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THE MESOLITHIC SETTLEMENT AT MAROULAS, KYTHNOS

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ABSTRACT

The prehistoric site at Maroulas Kythnos, is the only Aegean Mesolithic site, which has provided domestic remnants and burials, dated from the 9th and 8th millennium BC. This evidence is contemporary to the ones from the Cyclops Cave and from the site at Franchthi. Although the research is still ongoing, some preliminary results have benn obtained. Till now, the study of the Mesolithic tools has shown varied forms, which differ from those found in the Greek mainland. This difference is most probably due to some specific insular adaptation and the limited sources of raw material. Obsidian is however abundant indicating that Kythnos was along the main navigation route for transporting this material from Milos to Attica and Argolis. The food remains indicate a preference to marine resources, while animal bones are rare.

KEYWORDS: Mesolithic, obsidian, quarz, snails, fish, shells

INTRODUCTION

After the excavation of the Mesolithic strata in the Cyclops Cave on the island of Youra near Alonnessos (Sampson 1997, 1998), this is the second Mesolithic site to be located in the Aegean. Kythnos is one of the Cycladic islands closest to the Greek mainland, at a distance of 60 miles from Piraeus and significantly less from Cape Sounion.

The site of Maroulas on Kythnos is located along the coast, close to the mod-

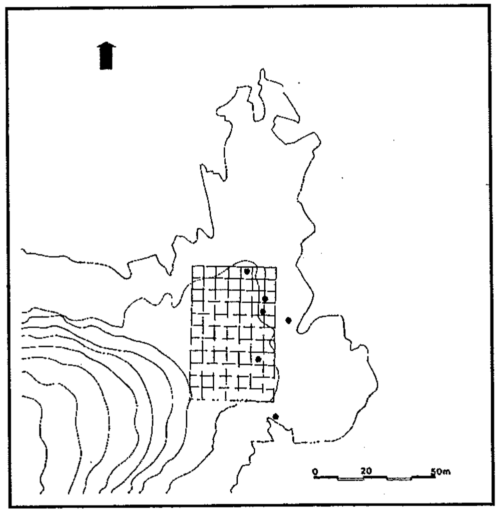

Figure 1. Maroulas on Kythnos. Map of the site.

ern settlement of Loutra (Fig. 1). It has been located 25 years ago by an anthropologist (Honea 1975) who appreciated the significance of this pre-Neolithic site. However, certain specialists in the field of prehistoric archaeology (Cherry 1979, 27-32; Cherry and Torrence 1982, 34) had negatively reacted and questioned the case of such an early prehistoric inhabitation ever in the Aegean, especially with reference to the Cyclades. They considered that food resources in the region would be limited and that man could not have permanently settled the islands in a period earlier than the Late Neolithic. However, it has been well established that the Cycladic islands do provide abundant food resources (cereals, stock raising) as well as water. Moreover, the islands would offer the obvious advantage of fishery.

It should be noted, that due to the sea level rise, which in that period would possibly be 50-60 m lower than the present (Bintliff-von Zeist 1982; Lambeck 1996) the greater part of the settlement has been destroyed, while its remaining extent measures approximately 1000 m². Mainly limited deposits have been preserved, especially along the side of the settlement in proximity to the sea. Thicker deposits occur to the West, not completely devastated by erosion. This leads us to the assumption that the location of a site that dates back to that era is a case of exceptional fortune. It appears that most contemporary coastal sites have been lost forever and this explains the rarity of Mesolithic sites in the Aegean. However, systematic research on other islands in the Cyclades and generally in the Aegean could possibly yield more cases of this period.

