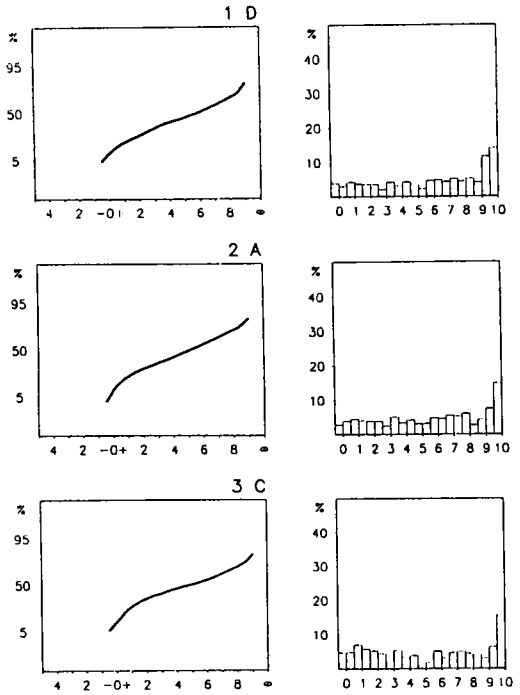

Fig. 17: Semilogarithmic distribution curves and Textural Histogrames.

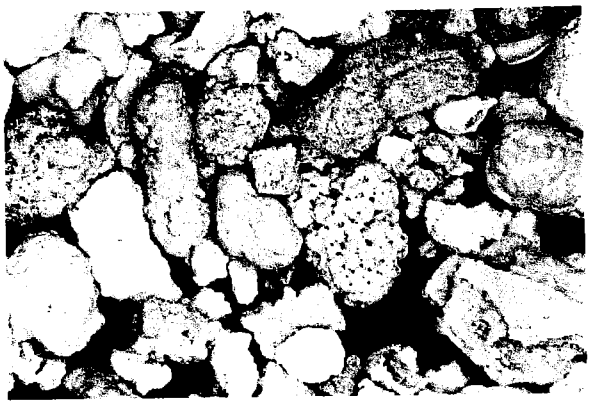

Fig. 18: Morphoscopy of Makri 2B Inner Profiles.

it is a bivalve (*Cardium*) accumulation, probably a shell dump. 4 to 5 cm thick light brownish grey (10 YR 6/2) sands (fragments of travertine). The calcareous boulder fraction is scarcely altered and has probably undergone little transport.

Level 3B. 52 cm thick pinkish grey (7.5 YR 6/2) sand-silt-clayish texture materials of massive structure. Very sparse shell fragments and an isolated block.

Level 3C. It begins after a thin shell level. 46 cm thick, pale brown, similar texture and structure (10 YR 6/3). Limestone and travertine sharp-edged boulders.

Level 3D. 66 cm thick, pale brown (10 YR 6/3), massive sediment of sand-silt-clayish texture, with abundant bone and shell fragments, as well as silex flakes and quartz crystals.

5.2. Sedimentological comment

The samples present great homogeneity: sand-silt-clayish texture, "tail" of fines, poor sorting and strong platokurtosis (Fig. 17). Plentiful traits of anthropogenic alteration.

Levels 1A and 2A present very similar characteristics and abundant organic matter. In the first one, it may have been caused by a long-lasting puddle, whereas in the second one it corresponds to a fire level.

Level 1B is clearly natural, and was caused by a very diffuse rainwash.

Levels 1C, 1D and 2B also belong to a single group which, according to its traits, may represent a series of wall collapses, although very different to those described in the lower levels (floor complexes).

Unit 3 presents little homogeneity. Levels 3A and 3C are sandy, with plentiful shell remains. However, level 3D shows few clays and a high content of organic matter, which could establish a link to the fire levels.

The morphoscopic study reveals that, as a whole, this

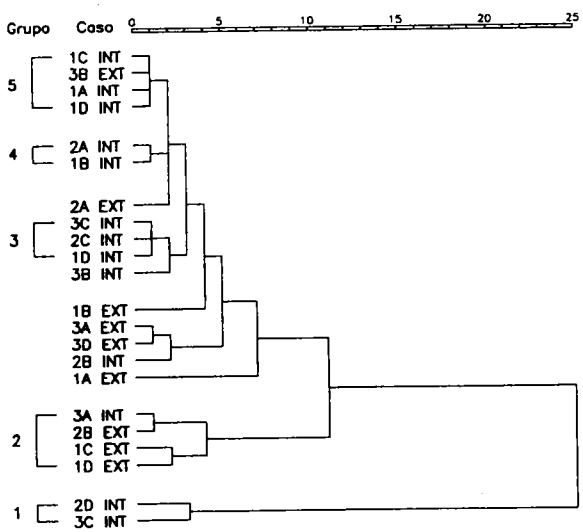

Fig. 19: Hierarchic cluster.

is a mixture of carbonated materials, mostly of travertine origin, quite rounded, and crystalline, sharp-edged quartzites, shales and botroid (ochre) iron materials, along with shell fragments. These prevail in samples 3C, 3B, 2A 1D and 1A. Sands are sharp-edged with a few exceptions (2A, 2B and 3D). Travertine remains, rubefacted by fire are present in levels 3D, 2D, 2C, 2B and 2A.

6. STATISTICAL TRAITS AND INTERPRETATION

The statistical analysis carried out through a hierarchic cluster and upon textural indexes, calcium carbonate and organic matter contents (Fig. 19) allow us to suggest the following groups:

Group 1. Very well defined in the semilogarithmic curves, with units 2D and 3C Inner, which are *occupation floors* from an archaeological point of view. They are sediments poor in silts, with plentiful carbonates and organic matter around 0.6 %.

Sample 1D Inner, described as an occupation floor, belongs to another group, although, as explained below, its peculiar traits bring it close to this body.

Group 2. Also very distinctly observed, it contains samples with abundant sand and little clay, which include levels described as *base sequence* (3A Inner). The other units belong to the outer profile and their interpretation is difficult (3D, 1D and 1C Outer).

Group 3. It corresponds to levels described as *low occupation floor*, with sand-silt-clayish texture and no organic matter (2C and 3D Inner). It also includes level 3C Outer, apparently without such features. It is very interesting that this group includes level 1D Inner, identified as an "occupation floor". The presence of organic matter and the scarcity of silts provides a different interpretation, which distinctly enough brings this level closer to those described as *occupation floors*.

Group 4. It correspond to leves 2A and 1B Inner. Sand-silt-clayish texture, less important clays and plentiful organic matter. Level 2A Inner has been described as *base sequence*; given the continuity observed between profiles 2 and 1, level 1A Inner could represent a first collapse of occupation level 2 (as described below) and, therefore, the base of the sequence 1 would be level 1B Inner. This is a consistant hyphothesis from a sedimentological point of view.

Group 5. It comprises levels described as *first collapse*, including level 1A Inner, mentioned above. These are sand-silt-clayish texture levels (3D and 1A Inner), with no organic matter.

In levels 1C Inner and 3B Outer, also within this family, the presence of organic matter and the sand-silt-clayish texture suggest a subgroup related in some way to the levels described as *low occupation floors*.

The rest of the samples are not homogeneous. They belong mostly to the outer profile, except for level 2B Inner. According to its sand-silt-clayish texture and scarce clays, this one is related to the levels described as sequence bases.

7. FINAL COMMENTS

The sedimentary units described are related in their origin. They are alluvial sediments connected to Pleistocene travertine structures. Nevertheless, despite their homogeneity, they have been sorted out into several families according to their sedimentological characteristics, which basically depend on human action; consequently, these traits are probably linked to their usefulness.

a) In the **inner profile**, a reasonably consistant sequence apparently exists in the succession of inner floors.
   - Levels initially described as *occupation floors* typically present scarce silts, plentiful carbonates and some (not much) organic matter. Morphoscopy shows common characteristics, which supports the idea of a single group.
   - A number of units have been considered a *first collapse*. They show a sand-silt-clayish texture and no organic matter.
   - The levels *previous to the occupation floors* have sand-silt-clayish texture and no organic matter. Morphoscopy has shown shales to be prevailing.

All of this suggests a sequence with three levels of occupation whose characteristics are repeated in such a precise way that they are likely to correspond to three moments in a same cultural phase. Despite that, the abundance of type 2A organic matter, and the stratigraphical discontinuity between 2 and 3, points towards a non-occupation phase. This would mean a non-dwelling interval between occupa-

tion levels 3 and 2, opposed to the continuity observed between 2 and 1.

b) The **outer profile.** No peculiar or outstanding sedimentary traits have been observed. On the contrary, it is very difficult to relate it to structures or specific uses. And, however similar they may be to the inner profile samples, the ensamble that they form, mostly out of the groups suggested so far, indicates, at least, a completely different archaeological meaning.
   - Units 1A and 1B correspond to an area adjacent to the dwellings, with prevailing natural sedimentation (diffuse rainwash and slow settling deposition), higher than in the upper level. These traits are contrary to those of the distinct collapse levels 1C and 1D.
   - Unit 2A is the result of a fire level combined with previous sediments similar to those at the base of the profile. The next deposit upwards (2B) corresponds to the collapse of the walls, once the fire had destroyed all vegetable remains in the structure.
   - The group of samples 3 is more confusing, no level allowing easy classification as a collapse one, although they include remains of blocks. Level 3A could be interpreted as a "shell dump". The other levels have been formed by successive anthropic fillings, except for level 3C, which can represent a phase of some stability and natural sedimentation.

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III. ARRANGEMENT AND USE OF SPACE
N. EFSTRATIOU

The way the neolithic inhabitants of Makri organized and used their space during the life span of the settlement, is particularly interesting. This refers to both structured and open spaces and it includes attempts to address issues such as the settlement, the community's ecistic behaviour, the architecture and the description of activity areas (Efstratiou and Urem Kotsos 1996).

The **extend** of the prehistoric occupation at Makri, still remains an open issue; the main reasons are the complex geomorphological and depositional factors involved. Investigations in the form of systematic surface collections and the openning of small trial trenches in the periphery of the mound, produced a contradictory picture: while human habitation traces were extremely poor beyond the actual mound and for a distance of more than 30 m from its top, trial trenches have revealed stratified prehistoric floor deposits underneath of alluvial strata 2 m thick (fig. 20) (Efstratiou 1992, 643). This is attributed to the effects of the travertine arrangement which is characteristic of the geology of the area and must have severely affected not only today's visibility of archaeological material but also the actual patterns of prehistoric habitation as well (lacustrine environments, swampy areas, frequent flooding) (Fumanal and Ferrer 1996). Under these circumstances, even a rough estimate of the extend of the actual habitation around the mound, without further systematic investigations, is risky, leaving important aspects of the community's space organization open; this was confirmed by the accidental location of a stratified lithic material deposit of a possible pre-neolithic date, in a narrow trench, 100 m northeast of the mound (Efstratiou 1996, 567). It becomes apparent, therefore, that the estimation of the size of the prehistoric habitation and the prevailing occupational patterns in an intra-community

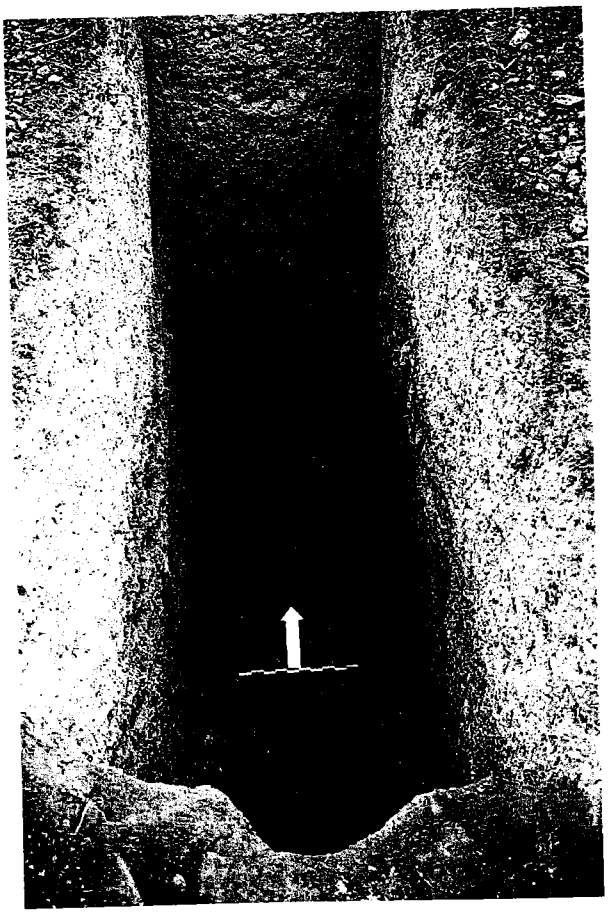

Fig. 20. Stratified neolithic material underneath thick alluvial deposits found in trial trenches which were openned in the perimeter of the site.

level, involves the understanding of complex and dynamic geomorphological processes (i.e. nature and duration of phenomena), in relation to organized human responce (palaeoenvironmental analysis, exploitation strategies etc); this is a study which is still in progress.

At Makri, there is enough evidence to suggest that **human occupation patterns** differ between the two cultural periods, I and II. Makri I is characterized by a limited residential space, probably restricted to the top of the mound, sector (A) while Makri II extends to a much wider area, covering the sector B and sector Γ. Makri I was probably a small camp, founded on the bedrock and occupied a limited area at the centre of mound. Although the exposed area, where remains of this early phase were found, is not, so far, large, there is enough evidence for the reconstruction of the basic features of this occupational period (well-defined post-holes lined with clay, desolved mudbricks, floor remains and pottery). The analysis of sediment samples taken from this early deposit, indicate possible short periods of abandonment of the camp (see section II); this is particularly interesting considering the semi-sedentary or periodically abandoned occupation pattern which tends to characterize many Balkan sites during the First Temperate Neolithic period (FTN) (McPherron and Srejovic 1988, 468). Equally important is the palaeoenvironmental evidence of the site (carbonized wood from fire-places and building materials) deriving from the securely dated upper part of Makri I and early Makri II deposit ("destruction layer") and showing that human intervention had not altered the surrounding forest area, which, in the middle of the 6th millennium BC, was still "neolithic" in character (deciduous oak, fraxinus etc) (see section IX). It is possible, therefore, that the area around the settlement had not reached a stage of overexploitation as a result of the previous long, uninterrupted and intense habitation and production practices of Makri I. Moreover, if the existence of a suspected nearby site of an even earlier date (lithics of pre-neolithic (?) character) is confirmed, then the occupation pattern of Makri becomes very complex and interesting as regards prehistoric developments in the region of Aegean Thrace (Efstratiou 1992, 650).

Occupation patterns change dramatically during the succeeding main cultural period of the site (Makri II). Human habitation covers the whole mound (sectors A, B and (Γ) and judging by the accidentally identified, stratified neolithic deposits at a considerable distance from the mound, it must have extended at least 150 m from its centre; however, this hypothetical size of the Makri II settlement can not be yet archaeologically documented. The exposure of the Makri II settlement revealed a complex picture as regards its arrangement and use of space. Its main feature is the presence of three well-defined areas with distinctive characteristics: first, the top sector (A) which is dominated by a communal place, the so-called "complex area", second, a purely residential area, founded on the slope sector (B) and finally, the peripheral sector (Γ) with more extensive habitation evidence. This arrangement seems to persist for hundreds of years without noticeable changes (at least during the second and third habitation phases). The study of comparative material from these different occupational areas, on a micro-scale (house-plans, construction techniques) and semi-micro scale levels (structures, clay features), indicate only minor variations through the different phases, which are atributed to the gradual extension of the built-up area as a result of population growth (peripheral section).

Changes in the arrangement and in the use of space between Makri I and II are interesting and acquire particular importance, if viewed in the context of the site's cultural traits (ceramics, economy, technology) (see section XI). In terms of a more general habitation picture, the small, short-lived camp of the early cultural period, which occupied the top of the mound - perhaps periodically - gave way to the long-lived Makri II settlement, characterized by a complex ecistic plan; indeed, its architectural layout shows a gradual but impressive population and residential growth, covering a much wider area, in the form of an extensive village.

The **architectural tradition** at the settlement of Makri is impressive and combined with the variety and the state of preservation of its finds, it is considered unique for the neolithic period of northern Greece. It represents a fine example of a post-framed, wattle-and-daub and mudbrick architecture (rows of post-holes, fine plaster floors, wood impressions on numerous pieces of clay, remains of carbonized wooden posts from fallen roofs and consecutive mudbricks, *in situ* or dissolved). The use of stones is rare; it occurs only in the fourth habitation phase - immediately above the destruction level - and it is not related to specific structures, except perhaps in the case of a stone wall of doubtful function which was found in square Δ4 (see below).

The most impressive architectural feature of Makri is the so-called **"complex area"** which is located in the centre of the settlement, at the top of the mound (fig. 21). It is a large post-framed structure, perhaps with a second storey, consisting of rows of post-holes of different diameter which run in a northeasterly-southwesterly direction, large pieces of clay with wood imprints and a fine plaster floor with many thin layers of reconstruction. Its interior revealed a number of extremely interesting features: **i.** a fine plaster floor with many half-sunk unfired vases which give the impression more of clay-lined pits rather than free-standing pots (Kallindzi and Efstratiou 1988, 509) (fig. 22), **ii.** a finely constructed and finished clay platform and a large and deep clay pit which mark the centre of the area; four solid clay objects, similar to those found in other Balkan neolithic sites, were found buried in the deposit of the pit (fig. 23). Their character is unclear and both a utilitarian and symbolic function has been suggested (Tsountas 1908, 223, Hegedus and Makkay 1987, fig. 14), **iii.** a certain section of the "complex area" seems to have been encircled by a post-framed clay wall, parts of which have survived to a

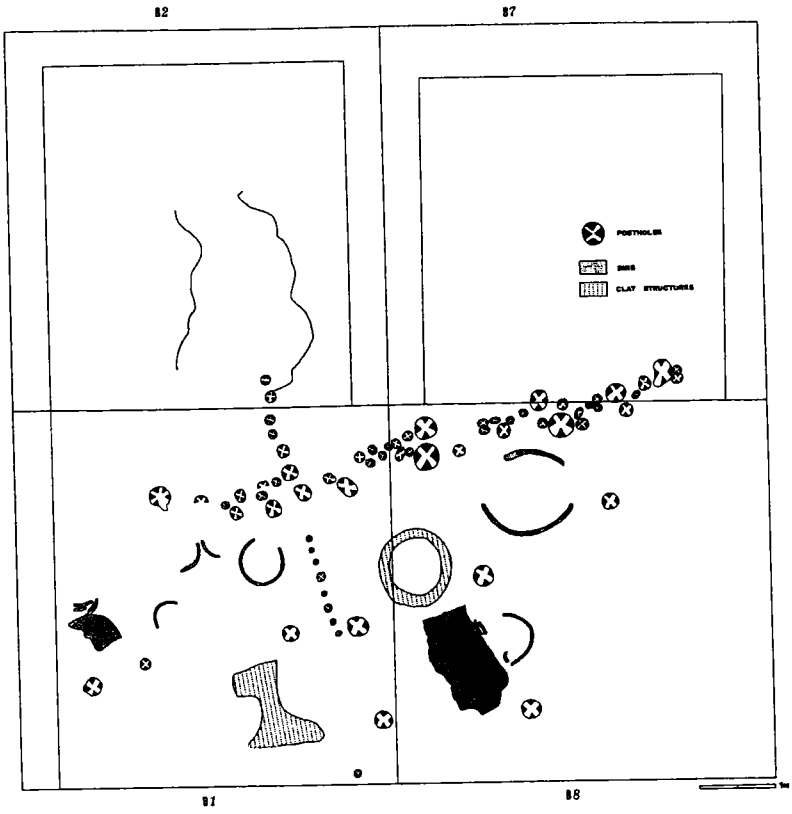

Fig. 21. Plan of the "complex area" with the remains of a post-framed structure, storage pots and other clay features.

consideracle height (fig. 22). This special function complex area was used probably for the storage of goods by the whole of the neolithic community (see phytolith section X). If this is so, it will be one of the earliest recorded examples in prehistoric Greece.

A typical **post-framed house** was located on the sector B (square Δ1), a designated residential area (fig.8. see section I by N. Efstratiou, this volume). Although not completely uncovered due to later disturbances, it appears to have been a rectangular structure with an east-west orientation, with two rows of post-holes openned on a raised clay surface; a second row of post-holes, vertically arranged to the first one, are found at a lower level, probably marking an internal partition. At least two large post-holes, inside the house, must have served as foundations for the central wooden posts which supported a light roof. The interior of the house has a well-preserved plaster floor with many thin reconstruction layers of clay, a number of oval or round clay constructions found in situ (fire-places, ovens, platforms), as well as storage and rubbish pits; a large number of household pots vases, large stone tools for grinding food and a number of clay looms weights, were collected from the house floor (fig. 24). Evidence of the way the superstructure was built (presence of both daub and mudbricks) is fragmentary; the pitched (?) roof must have been made of thatch. The experimental construction of a post-framed hut, carried out in the area, in the context of an ethnoarchaeological excercise, has shown that a combination of the wattle-and-daub and pise techniques was most probably employed for the construction of different parts of the walls (fig. 25).