THE EXCAVATION

A rescue excavation at the site was initiated in 1996 with a limited duration of time. After an interruption that took several years, the conduction of the excavation was continued in 2001, in collaboration with the Ephorate of Antiquities in the Cyclades. Prof. J. Kozlowski and Dr M. Kaszanowska also collaborated with our team and undertook the study of tool technology. During the 2001 summer season, we opened numerous trenches in the area. Our research yielded more floors of inhabitation, graves and storing pits that contained layers of burning and food remains. A great number of stone imple-

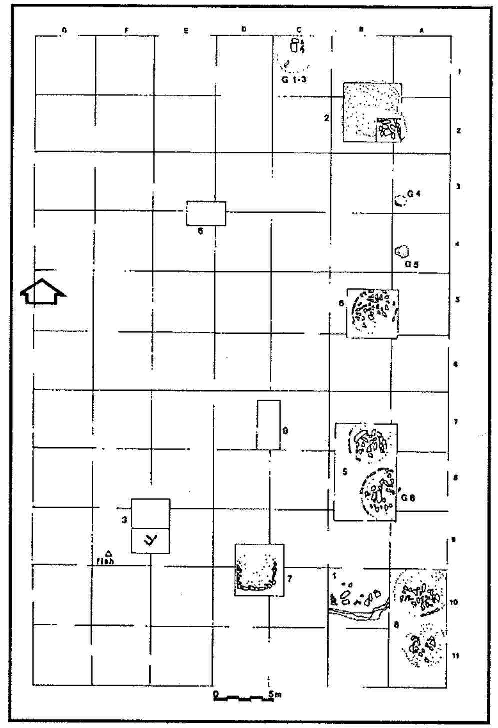

Figure 2. Topographical grid of the excavation.

ments made of obsidian, flint, and quartz had been brought to light and studied by specialists. The majority of the trenches have been excavated according to a grid 60X35 m large laid out by a topographer (Fig. 2). The entire amount of soil has been sieved with a dry sieve or the flotation method.

STRATIGRAPHY OF DEPOSITS

In the northern part of the site deposits that are, generally, richer in calcite, predominate. In the profile of trench 6 (Fig. 3) loamy layers 2-4 contain considerable ammout of calcite, only the sandy layer 1 contains mainly quartz and plagioclases. Muscovite and chlorite occur in all the layers as secondary admixture. Layers 2-4 are weakly anthropogenic which can be seen in the small ammount of artefacts and light colouring of sediments.

In the southern and south-eastern parts of the site the sediments are strongly anthropogenic (the presence of large ammount of shells and artefacts, a high proportion of organic matter) and – at the same time – show a different mineral composition. For example in trench 3 the proportion of quartz is high. It is only in lower layers (primarly in layer 5, but also partially in layers 3 and 4) the proportion of calcite increases. The bottom layer 5 is cemented by carbonates. Secondary mineral composition in the profile of trench 3 is represented by plagioclases, chlorites, muscovite and cordierite.

Layers 3 and 4 contain a large quantities of land snails shells making a kind of shell midden; it is underliyed by the lower pavement (II - Fig. 4) and covered by the upper pavement (possibly doubled: Ia and Ib). The interface of layers 3 and 4 is

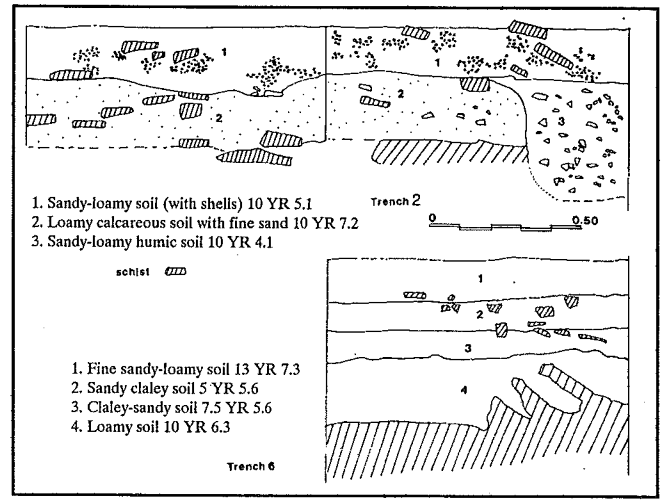

Figure 3. Profiles in Trenches 2 and 6.