A long **post-framed structure**, much larger in size from all known examples, was excavated in squares E1-E2-E4, in the periphery (sector (Γ). This is, in many respects, a quite different building (fig. 26); it has two long rows of post-holes, running in a north-south direction, with an inner, post-framed, round structure. The character of this long structure is not clear, although its contents are typical of a residential unit (successive habitation floors, rubbish pits, clay structures in situ, household pottery, traces of human burials under the plaster floors there is nothing to suggest a specific function. Unfortunately the layout of the building has been severely damaged by later disturbances which had cut through the prehistoric deposit (bronze age rubbish pits, present-day military trenches).

The remains of a **stone wall** encircling the Makri II settlement or part of it, constitute another interesting feature of the site. It has been so far identified only in square Δ4; it is made of unworked stones and rocks and cuts through the mound, in a northeasterly-southwesterly direction (fig. 27). Although still partially uncovered, judging by its massive

Fig. 22. Part of a post-framed clay wall surviving in considerable height in the "complex area".

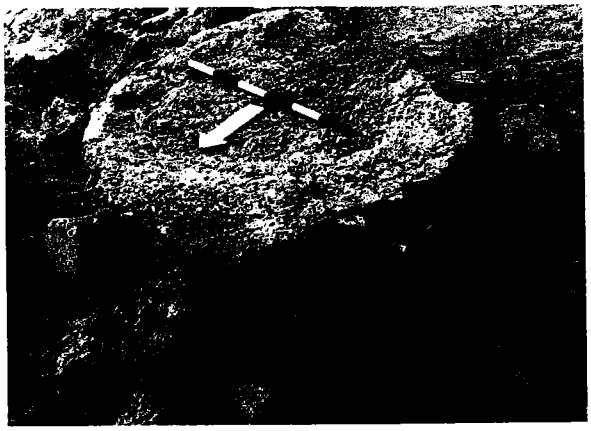

Fig. 23. A deep clay-pit with a number of solid clay objects buried in the deposit (before their full uncovering).

Fig. 24. The interior of a post-framed house with vases and clay structures in situ.

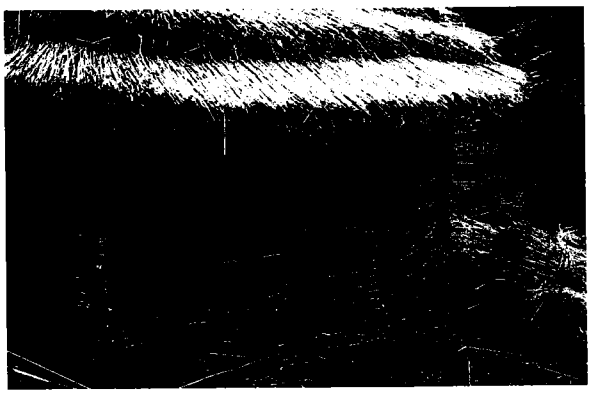

Fig. 25. An experimentally built post-framed house made of wattle-and-daub similar to those excavated at Makri.

construction, it seems to have been a dominant element of the community spatial organization still during the third habitation phase. The exact function of the stone enclosure is still unclear: it could have been a defensive or retaining character or it could just be a feature defining certain special purpose areas.

The identification of various **activity areas** within the site (household, storage areas, communal places, burial grounds, open spaces, specific structures), was another interesting aspect of the study of the use of space in the settlement. This includes the analysis and synthesis of the material remains of the site and their distribution patterns in the context of particularly demanding and often strongly criticized approaches (Kent 1990, 1). The identification of distinctly antithetical spatial units in Makri such as private-communal, open-closed etc, is still awaiting the supporting evidence from other categories of finds (pottery, lithics etc) and their synthetic interpretation. However, some preliminary observations are already possible.

The large area used for the storage of goods and/or symbolic purposes, at the centre of the settlement, is strikingly different from the residential units located in other areas such as the house in Δ1 and the long building in E1; such differences refer to the general spatial layout of the area in terms of the overall size of the building and its construction (plaster floors), the complicated arrangement of structures and objects (position, scale, number, repetition of features) the degree of the opulence of the variety of the finds (unique objects) (fig. 28), and the communal character of the "complex area"; although its character is still obscure, the clearing of the area from the masses of debris (probably from a collapsed upper storey), is soon expected to clarify these matters. What is perhaps indicative of a communal use of the area, is the almost complete range of the typical ceramic repertory of Makri II, which was found in the excavated deposit (see section IV).

Residential units, on the other hand, present a different picture: a much more ordered layout and arrangement of constructional details (space, post-holes, scale) and a limited range of finds both in terms of quality and quantity.

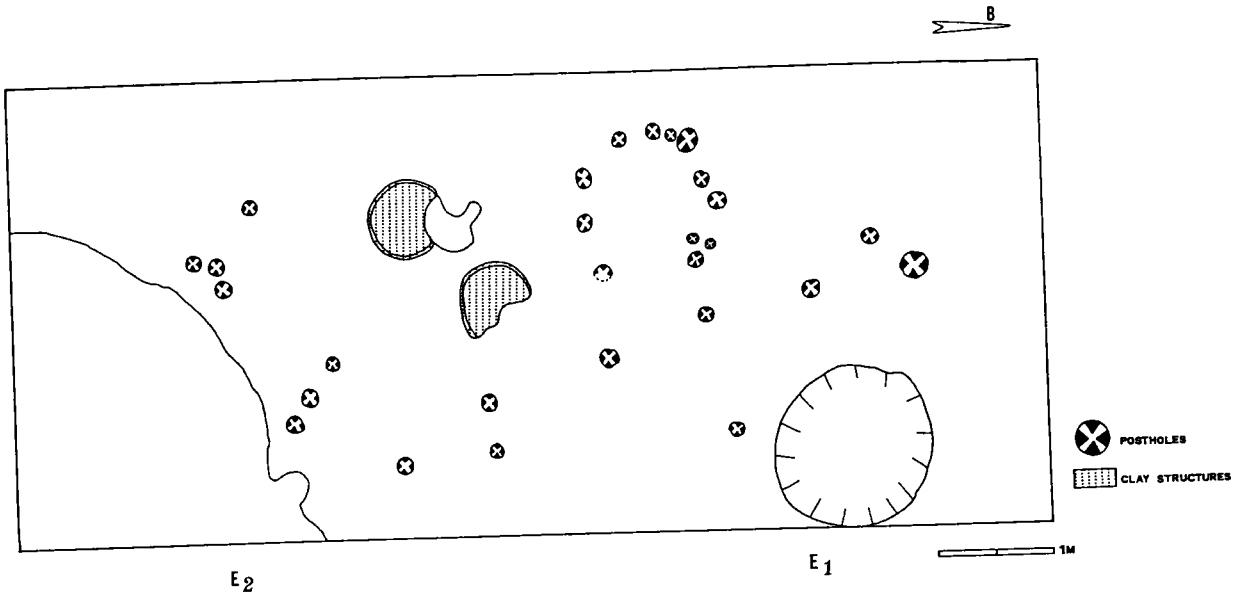

Fig. 26. Plan of the large long post-framed structure in the peripheral sector (Γ1) of the settlement.

Fig. 27. The remains of the stone wall in square Δ1.

Fig. 28. A finely constructed working platform found in the "complex area" of the settlement.

Such units are more indicative of spatially well-defined household scale of activities, such as cooking facilities (fire-places), sleeping (platforms), disposal of rubbish or storage (fig. 29). The arrangement of these features in the interior of the house, give the impression of an ordinary living area. Similar instances of living quarters are attested at a number of fragmentary sections of floors from other areas of the settlement, constituting a body of diagnostic data. The spatial distribution of these traits is expected, hopefully, to help in isolating specific activity units whithin the above designated residential areas, such as storage, knapping floors etc.

Burial grounds constitute another important but different "activity area". Three neolithic burials and the traces of a fourth, were found associated with habitation areas, such as plaster floors and pits. The bones of two bodies were found inside a well-prepared, clay-lined pit, while the skeleton of a third (the only complete one) was located under a plaster floor, in a typical neolithic position (contracted with the hands near the face and a flat stone, probably a grinding implement, resting on the neck (fig. 10, see section I by N. Efstratiou, this volume). The study of these neolithic skeletal remains, very rare for northern Greece, have yielded important palaeoanthropological information (Aggelarakis and Efstratiou 1996, 11).

The distinction between open and closed spaces within the village compound, is not an easy task. Constructional details, such as post-holes and plaster or clay floors, are used only as a relatively secure criterion. Other constructions (platforms, the so-called "thermic structures", rubbish

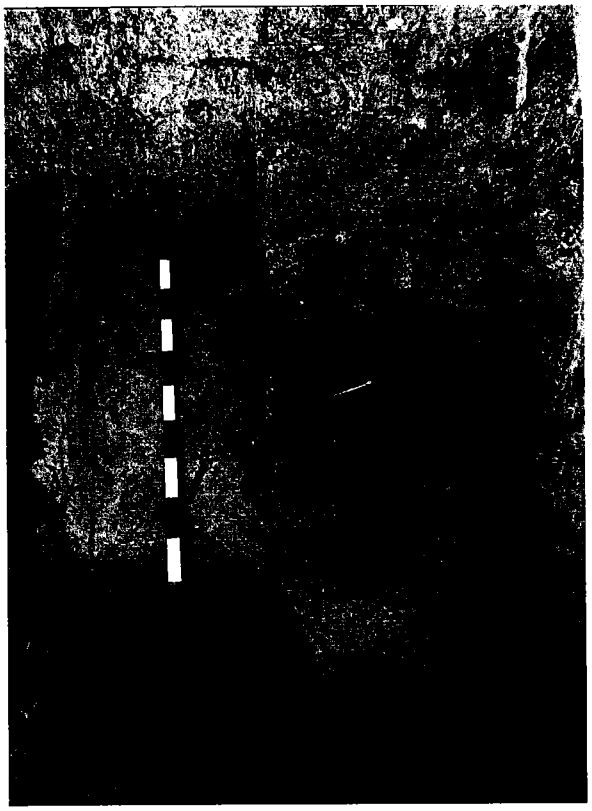

Fig. 29. A sleeping platform preserved in excellent condition.

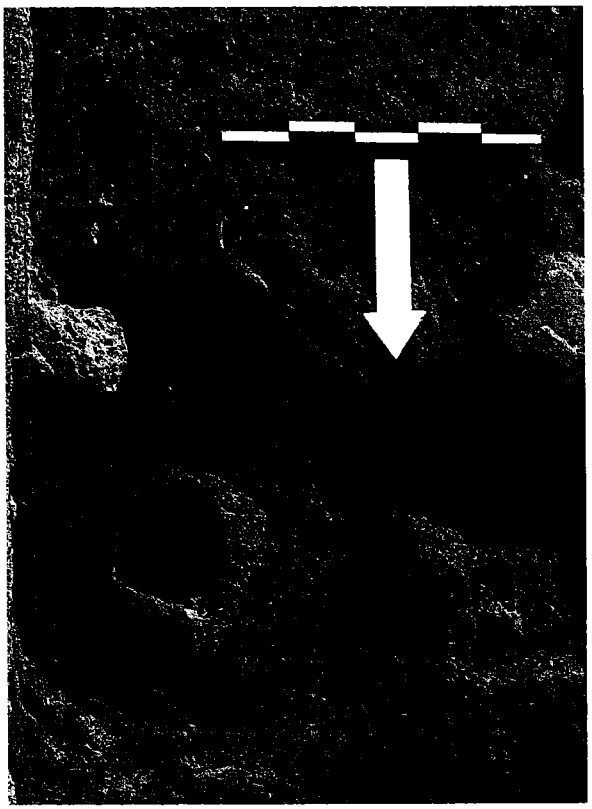

Fig. 30. A typical clay structure of unknown function.

or storage pits) when not associated with specific contexts, can be easily assigned either function (fig. 28). Certain activities can take place in both open and closed spaces (working, cooking, tool-making); although usually such places are open-air areas (court-yards), they can be easily, temporarily or partially, covered by light structures (thatched areas); such areas do not leave permanent marks on the ground. In any case, activity areas like these can be safely diagnosed only after the study of their material remains, is completed.

The exact nature and use of specific structures is another complex but exciting subject; this is particularly important for Makri where a variety of clay structures has been found in different contexts (communal, household) (fig. 30). Their elaborate construction, careful finishing and long use indicate a special function, the nature of which, however, remains obscure; this is mainly because, in terms of their finds, they do not define any specifically recognizable context of use.

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IV. THE POTTERY AND THE CERAMIC SEQUENCE

D. UREM KOTSOS

The neolithic settlement of Makri has been till now the only site in Aegean Thrace systematically investigated. The aims of the pottery study are: the recognition of the phases of the settlement; the correlation between habitation phases; the use of the spaces; the understanding of pottery as a productive process, and as a social phenomenon within the frame of a prehistoric community.

In this preliminary report only one part of the pottery study is presented, that which involves mainly the typological and technological characteristics of the material. The conclusions reached concern the pottery found in the trenches Γ1, B1, B8, Δ1, E1 and E2 which give sufficient evidence for the reconstruction of the ceramic sequence.

It should be noted that the excavation did not reach the same depth at all the trenches due to the excavators decision to preserve the impressive architectural remains. The excavated layers are determined on the basis of the presence of floors which often mark corresponding habitation phases. Each excavation trench has its own vertical stratigraphy independent of the rest, and the horizontal correlation of the habitation phases (strata, floors, building phases) is based

exclusively on the hypsometrical indications, with the exception of cases where pottery has been differentiated. In this way the deposits of the settlement allow:

a) the distinction of two cultural periods (Makri I and II) which are separated by one «destruction layer»
b) the determination of the habitation phases: one during Makri I, and four during the next Makri II period

The pottery study which follows focuses on three basic axes:

1. Pottery typology which is based on the characteristics of the pottery observed macroscopically: in particular the shape, the non-plastic inclusions only in terms of size distributions and frequency, the characteristics of the exterior surface (color, surface treatment) and decoration.
2. The study of technology which is approached in two ways: a) by microscopic analysis of selected sherds and b) by macroscopic examination of the material. The former involved petrographic analysis which was used to obtain information related to provenance studies and to the use of the pottery. This analysis was also expected to provide information for the reconstruction of the methods of manufacture and firing. Within the frame of this approach, an investigation of the area was undertaken for the first time, with the goal of finding the sources of clay that had probably been used to make these vessels.

   The macroscopic examination intended to obtain information related to the methods of manufacture of the vessels. The aim was to point out the possible changes in the manufacturing techniques of the vessels, through time.
3. Experimental approach comprised of the manufacture and firing of the pots. The aim of this approach was to better understand the methods and techniques used by the Neolithic potters at Makri in the production of their pots (construction, surface treatment, firing).

1. The typological characteristics of the pottery

As has already been mentioned, the classification of the pottery was based on its macroscopic characteristics which are as follows: non-plastic inclusions (size distributions and frequency with which inclusions appear), colour and surface treatment of the exterior surface, decoration and shape. The kinds of non-plastic inclusions have not been used as parameters for the classification of the pottery because on the one hand, it was not judged as a secure means of recognition of the main non-plastic inclusions in some categories such as in the case of black and gray sherds, and on the other hand the microscopic analysis showed that there is no

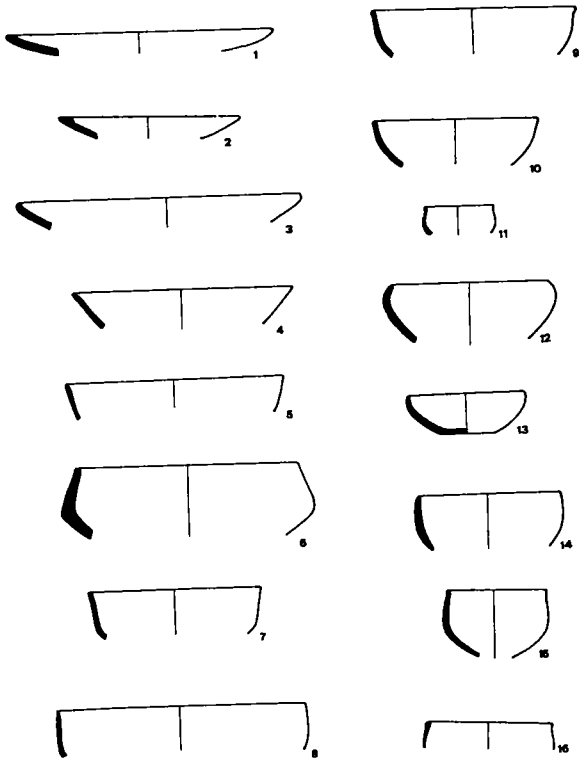

Fig. 31. Makri I and II - open shapes.

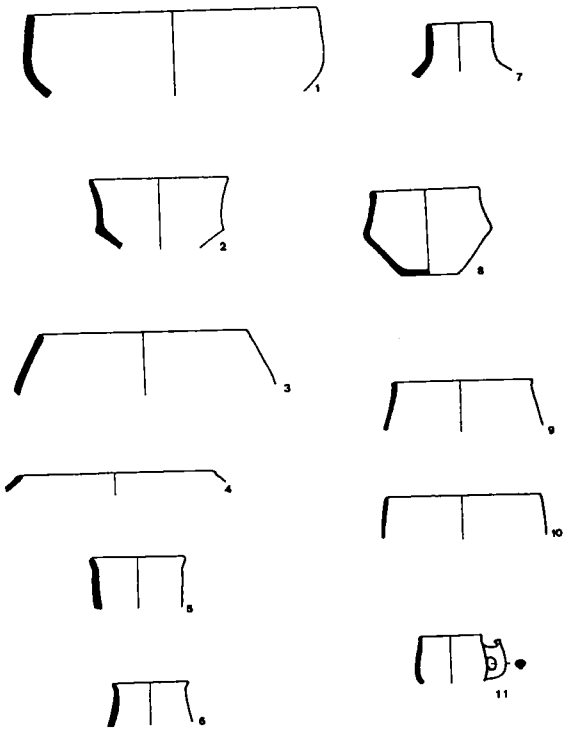

Fig. 32. Makri I and II - open and closed shapes.

relation between ware category and fabric type except in the case of pottery with raised decoration that is chaff tempered (Yiouni 1995, 620). However, this ascertainment will be reexamined microscopically (petrographic analysis of thin sections) with a reliable number of samples per ware and shape. On the basis of size distribution and frequency of non-plastic inclusions three categories of ware were discerned: fine (up to 0,5 mm), medium (0,5-2 mm) and coarse (from 2 mm and up). The majority of sherds belong to the medium ware category.

The typological characteristics of the ceramic features from all of the habitation phases at Makri from both cultural periods show a uniform and stable tradition without significant changes. Nevertheless, some features as will be explained below, allow the division of the settlement into two cultural periods (Makri I and Makri II).

1.1 The typological characteristics of Makri I

This earlier phase of the settlement was found only at the top of the mound. More specifically, it was found in trench Γ1 in the deposits which are located below the «destruction layer». This period is composed of 6 successive floors. Judging by the small hypsometric distances between these floors, they perhaps belong to a single habitation phase.

The information related to the pottery from this period, which is of relatively small quantity, comes exclusively from sherds which are often small in size. Whole vessels have not been found. Pottery from this period is characterised by dark colours: black, brown and reddish-brown. A small number of sherds have firing clouds. The sherds which prevail are monochrome polished, smoothed and to a lesser number have a rough exterior surface. The polished sherds are usually black in colour, and their polish is of excellent quality. The sherds with decoration constitute only 8% of the total. Sherds with impressed decoration made with fingers or some other tool, dominate. Sometimes impressed decoration appears with white incrustation. Sherds with incised decoration, with or without white incrustation have also been found, as well as sherds with raised decoration. The latter consists exclusively of ribbons. In addition, a very small number of painted ware (white on red) have been found.

The majority of vessels of the earliest period of the settlement belong to open shapes (Fig. 31: 4,5,7,8,9,11,14; Fig. 32: 1; Fig. 33: 1). In these, shallow and deep conical vessels dominate (Fig. 31: 4; Fig. 33: 1), whereas in closed shapes those with a vertical rim (Fig. 32: 7) and those with a converting upper part (Fig. 32: 6,10) are prevalent. A certain number of sherds which belong to strainers have also been found. Many of the vessels must have had a flat base, whereas very few must have had a ring base. A significant number of very short legs found, show that many vessels had legs. Although a very small number of handles were found (Fig. 33: 7-8), the majority of the vessels were without handles.