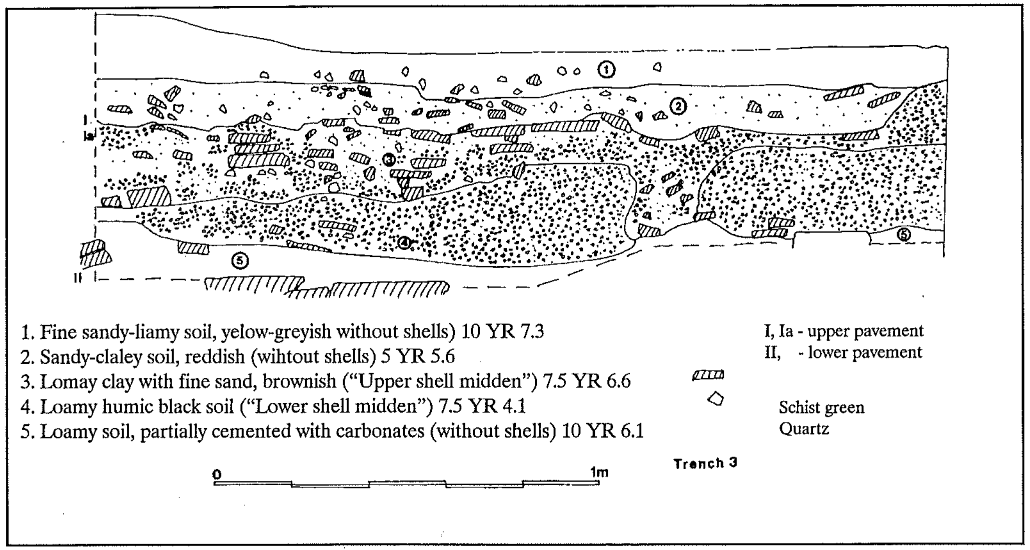

Figure 4. Profile in Trenc 3.

cemented by carbonates.

The carbonates formed in the effect of secondary processes of evaporation of solutions within the sediments. This process is analogous to the formation of nuclear caliche. The process could occur in several episodes which is indicated by radiocarbon dates on carbonates from trenches 2 and 3. The carbonates from layer 5, trench 3 have been dated to 11 370± 110 yers B.P. (Gd-11 654), whereas the carbonates just above the lower pavement in trench 2 has been dated at 6.500 ±50 (Gd-11 653) and below the lower pavement at 6 880±140 (Gd-11 655). All these dates, obtained by Prof.Anna Pazdur from C-14 Laboratory of the Institute of Physics of the Silesian Technical University in Gliwice, suggest that the formation of carbonates in these layers corresponds to wetter and warmer periods when the humidity balance was positive. These were, probably, the Late Glacial Allerod interstadial and the optimum of the Atlantic Period of the Holocene.

The mineralogical investigations were conducted by Dr Marek Michlik from the Institute of Geological Sciences of the Jagellonian University in Krakow.

Figure 5. Pavement in Trench 2.

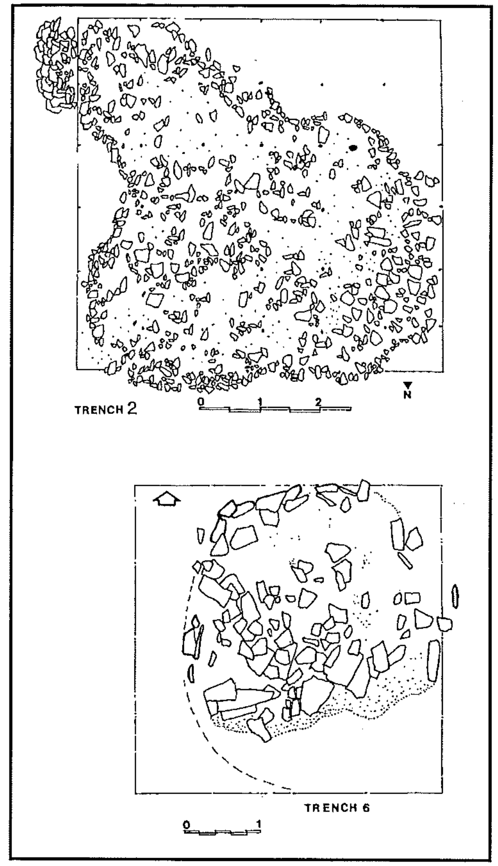

Figure 6. Pavement in Trench 2 and Trench 6.

ARCHITECTURAL REMAINS

At various points in the site, built constructions have been located, mainly in the eastern part of the settlement next to the coast. Due to intense erosion and the absence of deposits, constructions were considerably damaged. At the NE end of the site (Trench 2), a stone-paved floor of irregular dimensions was cleared, partly destroyed in the direction of the sea (Fig. 5, 6). The floor was constructed of large slabs and numerous small stones. It belongs to the later phase of the settlement, while another floor of an earlier phase has been located in the SE corner of the trench, at a depth of 0.40 m., at the extent of 4 rectangles measuring 1 m each. At this point, a wall in a SE-NW direction has been preserved, along with the part of a circular pit that contained several layers of burning. Further to the South, in Trench 6, the remains of a circular construction (Fig. 6) have been excavated. It comprises a floor built of flagstones, bordered on the periphery with small and large stones. The construction measures approximately 3.20 m in diameter. In the centre, a human bone was found along with a large concentration of snails and fragments of stone implements.

In Trench 5, two more circular constructions-floors have been excavated, almost adjacent with one another (Fig. 7, 8). Both of them were bordered by small stones placed in an upright position. These small and large stones are usually founded on fossil soil cemented by epigenetic carbonates during preceding and

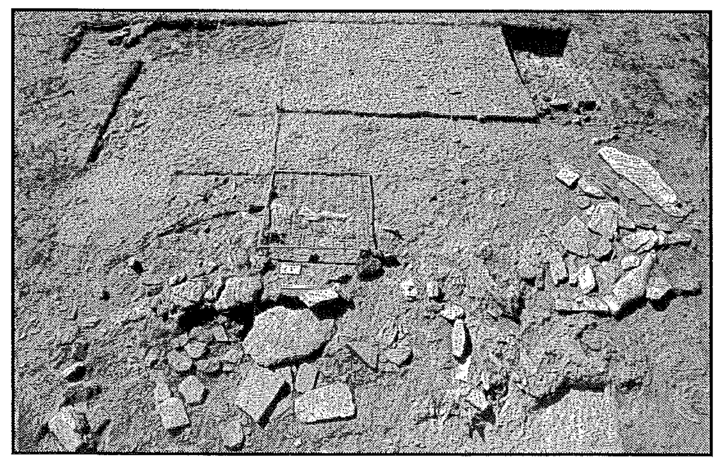

Figure 8. Ground plan of the constructions.

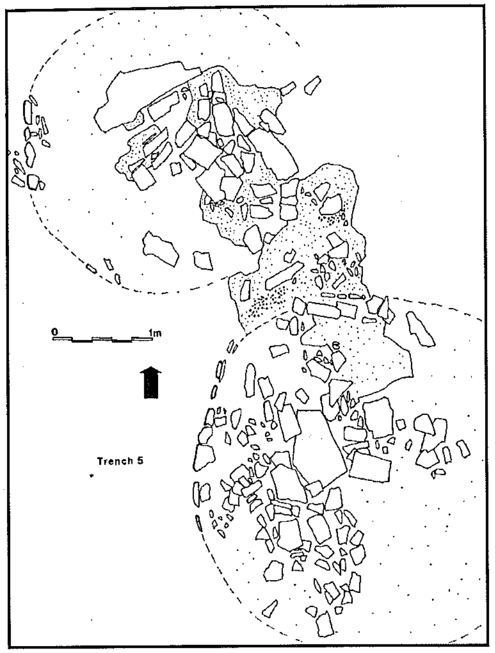

Figure 7. Circular constructions in Trench 5.

subsequent to settlement episodes wet phases. It contains food remains and stone implements. The construction located to the South is larger in size and measures about 3.5 m. in diameter, whereas a large part of the construction to the East has been destroyed. Rather in the centre of the floor, under a large slab, the remains of a human burial have been found. Beyond any doubt, this is the case of a paved area with flastones that probably belonged to the floor of a hut or another roughly made construction. In this area, a limited amount of shells have been found, mainly limpets, along with numerous terrestrial molluscs.