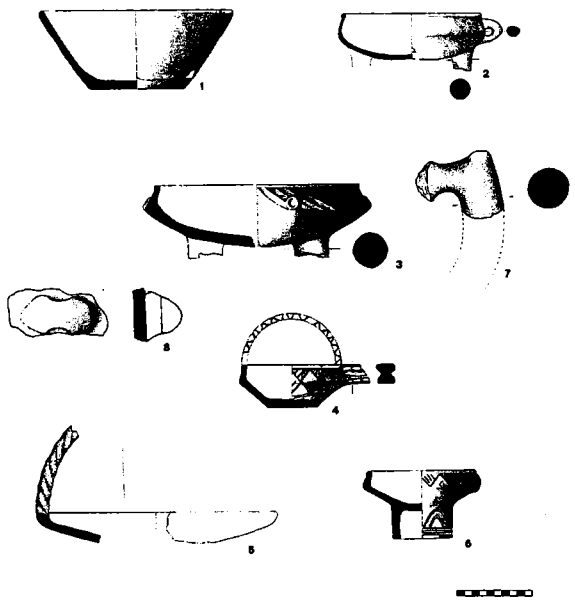

Fig. 33. Makri II: 1-6 plane and decorated open vessels. Makri I: 7, 8.

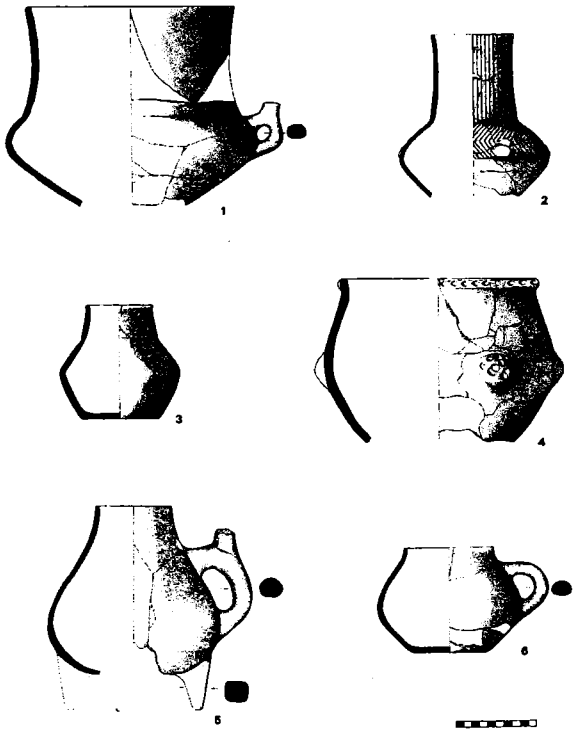

Fig. 34. Makri II - plane and decorated closed vessels.

1.2 The typological characteristics of Makri II

This later cultural period of the settlement is comprised of four habitation phases, starting from the surface of the soil. The ceramic features of the first habitation phase are still not known because these were not found in excavated trenches which are presented in this work. The pottery of Makri II shows characteristics similar with those of the earlier period. The vessels of this period continue to have the same dark colours: black, brown and reddish-brown; monochrome polish and smooth sherds prevail, while those with a rough exterior surface are much fewer. The latter are encountered mostly in the coarse ware category. The quantity of decorated sherds increase in this phase. The shapes and decorations from the earlier period (Makri I) continue to be present but some new elements appear:

1. sharp carinated open and closed vessels (Fig. 31: 6; Fig. 32: 2,8; Fig. 34: 2,3)
2. plates with thickened rim (Fig. 31: 2; Fig. 33: 5)
3. vessels with legs of medium height (Fig. 34: 5) and vessels with high cylindrical legs (Fig. 33: 2,3)
4. pedestal open vessels which always have incised decoration with white incrustation (Fig. 33: 6)
5. black and red topped vessels
6. vessels with horn handles (Fig. 34:1,5)
7. channeled decoration which always decorate carinated open and closed vessels, as well as the rim of the thickened rim plates (Fig. 33: 3,5; Fig. 34: 2)
8. there is a greater variety of raised decoration. For the first time there appear pellets which often have finger impressions (Fig. 34: 4)
9. painted sherds are extremely rare and differ from those of the earlier period (Makri I) both in terms of the colour of the vessel's surface as well as decoration. As a rule, decoration is not saved. Some linear motifs with a matt surface on polished vessels can, however, be discerned. Just a few sherds decorated with graphite were found.

It is interesting to note that these innovations do not appear simultaneously. Thus, from the fourth habitation phase some of the new elements start to gradually appear: channeled decoration, sharp carinated vessels and plates with thickened rim. It must be emphasised however, that the pottery from this habitation phase is very small in quantity since it comes exclusively from trench Γ1. During the third habitation phase the elements which have been aforementioned appear collectively. Something which continues in the following second habitation phase.

The quantitative analysis of the material shows that the closed shapes in the later period of the settlement (Makri II) are fewer in number in relation to the open shapes. It is observed that both large and small vessels appear with the same shape. The majority of the pots of Makri II have flat bases of which very often there is mat imprint. A similar use of mat was also discerned in the earlier period (Makri I).

Judging from both the shape and the well burnished surfaces, many of the vessels at Makri belong to table ware. Although all the sherds were carefully examined, especially the bases, no clear evidence was found concerning the use of vessels as cooking pots. Microscopic analysis did not help in the recognition of cooking vessels since most of the fabric types were suitable for such types of vessels (Yiouni 1995, 620). Nevertheless, evidence exists that vessels of a certain type (Fig. 34: 4) could very well have been cooking pots. Vessels of this type are encountered in medium or course ware. These have a smooth or rough, brown -coloured exterior surface. Their shape is smooth without sharp contours, suitable for their repeated use on the fire (Rice 1987, 237). As a rule they are decorated with either finger or some type of tool impressions, or they have raised ribbons or pellets with finger impressions. The absence of sooting and blackening on the bases is perhaps an indication that cooking vessels were not suspended over the fire but rather were placed in the fire, in which case sooting and blackening would have been present on the sides of the pot (Skibo 1992, 159, Rice 1987, 235). As, however, the majority of the ceramic material of Makri consists of sherds it is difficult to attest that some of the firing clouds which we often come across in all the wares were a result of the repeated use of the pot as a cooking vessel and not a result of the conditions at the time of firing the pot. Petrographic analysis of the sherds of this category as well as residual analysis could shed some light on the problem concerning the use of the vessels at Makri, while the experimental approach could help in better understanding the ways in which pots were used, especially in the case of cooking ware.

2. Pottery technology

This brief report on the technology of the pottery from Makri is based on the results which came from the microscopic analysis of 30 thin sections done by Dr.P.Yiouni (Yiouni 1995) and the macroscopic examination which was done by the author. Since microscopic analysis preceded the typological analysis of the material this has resulted in some questions having remained unanswered. Furthermore, microscopic analysis was done only on the pottery of the later period of the site (Makri II), and consequently the quantity and quality of the information for all the phases of the settlement are not equal.

2.1 Fabric types

The petrographic analysis of thin sections showed that the potters from Makri used 6 fabric types during the later period (Yiouni 1995, 609-620). All 6 fabric types were available within the vicinity of the settlement (the more distant possible sources are about 9 km from the site). Yiouni

did not ascertain a relationship between fabric types and ware categories which means that the potters from Makri did not choose particular fabric types for the manufacture of particular types of vessels. The only exception are the vessels with raised decoration for the manufacture of which chaff-tempered fabric type A was used (Yiouni 1995, 620). The characteristics of non-plastic inclusions (roundness) indicate that the potters from Makri did not add temper to the clay. The only type of non-plastic inclusion which was added to the clay is chaff temper.

2.2 Forming techniques

The main technique used for the manufacture of the vessels was coiling. This method is very easy to recognize since many pots are fractured along the junction of coils (the surface of coils shows that these were too dry when joined). Besides the coiling method there are indications that at least for a number of the large storage vessels was used slab modeling (Rice 1987, 125). One cannot exclude the possibility that the pinching method was used for the manufacture of very small vessels. However, Makri vessels were carefully finished so that marks of the primary manufacturing techniques were obliterated by subsequent treatment. This is the reason why it is difficult to recognize the use of the pinching method.

For the manufacture of a great number of the Makri vessels, mats as well as woven material were used. The great number of the bases with mat imprints, their deep relief and in many cases attempts to obliterate the mat impressions indicate that mats were used during the building of the pot (for supporting or rotating) and not during the drying stage. There are a lot of ethnoarchaeological examples of similar use of mats (Rye 1981, fig. 42). Three kind of mat imprints used for the manufacture production of Makri vessels, have been distinguished on the pottery studied so far, whereas more kinds are yet to be recognised, varying through space and time. Despite the homogeneity observed in the pottery forming techniques, the identification of mat imprints could demonstrate intra-site variability, providing more detailed evidence for the study of pottery production. The association of the latter with the household level of activities is one of the main targets of the pottery analysis. One of the main issues that requires further investigation regards the vertical and horizontal distribution of mat imprints within the habitation phases recognized at the site.

2.3 Surface Treatment

The vessels from Makri do not display great variability as far as colour, decoration and surface treatment are concerned. The great majority are monochrome (black and brown shades) with polished and smoothed surfaces. The open vessels, especially those of a black colour have polished exterior and interior surfaces. The closed black-coloured vessels on the other hand, have both the exterior surface and the upper part of the interior surface polished. On those vessels as well as on the black topped and red topped vases, polishing is usually of excellent quality. On account of the abundant number of pebbles which were found at and around the site, as well as the marks on some of them, polishing must have been done with such kinds of tools. On the vessels which were made experimentally the polishing was done with bone tools as well as with pebbles found at the site, with similar results. On the rest of the vessels, burnishing varies from high to low, while a significant number of the sherds have simply been smoothed. The differences in the quality of surface treatment should not be attributed to any differences in raw materials since, as has already been mentioned the same fabrics were used for the manufacture of the various pottery categories (Yiouni 1995, 616). In terms of surface colour, it seems (Yiouni 1995, 617) that the black surfaces of the black coloured, as well as the red and black topped vessels is due to the technique of smudging.

Although there is a variety of decoration techniques, the range of motifs is quite limited. Channel decoration, finger impressions or impressions with some sort of tools directly on the wall of the vessel (usually the rim), or on the raised ribbons and pellets prevail. Very simple incised linear motifs and punctuated ornamentations are present to a much lesser degree. Of special interest are the very few sherds which have been found with painted decoration. Only in three cases was the use of graphite ascertained. For the remaining painted sherds the substance with which they were painted is not known. Taking into account the characteristics of graphite painted ware from Romania and Bulgaria it is possible that the painted ware from Makri has also been decorated with graphite. In this case the graphite painted ware differs in terms of the quality of the graphite, its chemical components, and the technology of application and firing from those of the other sites of eastern Macedonia (Sitagroi) and connect this type of ware from Makri with similar wares from Bulgaria (Gardner 1979, Jones 1986, 768).

2.4 Firing

Information concerning the temperature at which the vessels from Makri were fired is derived only from the petrographic analysis, since the analysis of ceramics with SEM has not yet been done. The results of the petrographic analysis indicate that the vessels from Makri were fired at a temperature not higher than 750-800° C (Yiouni 1995, 618). A great number of sherds with firing clouds indicate that vessels were fired in direct contact with the fuel, whereas the atmosphere of firing was not always under total control (Vitelli 1984, 123; Vitelli 1993, 9, Shepard 1976, 92).

3. Experimental approach

The experimental approach of the neolithic material of

Makri aiming at an understanding of the procedures followed by the potters for the manufacture of their pots is still at an early stage. In this first phase an attempt was made to construct neolithic pots based on the technological information collected from the macroscopic observations made. These pots were then fired in a kiln which was constructed on the prototypes of neolithic kilns discovered in the wider area of the Balkans (in particular, domed oven of a later neolithic period from Stara Zagora in Bulgaria). The selection of pots to be made experimentally was based on the variability of shapes recognized for Makri and in particular with relation to the later period of the site (Makri II).

In the performance of the experiments, participated the experienced potter Ivan Stoilov, who has been studying the technology of balkan prehistoric pottery for many years, as well as students from the Dept. of Archaeology at the University of Thessaloniki. For practical reasons, the experimental approach in this first phase did not strictly consult the technological information already available by the petrographic analyses, such as the use of clays from the possible sources of the area. One of the major targets of the experiments taking into consideration the known manufacturing techniques (e.g. coiling) was an attempt to ascertain the degree of specialization required with relation to a series of technological questions (surface treatment, decoration, firing, manufacturing and firing time, quantity of pots produced etc.). Due to the limited character of this paper only a general description of the experimental approach will be given.

1. The selection of clay was based on certain clay characteristics such as plasticity. Clays were collected from three different sites in 2 km radius around the settlement. This was followed by the preparation of the clay which included its cleaning done with the method of levigation. Clays with small inclusions were used for the manufacture of the vessels, whereas those with large inclusions were used for the construction of the kiln.
2. Based on the neolithic prototype, a domed kiln was constructed (fig. 35). The kiln was 1.10 m long x 0.98 m wide, and had an opening of 40 cm. Besides water, straw and grass were also added in the clay. The base of the kiln was elliptical and was construc-

Fig. 35. The experimental kiln with pots ready to fire.

Fig. 36. The potter Ivan Stoilov moddeling a pot.

ted by layers of clay and tiles. The kiln frame was made from branches which were then covered with a thick layer of clay. The surface of the kiln was then smoothed using a stone. The whole construction process was completed with the drying of the kiln which took 12 days.

3. A detailed macroscopic examination was made in the six samples of vessels chosen for the experiment, in order to ascertain their technological characteristics such as method of modeling, surface treatment, decoration (fig. 36). The modeling of the pots was done by the coiling method followed by surface treatment of rubbing, then smoothing and polishing for which various bone, stone and wooden tools were used. Some of these tools came from the neolithic sites of Bulgaria and others from Makri. This process lasted 3-4 days during which the potter continuously worked the surface of the vessel with either his hands or with bone tools, wetting with water and adding a thin solution of clay. The drying process, depending on weather conditions should take 15-20 days. In our case, however, due to lack of time the drying took much less time, with the outcome that many of the vessels cracked and broke during firing.
4. In order for the vessels to dry better before firing they were placed on the top of the already heated kiln for about 5 hours. Inside the oven the vessels were fired for 35 minutes to 1 hour in direct contact with the fuel. These vessels which were to acquire a black surface, were covered with grass for a few seconds as soon as they were taken out of the kiln. Some vessels broke during the firing stage, mainly because they had not been dried properly. Approximately 50% of the vessels were successfully fired.

Discussion.

The pottery study at the present stage has brought forth the following results:

1. The pottery shows a stable tradition without any major, important changes in the entire life-span of the settlement. The minor changes in technology and typological characteristics of the pottery that appear were not especially helpful in resolving the problem of the synchronisation of the settlement's habitation phases. Nevertheless, there was sufficient evidence for the separation of the settlement into two cultural periods: the earlier phase Makri I and the later and main phase Makri II. The quality and the quantity of information regarding the pottery of the two periods is not the same since Makri I had a significantly fewer number of sherds in comparison to the later period. Moreover, microscopic analysis of the pottery was done only for that of Makri II, which has resulted in an incomplete picture of the technological characteristics of the pottery found on the entire site.
2. On the basis of the excavation data so far, it is obvious that the neolithic settlement of Makri did not occupy the same area in all habitation phases. Thus, the top (A) appears to have been inhabited without significant hiatuses, neither between cultural periods, nor between habitation phases. The slope (B), on the other hand, has evidence of habitation during the Makri II period, particularly during the 2nd and 3rd habitation phases of this period. The pottery study of the so-called peripheral area (Γ) confirms that this section of the settlement was inhabited at the later period of the site (Makri II) in particular during the 3rd and 2nd habitation phases. Thus, one could say that the peak of the settlement, at least, as far as the use of the space on the mound of Makri is concerned, relates mainly to the 2nd and 3rd habitation phases of the later cultural period.
3. The attempt to interpret the use of the spaces and in particular the "complex area" on the basis of pottery, presents, unfortunately many difficulties. The reasons are that both the excavation in this area and the pottery study (especially the study of the variety of vessels and the study of their capacity) has not been completed. Nevertheless, some general characteristics of the pottery (see III) allow for its differentiation from the other excavated areas of the site. However, as far as the types of vessels are concerned, it can be seen that all the categories are represented. This ascertainment may confirm the communal character of the space. Possibly the study of vessel capacity and the quantitative analysis of the pottery could provide evidence regarding the common use of the space by the inhabitants of the settlement (such as use of the pottery on special occasions).
4. The technological analysis of the pottery shows that the potters of Makri had a high level of know-how. This is indicated by the large number of vessels of high risk shapes difficult to build and fire successfully. The carinated shapes, the vessels with high cylindrical legs, all excellently polished, and with uniform surface colour, required skill and knowledge.
5. The typical characteristics of the pottery from the phase Makri I have till now not been encountered at any of the excavated sites in Aegean Thrace. At all these sites the neolithic period starts with the characteristic pottery of Makri II. In accordance with the data published so far on ceramics from Aegean Thrace and eastern Macedonia, the Makri period II site is contemporary with the phases of the site of Paradimi I, II, III (Bakalakis, Sakellariou 1981) and the site of Sitagroi (Renfrew, Gimbutas and Elster 1986). This relative chronology places Makri I in the first half of the 6th millenium, while Makri II after 5500 BC (cal).
6. The experimental approach of neolithic pottery,

which was more of a *learn by doing* approach, was based on the technological observations previously made. In spite of the limited objectives, which had been set at this stage, the experimental approach showed that : a. the level of specialization of the potters, the quality of the pottery and the standardization of the vessels indicate that they cannot have simply been the results of household production. b. The quantity of production at the settlement level was not large, nor constant and most likely it was seasonal. c. The time required for the manufacture and finishing of the pots was long and demanded the full-time occupation of the potters for particular periods of time. d. The characterization of the ceramic production as a specialized activity requires further discussion. e. The archaeological identification of tools used for the production of pottery, and in particular tools used for polishing and smoothing, is precise. When considering the vessels found at Makri and also the kilns which have been found in the wider area of the Balkans, it is quite likely that the firing of the pots was also feasible in an oven.

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V. BONE ARTEFACTS FROM MAKRI
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INTRODUCTION

The study of the bone artefacts aims to approach social and economic aspects of the prehistoric community. Such an attempt would be achieved by the synthesis of the information provided by the analysis of the bone artefacts in three levels:

1.– *The composition of the material*

This level of analysis refers to a multilevel study of the material, including two basic stages. The first one is related to the classification of the sample in:

a. Kinds of products, that is finished products and by-products of manufacture.
b. Classes of finished products, means implements and other objects of special use, and
c. Groups of finished products.

The classification lies fairly on morphofunctional criteria, such as the form of the active edge and the degree of modification of the raw material (e.g. pointed tools on complete shafts of long bones or on split long bones, cutting-edged tools on complete or on split ribs) along with special characteristics of the objects (e.g. perforations).

The second stage is associated with to the microscopic examination of the material. The analysis of the observed wear patterns combined in many cases with other criteria, such as the form of the artefact's shaft or the size of the tip, leads to the identification of potential artefact functions (e.g. hide perforators or manipulators in the related crafts of weaving, mat-making and basketry, hide rubbers, wood gouges). Thus, the study of the bone artefacts touches a range of diversified productive activities of the community (e.g. craft and food-getting activities) and related techniques of production or, further, habits of personal, not unusually, symbolic decoration (e.g. bone or teeth pendants).

2.– *The behavior of the material in space and time*

The analysis at this level focuses on the distribution of the (classified) material in terms of space and time. In this sense, multiple results are expected, such as indications of working areas inside or outside the settlement, specific places of production in relation to housing, back yards and public spaces, or, further, changes through time concerning certain fields of the production and the organizational level of productivity. The aforementioned consist issues of considerable social and economic significance. Their promotion may enable further contemplations concerning the character of production on an intra- and/or inter-settlement level.

3.– *The production of bone artefacts*

This process of analysis deals with the degree of correlation between the raw material or the degree of its modification and the morphofunctionally determined groups of artefacts (finished products), e.g. use of split distal metapodials for the manufacture of pointed implements appropriate for the piercing of compact materials, such as leather. By this, the aim is not simply to understand the techniques involved in bone manufacturing. It is mostly intended to enlighten the issue of a potential standardized and/or controlled production of bone artefacts. Furthermore, conclusions could be reached regarding craftsmen specialization in bone working and beyond, in addition to any possible social implications related to that.

THE MATERIAL

The sample and the raw material

This preliminary report is lying on an assemblage of 114 artefacts. Animal bones have been used as raw material for the manufacture of the great majority of them, that is for 108 out of 114 specimens. In contrast, only four objects are made on parts of antler and two more on (animal) teeth.