Further to the South, in Trench 8, another construction of flagstones in ellipsoid arrangement seems to be more destroyed. During the clearing process, obsidian and flint fragments have been collected, along with many terrestrial molluscs and a limited number of shells. Ellipsoid small and large flagstones have been recovered in the southern part of Trench 8. In the western side of the trench, some stones were placed in an upright position and apparently defined the area. Upon and around these stones, snails and fragments of obsidian have been found. The remains of other two ellipsoid irregular constructions have been recovered to the West of Trench 8. The latter one has been founded on the surface of the schist bedrock.

A small stone-paved floor has been excavated in Trench 7, which also has been considerably destroyed by sea erosion. To the West, Trench 3 has presented an unusually thick deposit for the site at Maroulas. At limited depth from the surface, stones placed in an upright position and a large slab gave the impression of a grave. However, no human bones have been found. On the contrary, the area is full of thick layers of snails that form three successive differentiated strata. The lower one is dark-coloured due to burning (Fig. 4). It belongs to a deposit pit extending NW to be excavated in the future. It is to be noted that during the 1996 season, the skeleton of a large fish (tuna) has been recovered to the West of Trench 3.

BURIALS

The excavation began in Square C1, since the fragments of a human skull had been recovered at this point. A trench initially measuring 3 X 3 m was opened and then has been extended 1 m to the North. The soil was sandy though particularly hard at many points, as the trench was next to the sea. After the removal of a large slab stone, a human skeleton has been recovered (Grave 1), lying on the back but in a strongly contracted position, since the bent knees were drawn up to the shoulders (Fig. 9). The arms were bent

Figure 9. Grave 1.

and placed on the chest. The skeleton has been preserved in a fairly good condition, although a hard rocky crust had covered the bones. Small stones on the periphery defined the burial. Due to the burial's good state of preservation, it has been decided to detach it from the ground in order to study it better and replace it in the future at a site open to visitors.

During the excavation of Grave 1, small formless obsidian fragments, shells, and snails were found, along with a fish vertebra. During the procedure of the skeleton's detachment, the excavation has gone deeper in the area surrounding the grave. The remains of a child burial (G 2) have been revealed and preserved the fragments of a skull and a number of long bones. It appears that other burials originally existed in this area, now destroyed by sea erosion. The third burial (G 3) has also preserved the parts of a skull. It is possible that a concentration of burials occurred at the NE end of the site. However, no deposits have been preserved at this point.

Burial 4 has been found at the eastern end of the site (Square A3) and has been partly preserved. Its southern and western sides were defined with vertical rows of slabs, not preserved along the remaining sides. The skeletal remains comprised the fragments of focils and a series of vertebrae. The focils indicate that the corpse was placed in a contracted position. Parts of another burial were found in Square A4 (Fig. 2). Grave 6 has been found at the southern end of the settlement, inside an ovoid cut in the rock. A slab covered the chest of the skeleton, only partly preserved due to sea erosion (Fig. 10). The recovery of the tibiae indicated that the corpse was not placed in a strongly contracted position, while the head was placed sideways upon the ground, facing a SE direction. At this point, the bedrock has been entirely revealed to the surface. Within a natural cavity in the rock, another burial (G7) has been recovered. A part of the spinal column has been preserved, along with vertebrae and focils. Fragments of obsidian, snails, limpets, and fish bones have been collected from this area.