The stratigraphic context

The deposits associated with the older cultural phase of the site, that is the phase Makri I, have produced a very small sample of three artefacts, all made on bones. On the contrary, a rather numerous sample, that is 111 specimens in total (105 on bones; 4 on antler; 2 on teeth) have been

recovered in the deposits attributed to the cultural phase Makri II, which comprises the habitation phase one, two, three and four. Unfortunately, sixteen (16) out of the 111 artefacts, assigned to Makri II, have been unearthed in disturbed deposits of the top (A) sector of the site (i.e. square B3: 2; B4: 2; Γ1: 9); owning to that, they cannot be further ascribed with any validity to a certain habitation phase of Makri II. Otherwise, twenty six (26) specimens, all from the top (A) sector (i.e. square B2: 8; B7: 16; Γ1: 1) have been uncovered in deposits related to the habitation phase one. Thirty two (32) other artefacts are assigned to the deposits of the habitation phase two: the largest part of them, more precisely 30 specimens, is provenanced in the deposits of the top (A) sector (i.e. square B1: 6; B1/B8: 1; B2: 4; B7: 5; B11: 7; Γ1: 7), while the remaining two artefacts came from the deposits of the slope (B) sector (square Δ2). Furthermore, in deposits associated with the habitation phase three 21 specimens have been uncovered: eighteen (18) of them have been originated in the deposits of the top (A) sector (i.e. square B2: 2; B7: 3; B11: 8; Γ1: 5), while the remaining three from the slope (B) sector (square Δ1). Finally, sixteen (16) other artefacts have been found in deposits attributed to the habitation phase four: the majority of them, that is 14 specimens, is related to the units assigned to the top (A) sector (square B7: 4; B10: 5; B11: 5), while the remainder two to the slope (B) sector (square Δ2).

CLASSIFICATION OF THE MATERIAL

Finished products and by-products of manufacture

The great majority of the artefacts under consideration, in particular 110 out of 114 specimens, represents finished products of manufacture (104 on bones; 4 on antler; 2 on teeth).

In contrast, only four artefacts have been identified as by-products of manufacture. Particularly, three specimens are fragments of long bones, more precisely metapodials of large animals; splinters, served as blanks for further manufacturing, have been extracted from them by the controlled technique 'grooving-and-splitting', as indicated from still recognizable marks: two of these specimens have been recovered in deposits of the top (A) sector of the site (square B7), related to the habitation phase one and two; the third specimen is originated in deposits of the slope (B) sector (square D1), assigned to the habitation phase three. Finally, the fourth specimen represents a by-product of the antler manufacture: it is a tine, most probably, from a red deer antler with grooving marks on its basal part, indicating the applied technique, through which the removal of the tine from the beam has been effected; the artefact has been found in the deposits of the top (A) sector (square B7), which are related to the habitation phase one.

The presence of few by-products of manufacture in chronologically different deposits of Makri implies that the bone working constitutes a craft activity among others of the site. It is worthmentioning that Makri shares the law quantity of this artefact category with many other neolithic settlements, such as Nea Nikomedeia, Servia, Dimitra, Dikili Tash, Prodromos or Pevkakia-Magula in Northern Greece (Christidou 1997; Seferiades 1992; Stratouli 1998). Such a sparseness might be accounted for, in many cases, including that of Makri, neither by the recovery methods nor the insufficient identification of the unearthed bone material. It seems more likely that the quantity of the by-products of bone manufacture depends on a range of factors, concerning, among others, the potential law rate of the waste involved in the bone working (an aspect considerably different from that of the stone manufacture) and the places of both the bone manufacturing and the deposition of the (bone) waste. In this sense, it is expected a lacking of waste products in areas of the settlements, where the intensive everyday activity of the settlers takes place. Furthermore, in such a case, the scarcity of the by-products of manufacture might be related with the removal of the waste from the places of bone working and/or might implicate specialized, most probably non-excavated, areas for the bone manufacturing (and related crafts), located outside the residential space of the settlement (see also Christidou 1997, 145-146).

The finished objects (Makri I: 3; Makri II: 107)

Six out of 110 finished objects, all from the deposits associated with Makri II, particularly three made on bones (two from the top (A) sector of the habitation phase one; one from the same sector of the habitation phase two), two others on antler (from the top (A) sector of the habitation phase one and two respectively) and one more on a tooth (from the top (A) sector of the habitation phase three), due to poor preservation, cannot be further classified.

The great majority of the artefacts under discussion, that is 104 specimens in total, would be divided in the following two classes:

1.–Tools, means implements, which have been served for a range of craft and food-getting activities. They represent the most numerous class of the bone artefacts assemblage of Makri, that is a total of 102 specimens (ca. 92%), all made on bones. Except from three specimens recovered in deposits of Makri I, the great amount of these implements, that is 99 specimens, have been originated in deposits associated with Makri II (disturbed deposits: 16; habitation phase one: 20; habitation phase two: 28; habitation phase three: 19; habitation phase four: 16).

2.– Objects of special use. Only two fragmentarily preserved specimens can be attributed to this class. Their general form in combination with the presence of one or more perforations allows the assumption that they have served special purposes of a functional and/or symbolic character. They could be considered as elements of personal decoration, like pendants or 'belts', possibly underlied by a 'magic-religious' meaning for their users (e.g. amulets).

One of these objects represents a multiple perforated

canine of a (male) sus scrofa. It has been unearthed in deposits of the top (A) sector of the site (square B2), which are related to the habitation phase one.

The other specimen is a fragment of a perforated object, made on an antler splinter. This artefact has been uncovered in deposits of the slope (B) sector (square Δ2), associated with the habitation phase two.

The tools (102 specimens).

Based on morphofunctional criteria, such as the shape of the active edge of the implements and its modus operandi against the worked surface, the tools of Makri are divided into the following categories:

1.– Tools with a pointed active end (points): 53 specimens (Makri I: 2; Makri II: 51).

2.– Tools with a transverse cutting edge: 48 specimens (Makri I: 1: Makri II: 47).

3.– Tools with a lateral cutting edge ('knives'): one specimen (Makri II: habitation phase three).

1.– *The pointed implements (53 specimens)*

The numerous pointed implements of the site can be subdivided into the following groups according to the used raw material (anatomical part and animal size), the degree of its modification through manufacturing and the presence of particular morphofunctional traits (e.g. perforations):

1.1.– *Points on long bones* (47 specimens: Makri I: 1; Makri II: 46)

a.– Points on split proximal or distal metapodials with the half of the epiphysis as basal end (five specimens: Makri I: 1; Makri II: 4)

As raw material for the manufacture of the implement from the deposits of Makri I has been used a sheep/goat-sized proximal metapodial. Two of the Makri II specimens are made on metapodials of sheep/goat size (i.e. medium-sized animals), while the remaining two on metapodials of large animals, that is of red deer/bos-size and/or *Dama dama* (disturbed deposits: 1; habitation phase one: 2; habitation phase three: 1).

b.– Points on shaft fragments of long bones (29 specimens)

This group actually consists of a number of dissimilar tools as for both size and shape. Splinters of long bones, mainly metapodials, of large animals have been used as blanks for the manufacture of 23 out of 29 specimens, while in six other cases splinters of long bones of medium-sized animals have been employed. All the implements of the group are attributed to the deposits of Makri II (disturbed deposits: 2; habitation phase one: 4; habitation phase two: 13; habitation phase three: 6; habitation phase four: 4).

This group, however, includes a homogenous artefact assemblage, that is the so called 'Makri-points', which are quite characteristic of the deposits of the habitation phase two, three and four of Makri II. These artefacts, made on splinters of metapodials of large animals, represent long implements with a rounded shaft. Judging from the observed unevenly distributed wear along the upper and middle shaft along with the patterned discolouring of the bone surface, it seems likely that they were hafted during use and have probably served special utilitarian purposes (fishing activities?, elaboration of vegetable fibers or other organic materials?).

Eleven more fragmentarily preserved pointed implements cannot be validly attributed to one of the aforementioned groups a or b, because of lacking of evidence concerning the form of their missing base. They have been originated in the deposits of Makri II (disturbed deposits: 4; habitation phase two: 4; habitation phase three: 3).

Finally, two more artefacts in a poor state of preservation, related to the deposits of Makri II (disturbed deposits: 1; habitation phase one: 1), represent most probably fragments of pointed implements. They cannot be ascribed to a particular group of points.

1.2.– *Points on split ribs* (six specimens: Makri I: 1; Makri II: 5)

a.– *Perforated points – needles* (two specimens)

This group comprises of fragmentary pointed implements with a perforation near the basal end. According to their morphofunctional characteristics and the observed use wear along the shaft, these specimens could be considered as 'needles', serving purposes other than sewing. They are provenanced in the deposits of Makri II (disturbed deposits: 1; habitation phase four: 1).

b.– *Points on shaft fragments of split ribs* (four specimens: Makri I: 1; Makri II: 3)

The group consists of poorly preserved artefacts, which actually might be ascribed to morphofunctionally different groups of implements, such as this of the bi-points or that of the needles. Split ribs of large animals have been employed as blanks for their manufacture. These specimens were found in deposits related to both the cultural phases of the site, that is Makri I and Makri II (one specimen in each of the habitation phases one, two and three).

2.– *The cutting-edged tools (48 specimens)*

Judging from the used raw material and the degree of its modification, the numerous tools with a transverse cutting edge from Makri would be subdivided in the following groups:

2.1.– *On long bones* (44 specimens: Makri I: 1; Makri II: 43)

a.– *On complete (unsplit) shafts of sheep/goat-sized tibias* (41 specimens: Makri I: 1; Makri II: 40)

This is a significantly homogeneous group, including implements similar in both form and size. They are sufficiently representative in all the habitation phases of Makri II (disturbed deposits: 7; habitation phase one: 11; habitation phase two: 8; habitation phase three: 7; habitation

phase four: 8). These implements represent a quite common tool group among the neolithic sites of the Aegean as well (Moundrea-Agrafioti 1982; Seferiades 1992; Stratouli 1993; 1998).

b.– On split long bones of large animals (two specimens)

Few artefacts fall into this group. They have been recovered in the deposits associated with the habitation phase three and four of Makri II.

2.2.– On ribs (four specimens, all from Makri II)

a.– On unsplit ribs of large animals (one specimen from the habitation phase one)

b.– On split ribs of large animals (three specimens: disturbed deposits: 1; habitation phase four: 2).

DISCUSSION

1.– *The production of the bone artefacts*

The presence of few by-products of the bone and antler manufacture in the excavated deposits of Makri provides enough evidence, as it has been already discussed, to support the conclusion that the bone working has been carried out in the area of the prehistoric settlement. Furthermore, it seems likely that the settlers of the site were involved in this task as producers and even as owners and users of the finished products of bone manufacture.

Nevertheless, it is reasonable to raise questions about the recorded scarcity of the bone waste. Among a number of depositional and even post-depositional processes, which might be responsible for such a sparse evidence, the possibility is to be examined that the bone working has taken place in particular areas of the settlement, even perhaps outside the residential space. Such areas might have operated as loci ('workshops') for the promotion of a range of prescribed productive activities.

Moreover, a substantial management of the raw material used in the bone manufacturing, as indicated among others from the selection of particular anatomical parts and the application of time-consuming techniques of precision for the extraction of appropriate blanks, implies a planned production of particular tool groups. Additionally, such a production is suggested as well by the observed high standardization of both form and size, concerning largely the same as above tool groups, such as this of the numerous cutting-edged implements made on complete shafts of sheep/goat-sized tibias or that of the so-called 'Makri-points'.

As to the issue of the involvement of craftsmen in the bone manufacturing, the assemblage of Makri seems efficiently supportive. Specifically, the extraction of long shaft fragments from metapodials of large-sized animals, which have served as blanks for the manufacture of the characteristic for the site 'Makri-points', necessitates experience and special abilities. In general, it would be assumed that few individuals might have participated in, or better, even in the production of certain categories of bone tools. These craftsmen would cover the particular needs of a broader social unit than this of the nuclear family. They were been occupied in the productive projects of the community most probably for over a short period of time. In any case, it is rather obvious that such an occupation of craftsmen in particular tasks coincides with an advanced division of labour within the community, which consequently presumes existent arrangements in a social and economic context.

2.– *The functions of bone tools*

Even if the microscopic study of the assemblage under examination is still in progress, we would proceed to some preliminary remarks on the potential functions of certain tool types, based mostly on morphofunctional and dimensional criteria of the active edge and its macroscopically detectable use modification.

A small amount of the pointed implements could have been effectively used as perforators in hide working. Similarly, few are the pointed tools, which might have been served as manipulators in the related crafts of weaving, matmaking and basketry. If this evidence is reasonable, it follows that the bone industry of Makri may contrast markedly with the tool assemblages from other neolithic sites, in which high percentages of the aforementioned functional categories of tools are recorded, such as Nea Nikomedeia and Dikili Tash in Macedonia, Agios Petros in the Northern Sporades, or Sesklo, Dimini and Pevkakia-Magula in SE Thessaly, or, even, the cave 'Skoteini' in Tharrounia of Euboia (Efstratiou 1985; Moundrea-Agrafioti 1982; Seferiades 1992; Stratouli 1993; 1998). A reliable reasoning for such a differentiation of the assemblage of the site cannot be provided on the present stage of the research. However, questions are arising about the structure of the production and the location of the crafts and the activities, such as hide work or basketry, correlated with the tool categories under discussion (e.g. specific, non-excavated intra-site or extra-site areas?).

The rather numerous group of the pointed implements called 'Makri-points' is characterized by a consistent, nearby continuous representation in the deposits of Makri II (excepting that of the habitation phase one). The formal and dimensional homogeneity of these highly skilled tools implies that they have served special purposes in supporting particular crafts or activities, which most probably were closely related to and benefited by the specific ecosystem of the site (e.g. existence of particular sources of worked materials).

The cutting-edged tools are quite sufficiently representative in all habitation phases of Makri II. A high proportion of these tools exhibits a markedly use modified edge, specifically a highly chipped one. This wear evidence points to the assumption that a great number of the cutting-edged tools of Makri may have been used as gouges or chisels in wood working (see Campana 1989, 59-62). Otherwise, few of the cutting-edged implements could have been involved

in the hide working, serving as hide compressors or rubbers.

Finally, the significant scarcity or, more better, the lacking of evidence concerning a range of functionally specific categories of antler tools along with that of the antler hafts is to be underlined.

3.– *The behavior of the assemblage in time and space*

The most numerous and morphofunctionally characteristic tool groups of the bone industry are quite homogeneously, in terms of both quality and quantity, distributed through the habitation phases of Makri II. Thus, the existent data do not suggest any time-specific differentiation concerning the acquisition of the needed bones (i.e. particular anatomical parts), their manufacturing, the composition of the tool assemblage, and most probably the techniques related to particular crafts and activities, in which specific bone implements were involved.

As to the issue of the spatial distribution of the bone tools, the majority is recorded as been originated in the squares associated with the top (A) sector of the site. More specifically, as far as the habitation phases are concerned, in the habitation phase one a significant amount of tools has been recovered in the squares B2 and B7, in the habitation phase two in the squares B1, B2, B7, B11 and Γ1, in the habitation phase three in the squares B7 and B11, and finally, in the habitation phase four in the squares B4, B10 and B11. A relatively high concentration of cutting-edged implements has been unearthed in the deposits of the squares B10 and B11, which are related to the older habitation phase of Makri II, that is the habitation phase four. On the other hand, a significant concentration of pointed implements has been found in the deposits of the square B11, associated with the habitation phase three.

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VI. THE CHIPPED STONE INDUSTRIES OF MAKRI. DOMESTIC CONTEXTS OF TOOL PRODUCTION AND USE.

K. SKOURTOPOULOU

INTRODUCTION

The chipped stone industries of Makri comprise together with other kinds of production a set of data rich in information on the everyday routinized practices taking place on-site. Makri, a settlement with impressively preserved domestic architecture has also proved very fruitful in yielding evidence on chipped stone production. The knapping remains of the site reach at least the number of 5000 products most of which are clearly associated with domestic architecture deposits (mainly house floors from indoors areas). Although the study of the chipped stone data is still on progress, most of the material is now recorded and analysed. The results presented here account for the largest part of the Makri II material and almost all of the Makri I.

My main focus has been the reconstruction of all the possible steps the chipped stone products have gone through, during their manufacture, use and discard, and their contextual associations horizontally and vertically. I hope that the presentation of varied sets of activities related to flaked stone production and use, will contribute in starting a discussion on the practices and roles undertaken by the community together with some assumptions on the site structure.

1. THE ASSEMBLAGE CHARACTERISTICS.

1.1 Raw material variability and procurement.

The petrography of the rock qualities used in the industry of Makri is largely homogeneous, characterized mainly by high quality flints (fig. 37). The material most frequently used corresponds to a translucent or semi-translucent quality of flint of highly homogeneous, thin textured nature, of milky grey, yellowish, "honey" or black colour and an orange and black variety of lower quality. Reasonably high is also the presence of a high quality opaque flint, with colour varying from light bluish grey, to beige grey, dark grey or black.

A number of sources related to some of these materials, in the form of surface concentrations and zones inside pyroclastic rock beds, were located during a small survey in the vicinity of the site, not surpassing 30 km. in radius[1]. However, whilst there seem to be abundant sources of the opaque beige to bluish grey flint and the low quality orange and black one, no source has been located for the high quality transparent milky grey or honey coloured flint. This could be expected further north, as implied by recent petrographic research on the flint sourcing of northern Greece (Dimitriadis, Skourtopoulou, under publication). Moreover, the fact that whole cores are found abandoned at the site implies a rather reasonable distance for carrying this material.

Apart from these dominant varieties of rocks, there is a restricted representation of other categories (fig. 37) including, among other, an increased percentage of low quality quartz, an excellent quality of opaque flint of clear olive colour - related to the high skilled manufacture of a specific kind of blade tools. Finally, in very small amounts, not surpassing the 0.5% there are varieties reminding the radiolarites of western Greece (categories i, j in fig. 37), and two macroscopically distinguishable varieties of obsidian.

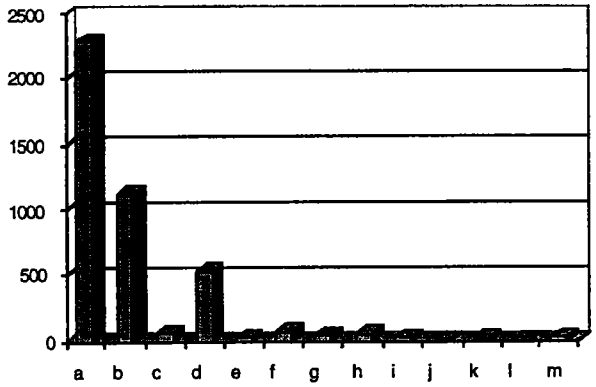

Fig. 37: Variability of the raw material categories according to their macroscopically detectable characteristics. a= translucent to semi-translucent milky grey flint, b= semi-translucent honey coloured flint, c= mixed opaque/translucent honey to orange coloured flint, d= opaque grey to beige flint, e= quartz, f= olive flint, g= mustard flint, h= chalcedony, i= "smoke -grey" obsidian-like flint, j= dark purple jasper, k= quartzite, l= orange coloured silica rock, m= obsidian.

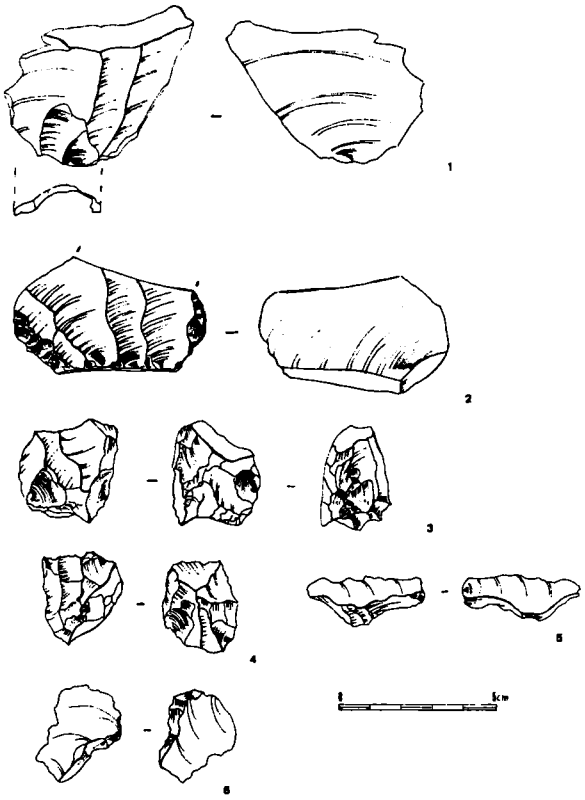

Fig. 38: 1, 2: Large rejuvenation flakes of blade cores, the second turned into a scraper as secondary use, beige grey flint, Γ1 # 3, # 12. 3, 4: Exhausted cores, combining the debitage of bladelets and small flakes, semi-translucent, milky grey and black flint, B11 # 16, Γ1 # 28. 5, 6: Flake "tablets" for the rejuvenation of core platform in blade cores, semi-translucent "honey" and black flint, B11 # 16, Γ1 # 3.

The petrographic examination of a number of samples representative of the dominant rock types in use, by polarizing and scanning electron microscopy, has shown a clear representation of volcanic rocks, silicified plant materials and silicified carbonates (Dimitriadis, Skourtopoulou, under publication). These materials are largely compatible with the regional geology of Thrace which is characterized by a richness in volcanic rocks and silicified carbonates, while the presence of silicified plant materials is genetically connected to volcanic formations (ibid.). In addition to the petrographic analyses, chemical and NAA analyses have been scheduled for a number of obsidian samples[2] the majority of which seem, nevertheless, to be of Melian origin judging by their macroscopic characteristics.