South of Square A 11, an oval cut has been located into destroyed parts of rocks washed away from the sea. This was originally another location of burial (G 8) that shows the magnitude of destruction at the prehistoric site of Maroulas, which originally extended in a large area to the East. The remains of another burial (G9) have been located under a large slab that belonged to the part of a floor related to the construction in Square 5. The practice

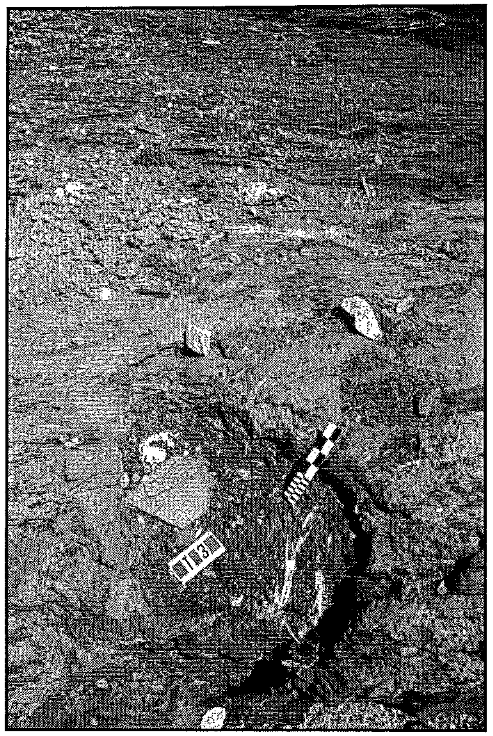

Figure 10. Grave 6.

to bury the dead under the floors of houses was common among the Natoufians of Syria-Palestine, while it also occurs at early Neolithic sites of the Near East. Scattered human bones have been recovered also at other points of this area, mainly the northern side, and must belong to one or more burials.

Generally at Kythnos, two burial types occur: a. rock-cut graves, and b. cist graves, i.e. a pit stone-lined on the periphery with slabs or stones and covered with large slabs. The recovery of burials at Kythnos is very significant, since till now the Mesolithic Age has been represented only by a limited number of skeletal remains in Franchthi (Cullen 1995) and a skeleton at the Theopetra Cave in Thessaly (Kyparrisi 1996).

The skeletal remains from Maroulas have been studied by an anthropologist, while a relevant announcement has been made (Poulianos and Sampson 2001).

Moreover, it has been observed that the walls of some skulls are very thick and show that these people suffered from thalassaemia, a type of Mediterranean anaemia.

STONE INDUSTRY

Major technological categories

The investigations into the site of Maroulas have yielded so far 2128 lithic artifacts. The majority are made from local quartz (80.45%), and obsidian artifacts are the next group (16.87%). In addition, well fissible white-patinated flint (2.6%), which occurs as small concretions, was also used in the production of tools.

The most commonly used raw material i.e. the local quartz, has poor fissibility. Quartz cores were discarded after obtaining merely several flakes. Such "wasteful" economy was caused not only by the poor quality of this raw material but also its easy availability. Besides concretions or their fragments also quartz plaquettes were processed: either exploited as cores or to produce specific tools. Some of the quartz blanks were obtained by means of the splintered technique.

Quartz was used to manufacture exclusively flake blanks. This resulted not only from the properties of this raw material but also from technological tradition as the high ratio of quartz flakes and the presence of flake cores from quartz suggest. Quartz flakes are nearly 59.9% of all the artifacts from quartz which is in agreement with the proportion of this category of artifacts on the sites where local processing was carried out.

Quartz tools are 5.2% of the total inventory from quartz, and 56.9% of all

TABLE 1: Major technological groups.

	Quartz		Obsidian		White flint		Others		Total	
	N	%	N	%	N	%	N	%	N	%
Cores	274	12,86	20	0,93	2	0,09			296	13,89
Plaquette	71	3,33	-		-		-		71	3,33
Splintered pieces	251	11,78	5	0,23	2	0,09	-		258	12,11
Flakes	1026	48,16	264	12,39	44	2,06	-		1334	62,62
Blades & bladelets	-		13	0,61	1	0,04			14	0,65
Tablet	-		1	0,04	-		-		1	0,04
Tools	90	4,22	56	2,64	8	0,37	2	0,04	156	7,32
Total	1712	80,35	359	16,84	57	2,39	2	0,04	2130	99,96

TABLE 2: Cores.