1.2. The production stages.

Following raw material variability, distinct manufacturing stages of tool production procedures have been identified. The most abundant rocks in use, mentioned above, show very clear evidence of on-site production

Flakes, flake fragments and rejuvenation products rise in high frequencies for all of these categories while some variability has been observed for blade products, cores and waste which are also in significant amounts .

Flakes: A very large part of the flakes has been extracted as pieces necessary for the manufacture of tool blanks (i.e mostly blades), and they mainly correspond to a variety of products for specific technical tasks (e.g. rejuvenation of core platforms). Most of the flakes are not broken. They retain plain butts (*talons lisses*)[3], in most cases of quite large dimensions and of a vetical flaking angle, and they form sub-groups of various sizes related to the manufacturing sequences of core reduction. Flakes of the larger dimensions, sometimes retaining cortex, with blade and flake scars forming previous flaking core surfaces (*flanks*), and with proof of changing the orientation and continuing the exploitation of core (*reprises de nucleus*) are very common, as well as flakes subtracting the striking platfrom of –usually– blade cores (*tablettes*) (fig. 38).

The majority of flakes is grouped around 1.5 to 2.5 cm in length with, few products reaching 4 to 5 or even 7 cm. In addition, there is a restricted number of very small flakes (between 0.6 to 1.5 cm in length) which could be related to retouch or rejuvenation procedures (e.g. fixing the flaking angle of the core crest).

Blade products: Blades and bladelets are quite increased forming the main intentional toolkit of the industry (fig. 39). They vary in length and width, most of them grouped around 2.5 to 3.5 cm length while there are fewer products reaching 4 to 6 cm. Very few products indeed reach howe-

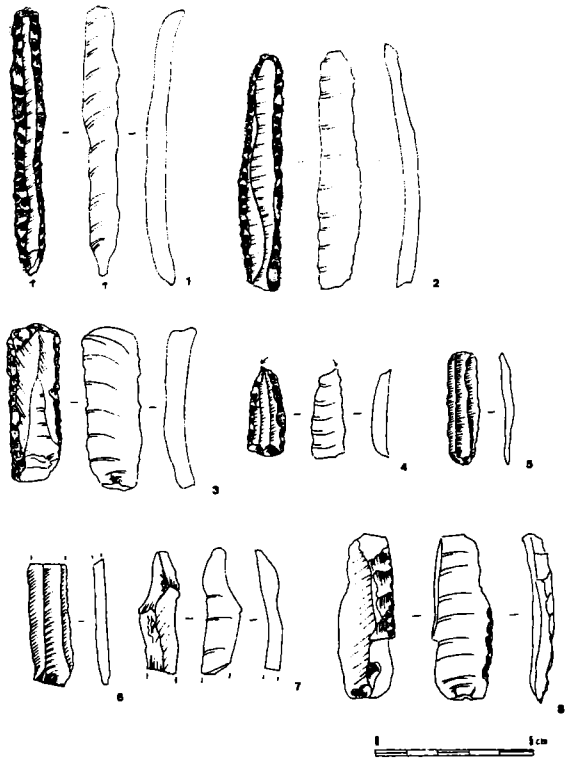

Fig. 39: 1. Blade with denticulated lateral retouch and perforating tip (borer, bec) retaining silica gloss, olive flint, B7 # 19. 2. Blade with denticulated lateral retouch retaining silica gloss, olive flint, B11 # 22. 3. Scraper and denticulated retouch on blade, beige grey flint, B5 # 6. 4. Perforating tool (bec) on blade, milky grey flint, B4 # 6. 5. Bladelet with plain butt and preparation scars under butt, beige grey flint, Γ1 # 5. 6. Proximal and medial blade fragment, with butt similar to previous product, same flint type, Γ1 # 2. 7. Medial and distal fragment of crested blade, beige grey flint, B5 # 6. 8. Rejuvenation blade changing debitage orientation and retaining core crest with partial semi abrupt retouch as secondary use, beige blue flint, B5 # 6.

ver 10 cm in length - especially the sickle blades from olive flint.

Most of the blades and bladelets have plain fairly large butts, straight profiles and three ridges, prooving a well advanced debitage of blade series. Their plain butts together with their rather thick, robust morhology and their vertical flaking angles, point towards the application of indirect percussion. However, there is a lower number of blades with flaked butts, steeper flaking angles and thinner, more slender morphology allowing assumptions on pressure flaking; apart from obsidian, for which pressure flaking is largely recongized (Perles 1984, Moundrea-Agrafioti 1981) these products are mainly related, however, to the obsidian and the smoke gray, obsidian like flint. In addition, there is some variation in blade morphology between the transparent flints and the opaque ones, for which the percentage of blades rises significantly and in general they are thicker and larger than the transparent ones.

A lot of the blade products are found incomplete, either as proximal, medial or distal parts, or missing a small part of both their distal and proximal ends. These fracture patterns are plausibly related to hafting and using procedures.

Cores: Cores are numerous and characterized by a progressed debitage leading to the almost final exploitation stage for a large part of them (fig. 38). Most of the cores are found either exhausted or abandoned because of bad raw material quality, as knapping is reaching the heart of the stone. An increased number of cores are either conical of one orientation, or slightly orthogonal with interchangeable debitage of many directions (*reprises de nucleus*) while there are very few cores indeed abandoned at an early stage of well progressing debitage. Most of the cores identified as being at a progressed, almost exhausted, stage of exploitation combine the debitage of blades or –more often– bladelets with flakes. Although these cores do not correspond to an efficent, highly controlled blade debitage and very few among them are trully *geometrical*, this might be due to their progressed, almost exhausted stage of exploitation. The high numbers of rejuvenation products bearing blade scars together with the recognition of the same rock qualities –in petrographic and knapping terms– for the largest part of both blades and debitage, point at the on site production for a large part of blades.

Following the variation described so far, similar patterns of on site production characterize also the debitage of

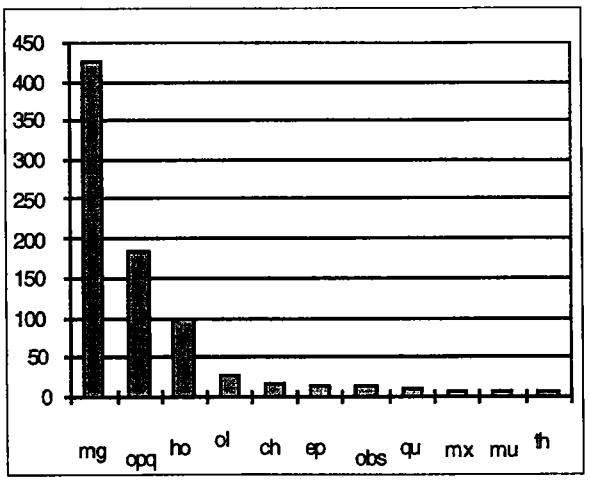

Fig. 40: Distribution of blade products (blades, bladelets and their fragments) among the various rock types. *Mg* = translucent to semi-translucent milky grey flint, *opq* = opaque grey to beige flint, *ho* = semi-translucent honey coloured flint, *ol* = olive flint, *ch* = chalcedony, *ep* = "smoke -grey" obsidian-like flint ("epirus" type), *obs* = obsidian, *qu* = quartz, *mx* = mixed opaque/translucent honey to orange coloured flint, *mu* = mustard flint, *th* = dark purple jasper ("thessalian" type).

chalcedony, quartz, quartzite and the small number of products made by mustard high quality flint. Quartz products, however, are characterized by much less controlled debitage, higher numbers of cortical products, and, as it is common elsewhere (Perles 1972, Skourtopoulou, under publication), quartz production is characterized by increased numbers of irregular flakes and splintered waste as a result of simple direct or bipolar percussion.

Apart from these materials, certain varieties of rocks found in restricted quantities are related exclusively to blade production (Fig. 40).

Taking into consideration the variability described so far, it could be argued that the flaked stone production of Makri is characterized by fairly high skilled procedures and a homogeneous level of applied technical knowledge. Although the intensification of these procedures is still to be questioned, the methods of core exploitation indicate an advanced potential of tool outcome. Differentiated technical skills and methods of flaking are recognized only for a very low percentage of the products. These refer to the highly standardized debitage of obsidian, grey transparent obsidian -like flint, olive flint and radiolarite. Apart from olive flint, the provenance of which could be regional judging by its petrographic structure, the rest of these groups are associated with rare rock types the provenance of which is either confirmed or expected to be non- regional.

1.3. Tool manufacture and use.

Although no systematic use wear analysis has been applied so far in order to get a more accurate picture of the amount and the morphology of the products used as tools, the examination, in the first place, of intentional secondary modifications (i.e. retouch) in the morphology of flakes and blades gives an idea of the average numbers of products deliberately turned into tools.

The overall percentage of these products is low (14.6%) and they are mainly formed on blades and bladelets. The main tool types recognized follow the common repertoire of neolithic industries. Scrapers on flakes, small scrapers at the edge of blades - sometimes in combination with "sickle blades" or with a denticulate retouch along the side, perforative tools (percoirs, and fewer becs), denticulated, "sickle " blades and bladelets, and " sickle elements ", form the most frequent tool types. In addition, there are partial abrupt or semi-abrupt retouches on flakes in lower quantities, a few backed blades, notched and truncated tools, and a few triangular pressure points, mostly atypical. Among the tool types, olive flint demonstrates a tendency towards the production of specific types of sickle blades and perforating tools (fig. 39), whereas obsidian is characterized by percoirs and partial retouches on bladelets.

In the second place, the recording of the macroscopically visible silica gloss along the edges of blade products in association with the presence of retouch gives us the opportunity to look into the use and maintenance patterns of tools specifically related to plant working activities, both inside and outside of the settlement, such as the harvesting of cereals, the clearance of fields by cutting reeds and grass, but also the making of shafts and arrows (Vaughan 1990, Perles, Vaughan 1983, Moundrea-Agrafioti 1983). The total percentage of products with visible gloss is low (3.4%) referring mainly to blade products (blades, bladelets and their fragments). More than half of the glossed tools are blade or bladelet fragments and more than half of them are "sickle blades" (*lames faucilles*) or "sickle elements" (*elements faucilles)* (Perles,Vaughan, ibid., Moundrea-Agrafioti, 1992, Camps-Fabrer, Courtin 1985) .

Signs of recycling are quite common among the sickle tools; approximately 1/3 of them reveals new retouch above the blunt glossed edge implying a constant care for tool maintenance. In addition, a small number of retouched blades and bladelets show completely blunt edges with no further attempt for resharpening at the time of the deposition.

Apart from traces clearly related with use patterns, there is an increased percentage of products bearing traces of and accidental "retouch" (14.3 %) and splintering (15. 2 %). The identified patterns of splintering (mainly negatives of small splinters vertical to the debitage axe, 1st degree according to Tixier 1963) and the association of these traces mostly with flakes, lead to their characterization as intermediate tools possibly for working on soft materials such as bone and wood (Moundrea-Agrafioti 1981: 129 -136, Keeley 1980: 40 -41).

2. THE CONTEXTUAL EVIDENCE: EVALUATION OF CHIPPED STONE ASSEMBLAGES WITHIN INTRA-SITE SPACE AND TIME.

The site of Makri has revealed numerous occupational phases of clearly recognized domestic activities by evidence of in situ architectural remains and distinctive sets of activities are inferred by the location of the various stages of chipped stone production, use and discard, in the horizontal and vertical axes of the site context.

The comparison of the different production stages between the various sub-phases of occupation of Makri II, as these have been distinguished for the sectors A and B of the site, gives us the first picture of the vertical variation of activities taking place on site. So, phase II-ii seems to be the predominant in terms of chipped stone percentages (fig. 41) implying rather intensive activities in association with the series of floors detected in the complex area, the rooms adjacent to it and the houses recognized in sector B (Δ1, Δ2).

The same pattern of lithic stages, from core reduction to discarded waste, is constantly repeated in all sub-phases reflecting complete tool production procedures taking place inside of the rooms.

Apart from phase II-ii, all the other sub-phases of Makri

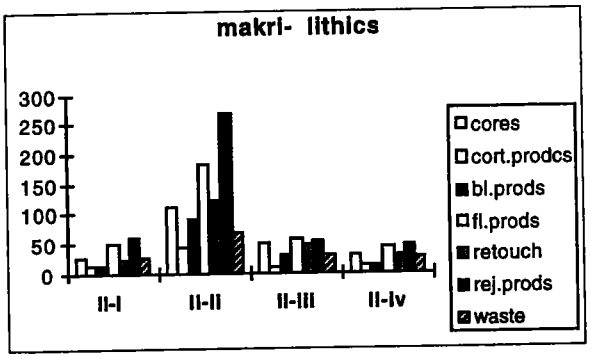

Fig. 41: The distribution of chipped stone stages among the various sub-phases of Makri II.

II are characterized by considerably lower amounts of material questioning the relative duration and significance of the various occupational episodes in the history of the site. Phase II-iii follows with considerable amounts of debitage whilst phase II-iv reveals very scanty debitage refuse and this might be due to the preservation of this phase, a very partially recovered deposit of destruction floors. A first comparison of debitage percentages with the volume of the excavated deposits for each phase, shows a rather direct analogy between debitage accumulation and size of the deposit, justifying thus the predominace of phase II-ii as a normal consquence of the more extensive excavation of these deposits.

Further than that, a first look into the spatial distribution of the chipped stone evidence between the various areas of the site during Makri II, shows variation in the quantities of products (fig. 42). The rooms of both top sector (A) and slope sector (B) are characterized by lower amounts in contrast to the series of successive floors revealed in the peripheral area which may signify differentiated activities, perhaps related to more intensive work processing or areas of discard.

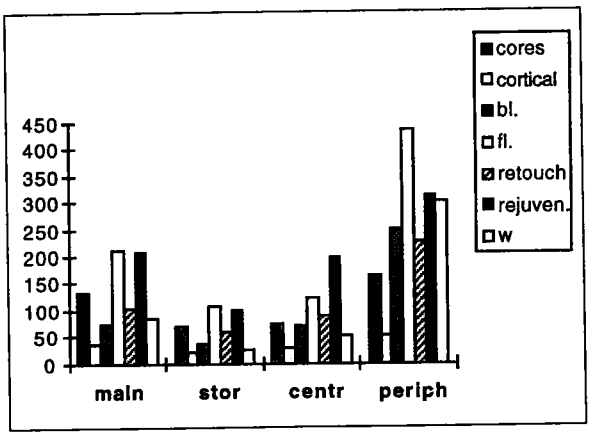

Fig. 42: The spatial distribution of chipped stone production stages among the various areas of the site (sector B -main, sector A- storage/central and sector Γ - periphery) during the period of Makri II.

Finally, moving at a broader scale, the comparison between Makri I and II, has shown no major differences in the variation between the tool production and use stages.The fact, however, that Makri I concentrates much higher amounts of chipped stone in comparison to Makri II, considering its restricted deposits, is intriguing and should be examined in the future as to the interpretation of this phase and its distinction from Makri II.

3. CONCLUSIONS.

The site of Makri offers impressive evidence of in situ activities related with the production and use of flaked stone. The rich deposits of chipped stone production and use revealed at Makri point towards local or regional networks of craftsmen/women. Skilled blade production using materials of local or regional origin marks the industries of the site at a great extent. On the other hand, the tools made by materials of obvious or expected non regional provenance are, for all groups but one, in very low percentages inadequate to engage in tool procurement networks of strongly economic character. To my opinion their presence in the site should rather be viewed in terms of communication networks the structure of which might be conceived within broader social interactions yet to be defined.

The only exception is the group of blade tools made by olive flint the increased number and high technical skill of which together with the absence of abudant evidence for their on site production might indicate a case of tool input in the site from elsewhere. However, the petrographical and technomorphological similarities of these tools with other from regional materials imply the possibility of these products being produced in terms of a regional inter-site network.

The discussion on the various patterns of activities related to the production of chipped stone benefits much by placing lithic production and use stages into context. The abundant presence of production and use debris in connection with closed, clearly delimited domestic spaces is very intriguing leading us to assume the integration of tool making with rather intensive procedures at the everyday level of mundane domestic activities. The association of debitage with impressive domestic architecture (carefully constructed, definitely covered, possible house floors) reveals a case where people make their tools inside their living spaces. While the vertical distribution of debitage for the sub-phases of Makri II seems to explain lithic variation in terms of the representation of the excavated deposits of each sub-phase, the horizontal variation of debitage among the various areas of Makri II underlines the increased accumulation of chipped stone production and use debris for certain areas of the site (peripheral area).

If these spaces, with increased accumulation of debitage, were open areas with no substantial traces of habitation it could be easily argued that such increased amounts of tool producing debris signify a workshop location. In Makri

obviously this is not the case. Tool producing debris is associated with carefully constructed clay floors and accompanied by clear evidence of tool use, as it is shown by the constant presence of retouched products and products with use traces. Whether it is some people who, playing the role of the craft specialist, are entitled in keeping themselves busy and earning their living by making tools, is still to be questioned. The high skill employed in producing these tools points to the direction of at least part time specialists but the discovery of tool use in the same spaces with the tool production contests an explanation where craft specialization forms a separate level of living for those individuals who exercise the craft.

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FOOTNOTES

1 Two major sources were identied in the area of Petrota and are well known quarry sites functioning from the Middle Paleolithic onwards (Efstratiou, pers. com.). More sites were detected at small distances from the site, inside pyroclastic rock beds, along and off the national road, and at greater distances in the area of Mesinvria.

2. The obsidian provenance studies are conducted by Democritus Laboratory of Archaeometry (N.C.S.R. "Democritus", Athens) in terms of a major program of the study of obsidian provenance and trade in Prehistoric Greece.

3. For a definition of the french terms in the text cf. Tixier 1963, Tixier et al, 1980, Moundrea-Agrafioti 1981, Perles 1985, 1993.

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VII. PRELIMINARY ANALYSIS OF THE FAUNA OF MAKRI.
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In this paper the data regarding the faunal remains recovered in 1995 from squares E1, E2 (peripheral sector), and from the balk between them will be presented. The levels analyzed belong to the main occupation phase of the site (Makri II) referable to the middle and late neolithic. The levels disturbed by remains or structures of later periods have not been included in the present study. In this area –size 9 x 4 m and depth of about 2.50 m–, the remains of a large post-hole structure with successive plaster floors, fireplaces, storage vessels and pits have been recovered.

Faunal remains are very fragmented and bone surfaces are quite altered because of chemical and mechanical actions of the deposit. Besides a good number of human traces of bone modification such as burning, fractures, and cut marks produced during butchering activities, a high frequency of gnaw marks made by carnivores have been detected. These species therefore influenced bone preservation and contributed to the formation of the deposit.

The faunal sample (see tab. 1) includes 1694 remains. 571 specimens (33,7%) have been determined to the level of species or genus; for 564 remains (33,3%), mainly shaft fragments, vertebrae, and ribs, it was possible to determine only the size of the animal. Most of the identified specimens belong to mammals, mainly domestic with few wild species. Rare remains of birds, reptiles and fishes are also present. In the quantification of the species on the basis of the Number of Identifiable Specimens (NISP), domestic animals represent 86,4% of all mammals identified. Ovicaprines are prevalent (61,2%; plus 2% referable for sure to sheep and goat), followed by cattle (15,0%), swine (7,9%), and dog (0,4%). Among wild mammals, fallow deer is prevalent (9,8%), followed by red deer and wild boar (1,2%), the other species (marten, fox, wolf, hare, porcupine, and hedgehog) are represented only by few remains.

The Minimum Number of Individuals (MNI) was calculated considering the bones from each single level as coming from different individuals. The evaluation of species abundance on this basis does not change dramatically the proportions among the species: the ovicaprines reach a total of 52%, the cattle 15,6%, the swine 11,7%, and the dog 1,3%. The fallow deer is still the most common wild animal (10,4%), followed by the wild boar (2,6%) and by the red deer (1,9%).

The cattle remains recovered at Makri have been all attributed to the domestic form (*Bos taurus*) for the absence of elements that could indicate the presence of the aurochs (*Bos primigenius*). From a dimensional point of view the size of the individuals is medium-large although it does not reach the proportions of the wild species. Interesting is the presence of two pathologic specimens: a mandibular condyle with a clear osteoarthritis on the articulation, probably due to the age of the individual or to masticatory problems; a complete first phalanx with exostosis on the ligament insertions of the distal articulation, that could be interpreted as the result of prolonged stress during transport of burdens or plowing. The age at death of cattle (see tab. 2) show a prevalence, but not marked, of immature individuals (4 newborn; 2 juvenile; 6 subadults), exploited for their meat. The presence of eight adult individuals, although not fully mature or senile, suggest the possible use of cattle for agriculture or transport and maybe also for milk. It was not possible to determine the age of four individuals because of the fragmentary state of the remains. However, it is possible to exclude that they belong to the younger age classes.

Square	E1						E1-E2		E2						Total			
Level	5	6	8	9	10	12	4	5	5	7	13	14	15	16	NISP	%	MNI	%
Mammalia																		
Cattle (*Bos taurus*)	13	20	4		1	3	5	18	1	3	2	3		5	78	15,0	24	15,6
Sheep (*Ovis aries*)	2	1	1											1	5	1,0	4	2,6
Goat (*Capra hircus*)		3						1						1	5	1,0	4	2,6
Sheep/Goat (*Ovis/Capra*)	59	71	27	5	9	5	10	25	6	24	5	36	20	17	319	61,2	72	46,8
Pig (*Sus scrofa* var. *dom.*)	11	11	2		1	1	4	6	2			2	1		41	7,9	18	11,7
Dog (*Canis familiaris*)							1							1	2	0,4	2	1,3
Domestic Mammals	85	106	34	5	11	9	20	50	9	27	7	41	21	25	450	86,4	124	80,5
Red deer (*Cervus elaphus*)	4	2													6	1,2	3	1,9
Fallow deer (*Dama* sp.)	11	13	8				1	3		4		4	5	2	51	9,8	16	10,4
Wild boar (*Sus scrofa*)	1	2		1			1			1					6	1,2	4	2,6
Wolf (*Canis lupus*)								1							1	0,2	1	0,6
Fox (*Vulpes vulpes*)	1	1													2	0,4	2	1,3
Marten (*Martes* sp.)	1														1	0,2	1	0,6
Hare (*Lepus europaeus*)		2													2	0,4	1	0,6
Porcupine (*Hystrix cristata*)	1														1	0,2	1	0,6
Hedgehog (*Erinaceus europaeus*)			1												1	0,2	1	0,6
Wild Mammals	19	20	9	1			2	4		5		4	5	2	71	13,6	30	19,5
Aves															2			
Mallard (*Anas platyrhynchos*)						2									2			
Quail (*Coturnix coturnix*)			1										1		1			
Lapwing (*Vanellus vanellus*)													1		1			
Carrion crow (*Corvus corone*)													1		3			
Reptilia										1		1						
Turtle (Testudinoidea)		1													5			
Pisces								1					3		1			
*Sparidae*ind.			1										1		2			
Gilt-head bream (*Sparus aurata*)						1							1					
*Sciaenidae*ind.													1		1			
Brown meagre (*Sciaena umbra*)			1												31			
Spurdog (*Squalus acanthias*)			1					1				19	7	1	571			
Pisces ind.		1	2															
Total NISP	104	128	49	6	11	12	22	56	9	33	7	65	41	28				
L.A. Vertebrae		4			1				1	1			1		8			
L.A. Ribs	17	13	1		5		1	10	1	2	2	3	5	1	61			
L.A. Others	20	18	4	1	13	1	2	5	1	1	4	3	2	5	80			
S.A. Vertebrae	4	5	2		8	2		2	1	2			5	1	32			
S.A. Ribs	6	20	4		18	4	2	6	2	8	1	11	10	11	103			
S.A. Others	38	25	39	4	37	14	5	23	10	14	3	17	29	22	280			
NID	74	98	58	7	75	26	3	28		18	4	52	62	54	559			
Total NID+PID	159	183	108	12	157	47	13	74	16	46	14	86	114	94	1123			
Total	**263**	**311**	**157**	**18**	**168**	**59**	**35**	**130**	**25**	**79**	**21**	**151**	**155**	**122**	**1694**			

Tab. 1– Sumary of the Number of Identifiable Specimens (NISP) and the Minium Number of Individuals (MNI). (L.A.: Large Artiodactyla; S.A.: Small Artiodactyla; NID: not identifiable; PID: partially identifiable).

	newb.	juv.	sub.	ad.	sen.	ind.	total
Cattle (*Bos taurus*)	4	2	6	8		4	24
Sheep/Goat (*Ovis/ Capra*)	13	15	13	38	1		80
Pig (*Sus scrofa var. dom.*)	2	5	5	2	1	3	18
Dog (*Canis familiaris.*)				2			
Red deer (*Cervus elephus*)		1		2			3
Fallow deer (*Dama* sp.)		3	1	8	1	2	15
Wild boar (*Sus scrofa*)			1	4			5

Tab. 2– Realtive age of indiciduals for the main mammal species (newb.: newborn; juv.: juvenile; sub.: subadult; ad.: adult; sen.: senile; ind.: indeterminate).

As far as the ovicaprines are concerned, it was possible to make distinctions between the genera *Ovis* and *Capra* only for a limited number of elements. The following specimens have been with certainty attributed to the sheep: a cranial fragment with a small shadow of horns referred to a female individual; a distal humerus of a large adult individual; two first phalanges and a complete second phalanx. A cranial portion with the attachment of the horns with straight and sharp morphology characteristic of the species, a distal humerus, a distal metacarpus, a medial-proximal metatarsus, and a first phalanx of a young individual have been instead identified as goat (Cornevin and Lesbre 1991; Boessneck 1969; Payne 1969). From a dimensional point of view, at least in this preliminary phase of the study, it is possible to evidence how the males of sheep are quite large while goats are small sized. The age at death of the ovica-

prines shows that adults –age between 3 and 8 years– represent about half of the individuals recovered (38), only one individual is older than 10 years, while 41 individuals are younger than two years. The high number of adults seems to reflect an exploitation of ovicaprines not only for their meat, but also for secondary products such as milk and wool.

Among the remains referable to swine it was possible to recognize the presence of the wild boar (*Sus scrofa*) on the basis of the large size of the bones. In particular a right cuboid, a fifth proximal metatarsus, two distal metapodials, and a complete second phalanx can be referred to adult individuals of the wild form, while a second metatarsus with unfused epiphysis is to be ascribed to a young-adult individual. The other remains have been attributed to the pig (*Sus scrofa* var. *dom.*), although it is possible that, especially among the young individuals, some elements can be attributed to the wild form. As far as the age at death is concerned, there is a prevalence of individuals under two years of age (2 newborn; 5 juveniles; 5 subadults), clearly culled at a young age for their better meat. The adults are represented by one individual slightly older than two years and one of four years. There is at least one senile individual. The age of three individuals could not be determined, although for sure they do not belong to the younger age classes. The presence of individuals of both sexes is confirmed by the recovery of canines with different morphology.

As regards the specimens from Makri attributed to Canids, the domestic dog (*Canis familiaris*) is represented by a distal right radius and a left second metacarpus belonging to adult individuals; a medial-proximal portion of a large third metatarsus have been attributed to the wolf (*Canis lupus*); the fox (*Vulpes vulpes*) is present with a fragment of a right M_1 and a right second metacarpus. Among the Cervids the fallow deer (*Dama* sp.) is the most represented animal with at least 15 individuals. There is a prevalence of adults (8) of medium-large size; at least one senile individual and some immature animals are also present (3 juveniles; 1 subadult). It was not possible to determine the age of two individuals. Red deer (*Cervus elaphus*) is scarcely represented. It was possible to identify at least two adult individuals, one is probably a male of large size, and a young individual. The presence of abundant fallow deer specimens suggests the presence, near the site, of alternating wooded areas and clearings, usually preferred by this animal.

Some species represented only by few elements complete the faunal assemblage of the site. The marten (*Martes* sp.) is present with a proximal fragment of left radius, the hare (*Lepus europaeus*) is represented by a fragment of scapula and a left distal humerus, the porcupine (*Hystrix cristata*) by a left maxilla with two molars, and the hedgehog (*Erinaceus europaeus*) by the diaphysis of a right tibia.

It was possible to recognize the presence of birds remains: a coracoid and a radius of mallard (*Anas platyrhynchos*), which lives in aquatic environment, and in particular, during winter, on the coast and in the estuaries; a complete left femur and a ulna of a quail (*Coturnix coturnix*), a bird living and nesting in open terrain with grass bushes; a distal metatarsus of lapwing (*Vanellus vanellus*), a riparian bird nesting in swamps, barren lands, and muddy areas, and finally a first anterior phalanx of the second digit of a carrion crow (*Corvus corone*) living in barren lands, cultivated fields and marine coasts. Remains of a tortoise (Testudinoidea) are also present: in particular two fragments of a humerus and a fragment of carapace which do not allow an attribution to the genus *Emys* or *Testudo*. Among the fishes recovered, besides some spines and unidentifiable fragments, only marine species have been identified, in particular some remains of Sparidae, a large sized gilt-head bream (*Sparus aurata*), remains of Scienidae, among which the sure presence of brown meagre (*Sciaena umbra*), and a vertebra of spurdog (*Squalus acanthias*), a shark-like fish that from deep waters can reach near the coast.

From this preliminary analysis of the fauna from the neolithic site of Makri it is possible to draw some economic and environmental indications. The ratio between wild and domestic mammals indicates how food supply was based mainly on domestic animals as it is possible to observe also in other sites of the same period such as Sitagroi I-II (Bökönyi 1986), Paradeisos (Larje 1987) and Franchthi Cave F1 (Payne 1975). Among the domestic animals, ovicaprines are prevalent in all the sites considered. At Makri ovicaprines and cattle were exploited not only for their meat, but also for the secondary products such as milk, wool, and work. In contrast, pigs were exploited only for their meat as suggested by their prevalent young age at death. Predation activities, hunting and fishing, involved a large spectrum of animal species: mainly fallow deer, wild boar, red deer and other mammals, besides different species of birds and marine fishes.

From the ecologic point of view the faunal association of Makri indicates the presence of a developed wooded covering (red deer, marten), with large areas of clearings and prairies (fallow deer, quail), and wet environments (wild boar, mallard, lapwing). A greater wooded covering is indicated at Sitagroi and at Paradeisos where, among the wild animals, red deer remains are prevalent.

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VIII. PLANT REMAINS FROM NEOLITHIC MAKRI

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One of the excavation objectives at the site of Makri was to investigate the role of plants in the neolithic eco-

nomy of the settlement. To this end, a large number of soil samples was processed by flotation during the excavation seasons 1990, 1991. This preliminary report presents a first account of the plant species identified and some observations on the crops and other plants used at the site. No quantitative data are available at the moment as the material is still under study[1].

Samples were taken from trenches B5, B7, B10, B11, Γ1, Δ2 and Δ4 in the "top sector (A)", representing floor fills, pits, hearths, various constructions, post-holes and features that had traces of burning. Although it was not possible to sample every excavated unit (due to labour and cost limitations), the majority of the 220 samples processed proved rich in archaeobotanical remains.

The samples were processed by flotation (Pearsal 1989). The material which floated was collected by a 300ì sieve. Material which did not float during processing was retained by a 1mm mesh. All 220 samples were initially scanned in order to obtain an overall picture of the assemblage, the range of species and the quantity of plant remains. Of those samples only the ones with more than 100 items were chosen for detailed study, as rich samples would provide a more reliable picture as regards species used and crops grown by the inhabitants of Makri. These samples were sorted for plant remains using a stereomicroscope (magnification up to X40) while heavy residues were sorted by naked eye. The material was subsequently identified using the same magnifications.

Triticum monococcum L.
Triticum dicoccum Shrank
Triticum cf aestivum L.
Hordeum distichon L.
Hordeum vulgare L.
Pisum sativum L. s.l.
Lathyrus sativus L./*L. cicera* L.
Vicia ervilia (L.) Willd.
Lens sp.
Quecus sp.
Vitis vinifera L.
Rubus fruticosus L.agg.
Prunus dulcis (Miller) D.A. Webb
Sanbucus ebulus L.
Cornus mas L.
Ficus carica L.
Pistacia cf terebinthus L.
Linum usitatissimum L.

Table 3.– Cereals, legums, fruit, nuts and oil plants from Neolithic Makri.

Neolithic species, crops and harvests at Makri

A wide range of species has been identified from Makri, including both cultivated and wild (Table 3 and 4). Not all of these was necessarily used by the settlement's inhabitants. One of the tasks of the archaeobotanical analysis is to specify the crops used by the people that occupied the settlement of Makri. Evidence for deliberate use of a plant species may be provided by the presence of large concentrations of a species' grains, nuts, fruit etc., or the by-products of its processing, in samples where the species forms the major component (Dennell 1976). The same, albeit with less certainty, may be inferred when a species is found in roughly pure 'caches' (Halstead 1994). Despite the lack of quantitative data from Makri, it is possible to make some preliminary observations on the definite and possible crops used at the site.

Cereals. The wheat species identified are the glume wheats einkorn (*Triticum monococcum* L.) and emmer (*Tri-*

Polygonum aviculare L.
Polygonum persicaria L.
Bilderdykia convolvulus (L.) Dumort.
Rumex spp.
Polygonaceae
Polygonaceae/Cyperaceae
Chenopodium cf *album* L.
Polycnemum spp.
Chenopodiaceae
Stellaria spp.
Scleranthus spp.
Silene spp.
Caryophylaceae
Nigella spp.
Ranunculus sp.
Papaver dubium L./*P.Pinnatifidum* Morris
Papaver spp.
Glaucium spp.
Fumaria spp.
Papaveraceae
Capparis spp.
cf Neslia sp.
Reseda cf *luteola* L.
Rosa sp.
Potentilla cf *rupestris* L.
Astragalus type
Melilotus/Trifolium
Trigonella type
Medicago type pod
Medicago type seed
Small Legumes indet

Malvaceae
Hypericum sp.
Thymelea spp.
Sherardia arvensis L.
Asperula spp.
Galium aparine L.
Galium spurium L.
Rubiaceae

Heliotropium spp.
Alkanna spp.
Buglossoides arvensis (L.) I.M.Johnston
Echium cf
Boraginaceae
Verbena officinalis L.
Ajuca spp./*Teucrium* spp.
Ziziphora cf *capitata* L.
Labiatae
cf *Valerianella dentata* (L.) Pollich
Anthemis spp./*Crepis* spp.
Centaurea spp.
Compositae
cf *Allium* spp.
Juncus spp. fruit
Juncus spp. seed
Bromus spp.
Aegilops spp.
Eragrostis cf *minor*
Poa spp.
Lolium cf *temulentum* L.
Lolium temulentum/multiflorum
Lolium remotum
Lolium spp.
Avena spp.
Phleum spp.
Stipa spp.
Phalaris cf paradoxa
Phalaris sp.
Cynodon dactylon (L.) Pers.
Setaria viridis (L.) Beauv.
S. verticillata (L.) Beauv.
Gramineae indet
Eriophorum type
Scirpus cf *maritimus* L.
Scirpus spp.
Cladium mariscus (L.) Pohl
Carex spp.
Cyperaceae

Table 4. Wild species (other than fruit) from neolithic Makri

ticum dicoccum Shrank), and a free-threshing wheat, probably bread-wheat (*Triticum* cf *aestivum* L.). The hulled wheats were mainly identified from the numerous glume bases and spikelet forks and provided a reliable source of identification criteria (Jacomet 1987). Some seeds of these species were also found. The presence of glume bases that could not be identified to either species on the basis of the available criteria is noted. They might represent a land-race or another species and they are currently under investigation (Jones and Valamoti, in preparation). The rachis internodes of free-threshing wheat were used for their tentative identification to species level. Grains of free-threshing wheat were also found but these cannot be identified to species level by morphological characteristics. Two-row barley (*Hordeum distichon* L.) and six row barley (*Hordeum vulgare* L.) rachises have been found in the samples. Barley grains both hulled and naked were also found albeit inadequately preserved. Consequently it is not possible to distinguish the two-row and six-row species on the basis of the grains and thus determine which varieties (hulled or naked) go with what species.

The vast majority of the samples are dominated by einkorn and emmer glume-bases and spikelet forks; these are components of the chaff that firmly surrounds the grain of glume wheats, the removal of which requires a whole series of additional processing compared to free-threshing cereals (e.g. bread-wheat) which require only threshing, winnowing and sieving for the separation of grain from chaff (Hillman 1984). This additional processing of the spikelets involves their pounding and further winnowing and sieving (ibid.). In the Makri samples, einkorn and emmer grain is very rare by comparison to chaff. This picture reflects in all probability the original composition of the samples: under various charring conditions wheat grain is better preserved than chaff (Boardman and Jones 1990), its low representation in the samples cannot therefore be attributed to depositional biases. Most of the Makri samples thus, represent the by-products of einkorn and emmer dehusking. This not only indicates the deliberate use of these species by the inhabitants of the site but also that they were actually used as human food. Had the crops, represented by these samples, been intended as animal fodder, the time consuming and tedious procedure of dehusking would have been unnecessary. Ethnographic studies in modern Spain and Turkey reinforce this suggestion (Nesbitt *et al* 1996).

The picture is far from clear when it comes to the finds of free-threshing cereals. Both grain and rachises occur in low numbers, as admixtures of the glume-wheat rich samples. We cannot therefore be sure whether free-threshing wheat was a commensal of the einkorn and emmer crops or whether it was used as a crop in its own right. In the second case the free-theshing wheat remains would have been mixed with the glume wheat remains during deposition, i.e. whilst cooking and lighting fires. In case we are dealing with a commensal it is not possible to state, at least for the time being, whether it is a commensal originating from a free-threshing wheat crop that was grown at Makri during earlier phases which have not yet been investigated archaeobotanically or, whether it was brought to the site with imported grain from regions where the species had been a crop or a commensal at the time. Bread/durum wheat has been reported as a crop from few Greek sites only (late neolithic Sesklo, late bronze age Assiros (Halstead 1994) and Knossos (Jones 1984).

Barley is not so common in the samples and in most cases it occurs together with glume wheat chaff. In one case, two-row barley rachises are the dominant component of the sample, outnumbering barley grain. Barley rachises are far more fragile than grain (Boardman and Jones 1990), their emphasized presence is therefore not the outcome of differential preservation of the different plant components but the result of crop-processing: barley rachises are removed from the harvested crop mainly by sieving the threshed and winnowed product (Hillman 1985, Jones 1990). The sample from Makri corresponds to the by-products of barley processing providing thus a strong indication that the species was a crop at the site. It is not possible however, to decide whether it was used as human food or fodder or both. Barley would have been processed up to the final stages irrespective of its intended use; the only stages that are omitted from barley processing when the crop is given to animals are hand-cleaning and de-hulling (Hillman 1985).

Pulses. Seeds of lentils (*Lens* sp.), bitter-vetch (*Vicia ervilia* L.), grass-pea (*Lathyrus sativus* L./*L. cicera* L.), pea (*Pisum sativum* L. s.l.) and possibly horse-bean (cf *Vicia faba* L.) have been identified in small numbers. Despite the wide range of pulses that are present in the Makri samples, their very low frequencies as admixtures of the chaff-rich samples are far from being indicators for their use as crops at the site. In only two samples from trench B10, lentils and pea are present in relatively large numbers with few other admixtures. These form the only weak indication that legume species were used as crops at the site. The archaeobotanical evidence as regards legumes cannot rule out the possibility that legumes were systematically grown at the site, at the same time it cannot provide any reliable evidence to support such a possibility.

Cereals versus pulses

The finds of both cereals and pulses in most archaeobotanical assemblages from Greece has lead to the suggestion that neolithic agricultural practice involved the cultivation of cereals and pulses in rotation, in small garden plots (Halstead 1981 and 1994).

The particular composition of the Makri samples, i.e. the dominance of cereals over pulses does not seem to be in accordance with the above general observation, and may be interpreted in various ways. Pulse seed may be considered less likely to become charred, compared to glume wheat chaff, as the latter would have had many chances of being deliberately thrown on a fire as fuel (either in its own right

or as the contents of dung). On the other hand roasting of pulse seeds could have generated charred remains. Nevertheless, charred caches of any kind of grain are extremely rare at the site. The rare occurrence of legume caches from Makri may therefore reflect a bias against charred grain crops at Makri. Despite indications for episodes of fire at the excavated trenches, mainly Γ1, no stored grain as a fully processed crop was observed either during excavation or through the study of the archaeobotanical assemblage. Crops were perhaps stored elsewhere at the site. Unfortunately, for the time being, we are lacking samples from the "complex area" of the site (top section (A)) in order to test such a hypothesis.

Alternatively the picture obtained through the study of the plant remains may actually reflect the range of crops processed and used at this part of the settlement. Perhaps pulses were processed and prepared for consumption elsewhere on the site. A similar suggestion has been put forward for the apparent low representation of pulses at the site of Selevac in Serbia (Mc Laren and Hubbard 1990). Whatever the case may have been, it is interesting to observe that what has been described as "cooking accident" and is widely considered as one of the main sources generating charred grains, does not seem to be the case at Makri. As already said, charred grains are few and rare, occurring in chaff rich samples, and could be tail-grain (when cereal grains are concerned) removed with chaff, or impurities removed during the cleaning of glume wheat spikelets (when pulse seeds are concerned).

Fruit and nuts. A variety of fruit and nut species were present in the samples represented by seeds, stones or cotyledons: grape (*Vitis vinifera* L.), Cornelian cherry (*Cornus mas* L.), fig (*Ficus carica* L.), elder (*Sambucus ebulus* L./*S. nigra* L.), blackberry (*Rubus fruticosus* L. agg.), acorns (*Quercus* sp.), wild pistacio (*Pistacia* cf *terebinthus* L.) and almond (*Prunus dulcis* (Miller) D.A.Webb). No sample, however, bears indications for a harvest from the wild as fruit/nut remains are sporadically present in low numbers. We can suppose that they were collected for consumption but we have no indication as to how intensive their collection may have been.