Core type	Quartz		Obsidian		White flint		Total	
	N	%	N	%	N	%	N	%
1. Single platform cores:								
1.1 Hypermicrolithic	1	0,33	4	1,35	-		5	1,68
1.2 Microlithic	18	6,08	5	1,68	1	0,33	24	8,10
1.3 Flake cores	38	12,83	3	1,01	-		41	13,85
1.4 Conical	1	0,33	-		-		1	0,33
1.5 Sub-conical	3	1,01	-		-		3	1,01
1.6 On flake	-	-	2	0,67	-		2	0,67
2. Double platform	28	9,45	-		-		28	9,45
3. Discoidal	20	6,75	-		-		20	6,75
4. Multiplatform and changed orientation	10	3,33	-		-		10	3,33
5. Residual	1	0,33	-		-		1	0,33
6. Other cores and core fragments	141	47,63	6	2,02	1	0,33	148	50,00
7. Initial cores (pebbles and chunks with single scars)	12	4,05	-		-		12	4,05
8. Choppers	1	0,33	-		-		1	0,33
Total	274	92,56	20	6,75	2	0,67	296	99,88

TABLE 3: Tools.

Tool group	Quartz		Obsidian		White flint		Other	Total	
	N	%	N	%	N	%	N	N	%
End-scrapers	13	8,33	6	3,84	-	-	-	19	12,17
End-scrapers +perforators	-	-	2	1,28	-	-	-	21,28	
Burins	3	1,92	-	-	1	0,64	-	4	2,56
(Burin spalls)	-	-	(1)		(1)		-	(2)	
Perforators	8	5,12	6	3,84	-	-	-	14	8,97
Backed implements	-	-	3	1,92	-	-	-	3	1,92
Truncations	-	-	2	1,28	-	-	-	2	1,28
Notched and denticulated tools	24	15,38	15	9,61	5	3,20	-	44	28,20
Tayac points	1	0,64	-	-	1	0,64	-	2	1,28
Bec burinant alterne	-	-	1	0,64	-	-	1	1	0,64
Side scraper	16	10,25	1	0,64	-	-	1	18	11,53
Retouched flakes	19	12,17	17	10,89	1	0,64	-	38	24,35
Implements with flat retouch	1	0,64	2	1,28	-	-	-	3	1,92
Hammerstones	4	2,56	-	-	-	-	-	4	2,56
Unidentified fragments	1	0,64	1	0,64	-	-	-	2	1,28
Total	**90**	**57,65**	**56 (+1)**	**35,89**	**8 (+1)**	**5,12**	**2**	**156 (+2)**	**99,94**
Splintered pieces	251		5		2			258	
Flake from edge of denticulated tool	1		-		-			1	
TOTAL	**342**		**62**		**11**		**2**	**417**	

the tools. The comparison of these two values indicates that quartz was easily available, locally processed and that it was less useful for tool production.

Obsidian is an extralocal raw material. It comes, in all likelihood, from the deposits on the Island of Melos (about 70-80 km away in a straight line). The proportion of this raw material is fairly high, higher than in the Mesolithic layers in the Franchthi Cave where in the lithic phase VII (Upper Mesolithic) it represents 2.8-3.15% (Perles 1990). Obsidian cores, accounting for 5.5% of the obsidian inventory, were strongly exhausted. If we assume that both quartz and obsidian were processed locally, then from a quartz core 4 flakes were detached on average, and from an obsidian core nearly 17. The splintered techniques was only occasionally used as splinters account for only 1.3% of the obsidian inventory and 15.07% of the quartz inventory.

Flake blanks predominate also among obsidian artifacts (73.5%) but individual fine bladelets, accounting for 3.6%, also occurred. Tools from obsidian are 15.5% of the total number of all obsidian artifacts, thus their index is higher than in the case of quartz tools. When we examine the raw material composition of the tool group, we find that as much 36.36% are specimens made from obsidian. Such a high obsidian tools index may mean that: a) because of its properties this raw material was particularly frequently used for the production of retouched tools which were used longer and were transformed, b) at least some of the obsidian tools were supplied to the site as finished products. It seems that in the case of the inventory at Marulas we are having to do with both situations.