Grapes deserve a special comment as a lot of emphasis has been attributed to the species in relation to the development of the Mediterranean polyculture and the formation of bronze age society. The grape pips found at Makri are few in number; the breadth/length indexes were nevertheless estimated for 20 grape pips: the maximum index was 92, the minimum 56 and the mean 67.55. The grape-pips cannot be attributed to either wild or domesticated plants. The vast majority of the Makri grape pips fall in the overlap zone between wild and domesticated species with few of them falling in the wild-vine zone. This however, cannot be taken as an indication for collection from the wild as experimental work has shown that after charring, domesticated grape pips tend to resemble wild ones (Smith and Jones 1990). Besides, the importance of grape lies in the fact that it is used for wine-making, a process that does not necessarily require domesticated grapes (Olmo 1976, Valamoti in press a). Although wine production from wild grapes is attested for northern Greece from late neolithic deposits at Dikili Tash (Mangafa 1990), evidence for wine production such as charred grape-skins (Valamoti and Mangafa 1993) have not been found at Makri.

Fig seeds are very common and in some samples numerous. This is not surprising as a single fruit possesses several hundred seeds. Two whole fruits were found but, at present, we have not developed any criteria for distinguishing dried from fresh figs. It may be possible to achieve such a distinction in the future (Valamoti in prep.), in which case archaeological finds of dried figs would indicate a more systematic harvest and processing of this fruit.

The fruit and nut species identified indicate the exploitation of areas of open forest vegetation consisting of oak, wild pistacio trees, etc., but also of shaded and moist habitats along stream banks, prefered by vines. The presence of such habitats is also attested by the charcoal analysis (Ntinou and Badal 1996).

Oil and fibre plants. Few seeds of flax (*Linum usitatissimum* L.) were found. The very few flax seeds identified occur as admixtures of chaff-rich samples and do not allow us to state whether they represent commensals of the cereal crops or a crop in its own right. Flax is known as a species since the early neolithic both in Greece and Bulgaria (Kroll 1991). Until recently it was only reported as a crop from early bronze age sites such as Kastanas in central Macedonia (Greece) but has since been found as a crop in two late Neolithic sites in northern Greece (Valamoti in press b and c). It is a very important and useful plant, for its properties range from being a food source (edible seeds), an oil source, and a fibre source to being a medicine. Although it is impossible to infer the specific uses made at the time, flax must have been an important crop in prehistory. Its role at Makri remains obscure unless the examination of other samples in the future provides more positive evidence.

Wild plants (other than fruit and nuts). Over 70 genera and species of plants that grow in the wild have been identified from the Makri samples. These species may have originated in the prehistoric fields of the settlement and may have been brought to the site as weed seeds, harvested with the cereal or legume crops. They could equally have been brought to the settlement as the contents of animal dung, i.e. as seeds grazed by the animals husbanded by the inhabitants of Makri. Other possible sources could be the use of certain plants for thatching or mat and basketry construction (e.g. *Juncus* spp.), or even for their medicinal properties (e.g. *Hypericum* spp.). The finds of water loving species such a *Cladium mariscus*, *Scirpus maritimus*, and *Juncus* sp. indicates the presence of aquatic habitats not too far from the site. Indeed, such habitats exist even nowadays near the site

and must have been a lot more abundant in the past as the memories of the modern Makri inhabitants recall. Their existence during the occupation of the site of Makri is confirmed by the geomorphological analysis of the area (see section I by M.P. Fumanal and Ferrer). This is just an example of the potential of the study of the habitat requirements of the wild species found at Makri. In many respects they provide a means to approach the neolithic landscape with its arable and pastoral land as well as its natural vegetation. The preliminary nature of the study does not, however, allow such reconstructions to be attempted for the time being.

Concluding remarks

The archaeobotanical material from Makri presents us with a unique opportunity to study plant use in an area that has never so far been investigated in this respect. A large body of data is now available showing the presence of an impressive range of species and providing the basis for determining prehistoric crops at the site and inferring their intended or possible uses. They also provide some idea about the vegetation in the vicinity of the site thanks to the wide range of wild species represented in the samples. It must be stressed, however, that this preliminary report does not explore the full potential of the available data as the material is still under study.

The archaeobotanical material studied, which provides the only evidence on prehistoric agriculture available at present from the region, corresponds to Makri II. Consequently it is not possible to attempt any comparisons between the two major cultural periods at Makri (section II). This, however, would be of uttermost interest as nothing is known about prehistoric plant husbandry from earlier neolithic phases in Thrace. The examination of samples from the earlier period (Makri I) in the future, will provide a means to investigate subsistence patterns on a broad temporal scale, as far as plants are concerned, and explore whether agricultural production and plant use remained stable or changed through time at the once lively and long lived settlement of Makri.

FOOTNOTES

1. The archaeobotanical assemblage from Makri together with the plant remains from four more prehistoric sites from northern Greece is currently under detailed study as part of a PhD research of the Prehistoric Agriculture and Plant Exploitation in Macedonia and Thrace, northern Greece (Dept. of Archaeology and Prehistory, Sheffield University, U.K.).

ACKNOWLEDGEMENTS

I wish to thank Dr Nikos Efstratiou and Ms Dina Kallintzi for entrusting me with the study of the archaeobotanical material from Makri. I am grateful to the former for his comments and advice on the work presented here, to Dr Glynis Jones and Dr Mike Charles for their patient supervision of the identifications and to Gordon Hillman for his advice on identification issues. I would also like to thank the British School at Athens for awarding me a Centenary Bursary which enabled me to carry out part of the identification work in Sheffield.

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IX. CHARCOAL ANALYSIS IN NEOLITHIC MAKRI

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The analysis of carbonized material from archaeological sites, constitutes an accurate method for the reconnaissance of the plant formations that the prehistoric human groups systematically used. Inturn, these formations reflect the dominant palaeoclimatic conditions in a region at a particular time. The vegetation provides material for the construction of dwellings and firewood as well, let alone other uses or resources. Charcoal analysis applied to the site of Makri, aims to determine the palaeoenvironment and the palaeoecological sequence as well as the distinct use of plant resources.

The site is located in the elevated coastal plain, on top of a cliff overlooking the coast. To the north of the extensive plain, the Rhodope mountain range forms a natural border line between Greece and Bulgaria (fig. 1 and 2 of section I by N. Efstratiou, this volume). From sea level to 500 m, the bioclimatic conditions in the region are of mesomediterranean type, dry, with mean annual precipitations around 500 mm. The plain is cultivated with cereals, cotton, tobacco and occasionally olive trees in the warmest niches with a limestone bedrock. Close to the coastal elevations, the vegetation forms a tall maquis dominated by evergreens, *Quercus ilex* (holm oak), *Arbutus unedo* (strawberry tree), *Phillyrea media*, etc. Deciduous vegetation grows as well, represented by *Pistacia terebinthus* (terebinth), *Fraxinus ornus* (manna tree), *Pyrus amygdaliformis* (pear). Less frequent are *Arbutus andrachne* (strawberry tree, oriental species) and *Carpinus orientalis* (hornbeam). From 500 m upwards, the bioclimatic sequence follows the supramediterranean vegetation of subhumid to humid type, characterized by deciduous oak woodlands with hornbeam (*Carpinus*), ash (*Fraxinus*), etc. The peaks of the Rhodope mountain range in Greek Thrace are covered by the oromediterranean beech groves (forests) (Forest Service, 1989).

THE PREHISTORIC FLORA

The charcoal remains were discovered in the Γ1 excavation trench with a total surface of 16 m². The carbonized

material analysed corresponds to periods Makri I and Makri II. According to the origin of the carbonized remains three main categories of charred wood have been distinguished:

a) remains of firewood scattered through the archaeological layers, collected by systematic sieving of the sediments from Makri I. This material reflects firewood used for domestic and everyday purposes, therefore allowing palaeoecological interpretation.

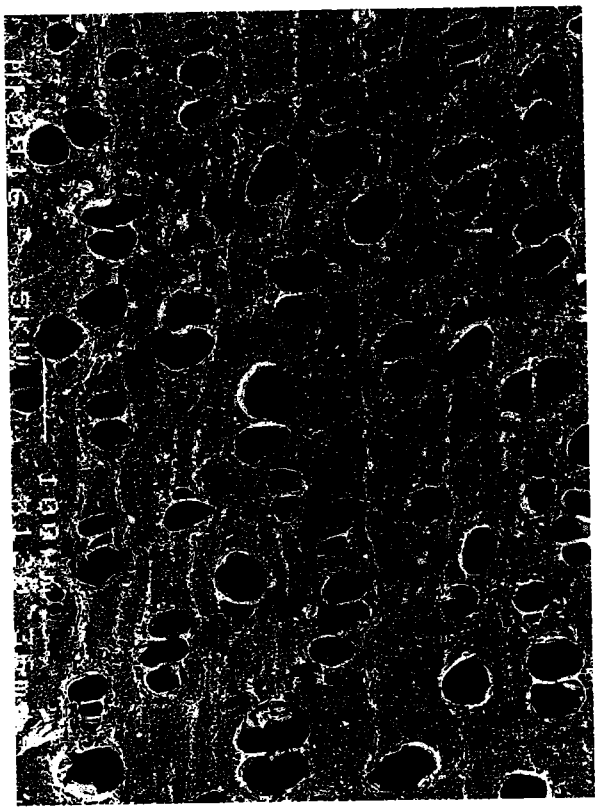

Fig. 43.

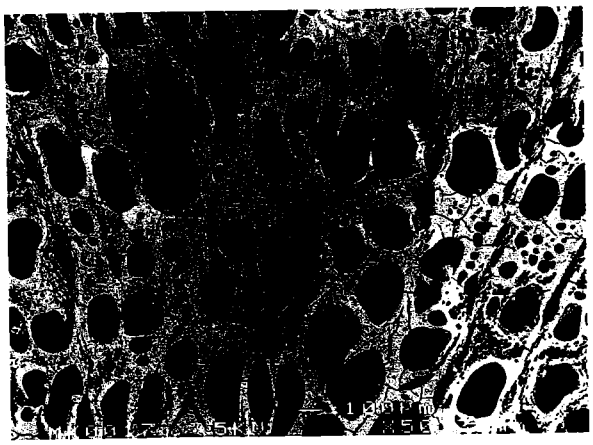

Fig. 44.

b) charred wood used originaly as timber in the construction of the dwellings. This kind of carbonized material was recovered from a fire level in the base of Makri II. Mainly, ethnobotanic information is obtained by the study of this charcoal category.

c) Finally, the charcoal directly associated to archaeological structures, pits, hearths, etc, offers information related to temporary activities (punctual) and usually is not interpreted in terms of vegetation. Although various archaeological structures were uncovered on both occupation periods the results of their analysis will not be treated in this occasion.

The analysis of 1488 charcoal fragments led to the identification of 18 plant taxa and another two that remained Indeterminate. The plant list of Makri I, consists of in alphabetic order: *Acer* sp. (maple), Conifer, *Cornus* sp. (cornelian cherry), *Ficus carica* (fig tree) (Fig. 43), *Fraxinus* sp. (ash), *Juniperus* sp. (juniper), Leguminosae, cf. *Paliurus spina-christi* (Christ's thorn), *Pistacia terebinthus* (terebinth), *Prunus* sp., *Prunus* cf. *amygdalus* (almond tree), *Pyrus-Sorbus*, Rosaceae, *Quercus* deciduous (deciduous oak), *Taxus baccata* (yew), *Tilia* sp. (lime), *Ulmus* sp. (elm) and *Vitis vinifera* var. *sylvestris* (grape vine) (Fig. 44).

In this plant list, the absence of *Pinus* (pine) stands out, as well as the generally scarse presence of conifers, counting only *Juniperus* sp. (juniper) and *Taxus baccata* (yew).

The lignifying angiosperms are represented by 14 plant families including various genera, all of them deciduous. Consequently, the plant formations surrounding the neolithic site must have been deciduous and clearly contrasting the mainly evergreen composition of the current vegetation in the same place.

In past papers (Ntinou, Badal, 1996) we presented the Indeterminate 1 that was attributed, quite doubtfully, to the Leguminosae family. A closer analysis of all the anatomical features rules out that possibility and demonstrates that this material corresponds to *Ficus carica* (Fig. 43).

The plant list of Makri I includes only one taxa that has remained Indeterminate.

THE PREHISTORIC VEGETATION

Plant formations, during prehistory, constituted an important source of raw material. One of the most common and traditional uses of plants has always been as firewood supply for domestic purposes (hearths). Remains of firewood are deposited in archaeological layers or in fire structures such as hearths and ovens, as stated above.

Results from scattered charcoal from Makri I represent the sum of scattered charcoal from all the layers. Some of the layers did not offer sufficient charcoal fragments and for this reason we had to unify the carbonized material of the deepest layers (32 and 34) in order to do the inventory of the taxa. Only layer 29 was relatively abundant in charcoal with a sample with 401 fragments. Due to the scarsity of

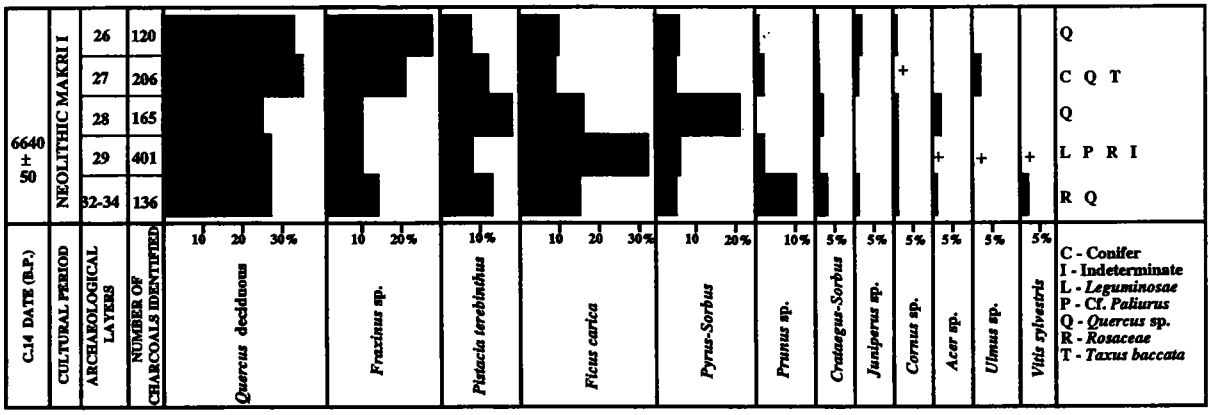

Fig. 45. Charcoal diagram from Makri.

charcoal we have been obliged to work out the data based on archaeological layers independentily of their thickness. Nevertheless, similar qualitatif results are obtained in all the layers between 10 and 15 taxa. Charcoal from layer 29 has been dated by ^{14}C: 6640 ± 50 BP, not calibrated (Gr.N-20475 Makri 3-29).

The charcoal diagram of Makri I (fig. 45) consists of five spectra; although the floral composition of these spectra is quite similar, it also shows slight variations, as far as the taxa frequencies are concerned.

In all spectra the dominant taxon is *Quercus* deciduous (30% aproximately), except in layer 29 were *Ficus carica* surpasses it. The frequencies of the remaining taxa, in all the sequence, are quite similar. The charcoal diagram seems to indicate, the presence of a deciduous oak woodland, where those trees are accompanied by other deciduous genera.

Ficus carica (Fig. 43) would have been quite abundant in the environment according to the frequencies obtained. Fig tree was used as fire wood in prehistoric Makri although it does not provide good quality fuel because "foc de figuera foc de quimera" (Alcover, 1953). Making fire with fig tree wood, produces a lot of unpleasant smoke and poor flames.

The wild form of the fig tree lives in the Mediterranean region from sea level to 1.000 m of altitud. This deciduous tree resists well the summer dry period and cold winters. Occupies rock crevices, gorges and stream sides. In the territory of the neolithic Makri, fig trees, probably grew on the abrupt calcareous slopes overlooking the sea. The anatomical caracteristics do not permit to distinguish between the wild and domesticate form. Fig seeds are present in the archaeological levels of Makri II (see section VIII by S. Valamoti, this volume).

The particular feature of this deciduous oak woodland rests on the presence of the heliophilous components. Actually the majority of the genera identified demand plenty of light and do not strictly belong to the bushy formations that prosper under tree cover (undergrowth); among others *Pistacia terebinthus* (terebinth), *Pyrus* (pear), *Prunus* cf. *amygdalus* (almond tree), *Juniperus* sp. (juniper), *Paliurus spina-christi* (Christ's thorn). The presence of such taxa and their frequencies indicate a plant cover not dense, but rather open where sunloving bushes could flourish. In turn, these formations could develop in a dry to subhumid pluviometric regime, a feature that differentiates those particular deciduous oak woods from their european equivalents that need higher precipitation rates.

Fraxinus (ash) could belong to the oak woodland or grow in areas of greater soil humidity like water courses or travertine formations, by the coast. The riverside vegetation in Makri is represented also by *Ulmus* sp. (elm), *Crataegus* sp. (hawthorne) and *Vitis vinifera* var. *sylvestris* (grape vine). The carbonized remaines (Fig. 44) of grape vines document the presence of this species in the region during neolithic times.

Cornus sp. (cornelian cherry), could grow in the hedges of humid areas or of the oak woodlands. We have not been able to identify the *Acer* (maple) species; nevertheless this genus is very common in oak forests, as well as *Taxus baccata*.

The prehistoric agropastoral groups were established in Makri about 6600 years ago; during the first phase of occupation of the territory, they started to exploit systematically the surrounding deciduous vegetation dominated by deciduous oak. Probably, this deciduous formation was the climax vegetation of the area and developed under mesomediterranean dry to subhumid climatic conditions. Although the climate was very similar to the one prevailing in the region today, the plant associations were drastically different. Nowadays, in the surroundings of the site, only evergreen formations thrive and among these the bioindicators of human activities are quite frequent.

Palynological investigations in natural deposits, were carried out in various regions of northern Greece. The beginning of the Holocene is settled conventionally *circa* 10000 BP and is characterized by a rise in temperature and humidity; pollen diagrams detect a progressive increase of the arboreal pollen parallel to a substantial reduction of the

steppic vegetation. The maximum tree representation was reached between the Boreal and Atlantic periods. According to the dates from Edessa (8050 BP) and Khimaditis III (8020 BP), the beginning of this phase slightly preceeds 8000 BP and lasted until *circa* 6000 BP (Bottema, 1974; Gerasimidis and Athanasiadis, 1995; Willis, 1992; Wijmstra, 1969). The settlement of Makri corresponds to the Holocene and specifically to the Atlantic period; the vegetation cover, according to the charcoal analysis results, is in agreement with the palynological data of the region.

THE TIMBER FOR THE CONSTRUCTION

The second archaeological period (Makri II) in the site of Makri has located at the base of the archaeological deposits a fire level extending over habitation floor; this fire level was detected in various trenches of the excavated area. In the Γ1 trench the fire remains were covering the whole of the surface forming a charcoal layer of aproximately 7-10 cm.

The charcoal recovered in this fire level was identified and the list of taxa is as follows: *Quercus* deciduous (deciduous oak), *Ficus carica*, (fig tree), *Fraxinus* sp. (ash), *Juniperus* sp. (juniper), *Pistacia terebinthus* (terebinth), *Pyrus-Sorbus*, Rosacea, *Tilia* sp. (lime). The rich plant formations surrounding the neolithic site supplied only eight different trees for timber, therefore, contrasting with the variety of plants used for firewood, as documented in the list of the plants burned in domestic fires. In a way, as far as timber is concerned the list testifies to the existence of human selection, probably imposed by functional and technological criteria.

The timber used for the construction of the dwellings, mainly comes from deciduous oaks (fig. 46) that represent 70% of the fire remains, followed by ash (12%), while the remaining taxa are very rare.

The domestic architecture in Makri is rectangular or square shaped, of the wattle-and-daub type. It consists of vertical posts entwined with horizontal branches, the whole wooden structure being covered with mud and straw; nevertheless sun-dried bricks were also used. The earthen floors are extremely compacted. Usually, related to the dwellings, are found various structures, like hearths, pits and platforms (Efstratiou, 1993).

The major posts of the constructions reach 15-20 cm in diameter and are mainly aligned; probably deciduous oak was the most common tree for the manufacture of posts. Cutting down trees of that size demands the use of blunt tools like the polished hand axes, frequently discovered on the site. The trees should be cut down while still alive, for the resistence is less and therefore the task easily accomplished. In the analysis of the beams, we detected the existence of timber parasites such as woodworms, that could indicate the deterioration of the dwelling.

The charcoal fragments with aproximately 5 cm diameter, probably belonged to the horizontal branches used in the construction. For that task branches with a small diameter were selected, quite fine and therefore young and very flexible. For those purposes ash was mainly used and to a lesser degree, lime and terebinth, along with young deciduous oak branches. Juniper although rather scarse, appears associated to the construction; it was probably used for the manufacture of vertical posts since it has a rigid and straight trunk.

Concluding, the results from the charcoal analysis of the neolithic site of Makri demonstrate the existence of a mosaic of deciduous trees, bushes or shrubs in the settlement's catchment area. The deciduous oak woodland and its components provided fuel for the domestic fires and timber for the building purposes.

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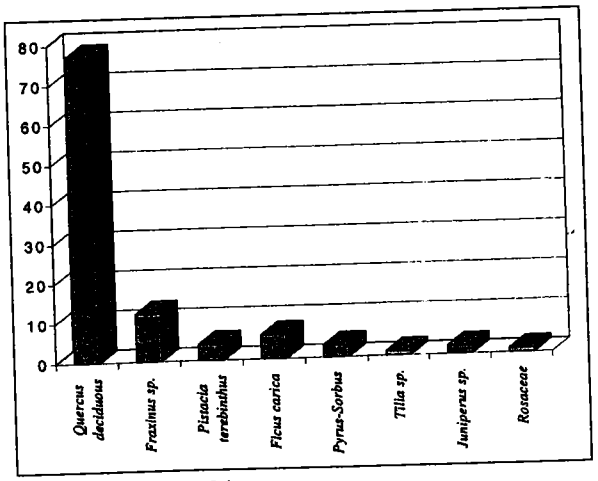

Fig. 46. Frequencies of timer.

X. PHYTOLITH ANALYSIS OF MAKRI
M. MADELLA

INTRODUCTION

Phytoliths are silica bodies produced in and between the plant cells. One of the main producer of phytoliths in the plant kingdom is the grass family (*Gramineae*). The silica is precipitated anywhere a significant amount of water is used or lost. The production of phytoliths is continuous during all the plant life but increases significantly in mature or senescent plant portions (Rovner, 1983). Any plant and overall grass species can produce a wide collection of morphologically distinct phytoliths and grass phytoliths are

very often taxonomically redundant, and occur in several different species (Rovner, 1983). For this reason, in the present study is used an approach that looks at phytolith assemblages: "suites" of disarticulate (Powers, 1992; Madella, 1995) and articulated (Miller Rosen, 1993) silica bodies.

METHODOLOGY

During the 1995 campaign of excavation some soil samples for phytolith analysis have been collected from the sections exposed during the preceding years. Of these samples, 19 from square B2 and 5 from square B12 have been analysed so far. All the samples analysed belong to Makri period II:

Phase I: samples 37-38-39-40-41-42-42/a-43
Phase II: samples 44-45-46-47-47/a-48
Phase III: samples 49-50-51-52-52/a
Phase III or IV: samples: Bs-Bi-As-Ai-C

Samples 42-42/a-43 are *floor 1 complex*, samples 47-47/a-48 are *floor 2 complex*, samples 52-52/a53 are *floor 3 complex* and samples C to Ai (from square B12) are also a floor, provisionally correlated with *floor 3* on the basis of the altimetry, but it is not appropriate to rule out the possibility that these samples belong to *floor 4*. For the benefit of this study, *floor complex* is meant as the samples coming from the surface and the flooring portion of a floor. Phytoliths have been extracted from the sediments by means of heavy liquid separation (Madella et al. *in press*), mounted and counted –minimum 250 per sample– at 1000 magnification. For the purpose of this paper, the phytolith morphotypes have been grouped in four classes (figure 47) by following their anatomical origin (long cells, short cells and trichomes/bulliforms/stomata) or shape (other morphotypes).

DISCUSSION

Given that a single phytolith morphotype will rarely (if ever) show precise features for taxonomic identification, the present study concentrates on phytolith assemblages and articulated phytoliths.

Therefore, this preliminary analysis of the phytolith composition of Makri sediments is aimed at investigating both changes in phytolith assemblages with relation to time and context, and cereal articulated phytoliths in order to gain information on plants use and crops.

Phytolith assemblages

For the 24 samples from the sections in squares B2 and B12, the absolute quantity of short cells phytoliths has been plotted against the absolute quantity of long cells phytoliths (figure 48). In Makri's sediments the proportion of those morphotypes follows a precise pattern: floor complexes are clearly identifiable on the basis of an increased presence of

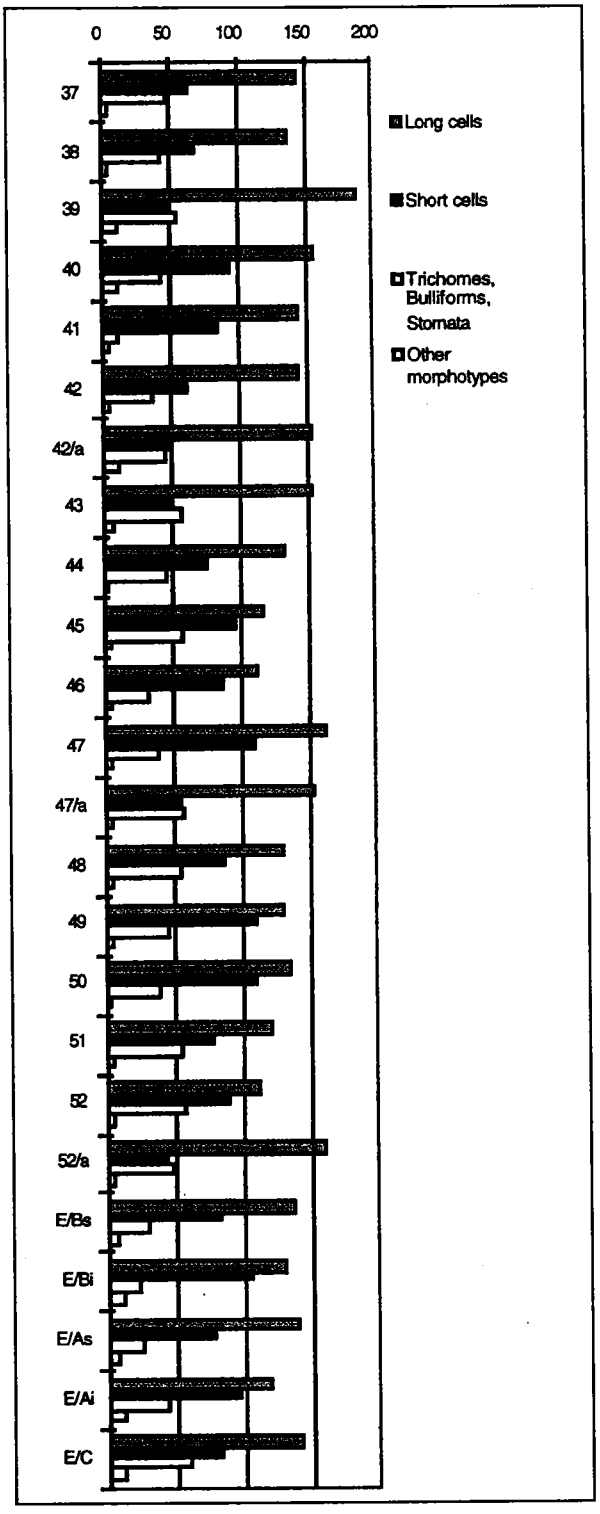

Fig. 47. Phytolith assemblages from Makri period II (samples 37 to 52/a from the section in square B2, samples Bs to C from square B12) are grouped in four main classes. Quantities expressed in frequency numbers.

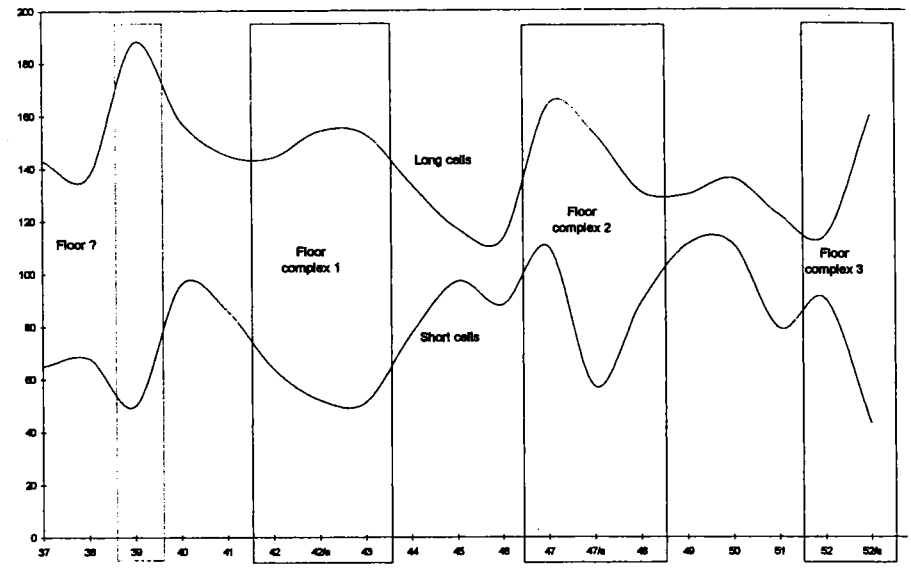

Fig. 48. Proportion of long cells phytoliths and short cells phytolith in Makri samples from square B2. The rectangles highlight floor complexes.

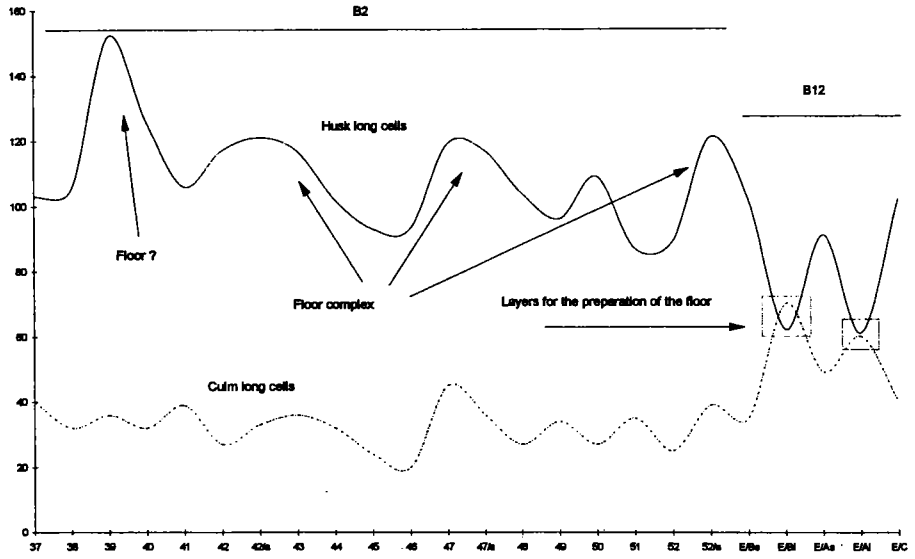

Fig. 49. Proportion of husk long cells and culm long cells in Makri samples from squares B2 and B12.

elongated and a decreasing of the quantity of short cells phytoliths (figure 48). The more general architectural destruction layers have an opposite trend. Sample 39 was not identified as a floor during the excavation but it may represent a living surface that lacks the proper characteristics of the other floors in Makri (hard and compacted earth flooring) but it has experienced a same phytolith input. This difference is due to the fact that different plants or, more probably, different parts of plant have contributed in building the phytolith assemblages of the floors and that of the architectural destruction layers.

The plotting (figure 49) of the elongate cells following the design of their walls –smooth or undulated (culm) against spiny (husk)– shows that husk phytoliths are always the most common in all the samples of square B2, while in square B12 culm elongate gain in importance.

An hypothesis can be put forward to explain the pattern. The abundance of elongate husk morphotypes in floors sediments in connection with the "storage area" may be related to the use and/or processing of cereals in the central part of the settlement. The overall opposite pattern for the samples from square B12 may represent an alternative use of this area, with an input from different plant parts (culm). In samples Bi and Ai culm elongates equals or outnumber the husk

elongates. These two samples are the beaten earth flooring part -the preparation- of the two over-imposed floors.

Phytolith assemblages have been analysed by means of Canoco statistical analysis software (Ter Braak, 1987). In figure 50 there is the graphical output of the correspondence analysis of Makri samples. The total inertia and the orientation of the axis in respect to the principal morphotypes is given in table 1 and 2. Notwithstanding the fact that the samples tend to cluster in the middle of the graph and that the total inertia for the first three axis is relatively low (thus underlining a high variability in the data set) the graph displays some interesting features. The four different floors lie in different quadrants, which manifests that the general input of phytoliths may have been different in time but, on the basis of the previous discussion, the plant parts utilised may have been similar. It may be possible that the group of plants (different cereals ?) exploited for the activities in relation to the floors changed in time, from phase 4(?)/3 to phase 1 of Makri period II.

The samples Bi, As, Ai and C correspond to a floor sampled in square B12. This level has been correlated to floor 3 of square B2 on the basis of their relative elevations. The phytolith assemblages are quite different from the ones of the section in B2, and lye close in the diagram. This may highlight, as already stated, a difference in the use of space in two areas of the settlement. As it is going to be discussed further on, articulated phytoliths from floor 3 are more abundant in B2 than in B12, and this can be related to the presence of the "storage area" with a possible higher accumulation of phytolith in connection with the storage and treatment of cereals. In any case, it should not be ruled out the potentiality that the floor in B12 is floor 4 belonging to the initial phase (phase IV) of Makri period II (late neolithic). This possibility would explain the marked difference in phytolith assemblages of those samples, and a closeness with the period of Makri I (middle or early neolithic). Until samples from Makri I will be processed and the stratigraphy of the site better clarified, however, it is not possible to incline for one of these two hypothesis.

Articulated phytolith

Since the "pattern of epidermal differentiation is consistent for each species" (Blackman, 1971:780) the use of articulated phytoliths (fossilised sections of epidermal tissues), that still retain the anatomical characteristics and the arrangement of typical silica bodies, should be diagnostic. The use of articulated (multi-celled) phytoliths has been pioneered by Miller-Rosen (1992; 1993) in epipalaeolithic and neolithic site from Middle East.

In the soil samples from Makri silica skeletons [as referred to by Helbaek (1960:540) and Renfrew (1973:9)] are quite abundant and their presence is constant in the samples. Composite phytoliths do not suffer from a particularly aggressive physical weathering (spines and ornaments are excellently preserved also in the disarticulated phytoliths) while it is evident a weathering (related to dissolution)

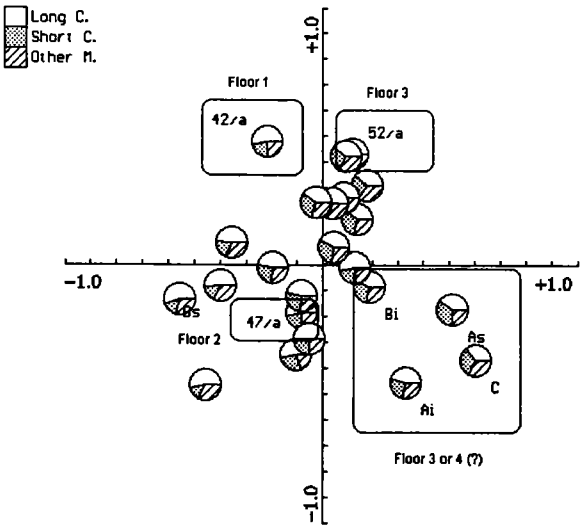

Fig. 50. Correspondence analysis display for Marki samples from square B2 and B12. The samples are represented by pie charts showing the proportions in the phytolith assemblage of long cells (Long C.), short cells (Short C.) and all the other morphotypes (Other M.)

Representation of the total inertia	
1st Principal Axis	17.0%
2nd Principal Axis	13.3%
3rd Principal Axis	10.8%
Total inertia	41.1%

Table 5. Summary of the inertia for the first three principal axis in the correspondence analysis of absolute data of Makri period II operated by Canoco program.

1st Principal Axis orientated on the absolute numbers of the following morphotypes:		
oval concave	VS.	Honey-comb
covex long dumbbell		Heavy block
2nd Pricipal Axis orientated on the absolute numbers of the following morphotypes:		
triehome type 8	VS.	oval concave
trichome type 16		

Table 6. Interpretation of the graphic display.

manifested by rugose and pitted phytoliths (both articulated and disarticulated).

The silica skeletons have been grouped following their general anatomical features and/or their long cells type:

1. cereal-like weavy long cells silika skeletons
2. smooth long cells silica skeleton
3. jigsaw-puzzle pieces

The first group is the only one in which there is an attempt to relate the overall anatomical structure with taxonomy. At this stage of the research the identification of the silica skeleton is still preliminary. Wheat and barley have been identified both as husk and culm silica skeleton. Grasses (not cereals) silica skeletons have been also identified but, at the moment, no precise taxonomical identification is available. The jigsaw-puzzle pieces may represent the input of phytoliths from Dicotyledons.

CONCLUDING NOTES

The enormous potentialities of phytolith analysis for supplying a deep insight in ancient agriculture have already been demonstrated, although the preliminary stage of this study.

Assemblages of articulated and disarticulated phytoliths are important tools for understanding use of space, exploitation of plants, and depositional and taphonomical problems that could have affected the site.

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XI. CULTURAL SETTING - CHRONOLOGY - CONCLUSIONS

The material evidence from the two distinctive cultural periods of the site, Makri I and II, according to the existing absolute dates (C14 radiocarbon dates) and the established relative chronology (ceramic typology), covers the period between the middle of the 6th millennium BC (calibrated) and the beginning of the 5th millennium. Indeed from the three available, so far, C14 dates, the two come from the transitional, destruction layer, between the two periods [GrN-21266: 6580+-40 BP, GrN21267: 6560+-30 BP], indicating a persistent date around 5500 BC (cal), while the third C14 date [GrN-20475: 6640+-50BP] which comes from the deeper strata (Makri I), is dated a little earlier (5540 cal. BC). This general cultural sequence is confirmed by the ceramic-traits of the site which are safely ascribed to the middle and late neolithic horizons of the southern Balkans and especially its local Aegean/Thracian version (Andreou et al 1996, 586).

The possibility of Makri I representing an early neolithic occupation period in the area, although not clearly supported by the the third C14 date, looks very probable. Indeed, there are specific and distinct ceramic traits, which although stylistically similar to the well-known "Paradimi horizon", point to a pre-Sitagroi I phase, which in terms of the local neolithic sequence must be dated to the early neolithic (see section IV). The importance of the presence of a possible early neolithic Makri I cultural period, is two-folded: first, it is the first time this phase is archaeologically documented in the area and second, it seems that it marks the early stages of a long lasting regional neolithic pottery tradition known as the "Paradimi culture", which during the succeeding late neolithic period, becomes the dominant ceramic tradition for the area of Aegean Thrace. This apparent strong regionalism in Thrace –the origin of which may go as far back as the palaeolithic period–, is particularly stregthened by the presence of the long-lived, uninterrupted and mature neolithic tradition of the Makri I and II material (architecture, portable finds, ceramic technology, lithics, economy, etc) (Urem and Efstratiou 1993, 617).

The main cultural period of Makri (II), viewed in a much wider Balkan context, must be seen as part of the long monochrome black-burnished Vinca A ceramic tradition which has a widespread distribution over a large geographical region in southeastern Europe. The comparison of the so-called Vinca ceramic traits between sites from different regions, has been always thought to establish a rough chronological and cultural contemporaneity among cultures in south-east Europe and north-west Anatolia (Fol *et al* 1989). Although greatly oversimplified, this assumption, if accepted, ties together the long sequence of Makri II with sites such as Karanovo III - Vesselinovo in Bulgaria, early Hoca-Cesme in European Turkey and Ilipinar IV in Anatolia (Efstratiou 1993, 33). In a narrower geographical context, it relates the neolithic culture of eastern Greek Macedonia with that of Aegean Thrace; Makri II appears to have many similarities with the neolithic sites of Sitagroi I - II and Paradimi I - II (Renfrew et al 1986).

Viewing, however, ceramic traits as cultural characte-

ristics and socioeconomic realities, applicable to such a vast geographical area, is always a risky process. Although this process has become a common practice in Balkan archaeology, it certainly simplifies different human habitation patterns, socioeconomic variations and expressions of cultural regionalism which seem to prevail in the whole area.

CONCLUSIONS

The emerging picture of the settlement of Makri has all the characteristics of a typical neolithic community of southeast Europe. Settled along the Thracian shore in the beginning of the 6th millennium BC, this agricultural and pastoral community experienced a gradual growth from a small camp with few compact houses to an extensive settlement layout with complex space arrangements and arhitectural features. This gradual change is documented by impressive excavational remains, the excellent preservation of which allows the study of their spatial and chronological characteristics. Geomorphological studies, micro-sedimentology and phytolith analyses, have contributed to the better understanding of its aquatic natural setting, the isolation of the main habitation periods of the site, including a number of short abandonment phases and the description of the function of certain activity areas. Moreover, charcoal analysis helped the reconstruction of the palaeoenvironment and the palaeoecological sequence in the vicinity of the site which, combined with the plant and fauna analyses, have clarified aspects of exploitation strategies and economic behavior.

What is striking is a sense of cultural maturity expressed, throughout the settlement,s life (Makri I and II), by a high degree of standardization in material products (pottery, architecture), persisting technological choices (ceramic and tool production) and forms of cultural and ideological expression (figurines, burial practices). Some minor changes such as the noticeable change in space organization between Makri I and II and the gradual appearance of new pottery forms, do not seem to alter the overall persisting cultural uniformity, the result, probably, of a successful socioeconomic expression.

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