Other extralocal raw material is probably the white-partinated flint of unknown provenance. The structure of the inventory from this flint is similar to that of the obsidian inventory. This was also a favoured material for the production of tools, but — just as in the case of obsidian tools — some finished tools may have been brought to the site.

The comparison of the structure of the inventories from the different raw materials (Table I) reveals a slightly different way of exploitation of each rock type on the site. The differences result from various availability and physical properties of obsidian, white-patinated flint and quartz. But, in general, we seem to be dealing with a homogeneous chipped stone industry at Maroulas.

Cores

Among structured cores single platform cores predominate, followed by double platform specimens, while discoidal and multiplatform cores (Table II) come third. Besides the cores of the structured type there was a very large group of unstructured cores with multidirectional scars. The quantity of core fragments was also large. The fragments had often cracked during reduction, which had been caused by fissures in the raw material.

The majority are cores in the mid-stage of reduction, although there were also wholly initial specimens such as quartz pebbles or quartz pieces with single scars. In this group belong also numerous plaquettes with individual scars on the circumference. The relatively weakly exhausted cores are abundant, whereas, on the contrary, cores in the advanced stage of reduction are few.

Most of the cores were used for flake production wich constituted the basic blank material. At Maroulas cores for blades are almost absent; there occurred only microlithic cores for bladelets.

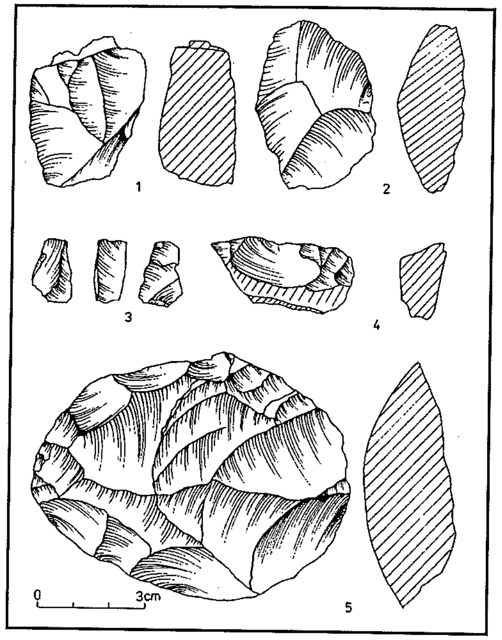

Figure 11. Maroulas. 1-5 cores (1,2,4,5 - quartz, 3 - obsidian).

When cores are analysed in terms of statistics and typology following groups can be distinguished:

1. Single-platform microlithic, or even hypermicrolithic cores for the production of bladelets and flakes, usually with the flaking surfaces extended onto the sites; the platforms are single-blow or unprepared (Fig. 12: 2,5,7).
2. Single-platform, low cores with broad, flat flaking surfaces used in the production of short and fairly broad flakes. These cores may sometimes exhibit traces of preparation of the flaking surface of the back. As a rule the platforms are unprepared (Fig. 11: 4).
3. Double-platform cores, fine, micro- or even hypermicrolithic used for the production of short flakes or bladelets. Obsidian specimens were made on small concretions or pebbles, whereas quartz specimens were frequently on plaquettes (Figs. 11: 3; 12: 3).
4. Medium-size, double-platform cores with common flaking surfaces, usually fairly regular, with a rectangular flaking surface. Such cores served to obtain blade-like flakes or flakes. Occassionally they have prepared sides and the back, but prepared platforms are rare (Figs. 11: 1; 12: 1,6).
5. Cores on plaquettes with scars along the narrow side (Fig. 12: 4), resembling "plate cores" described in the Mesolithic of the iron Gates region (Kozlowski 1983).
6. Discoidal cores for flakes, uni- or bifacial (Fig. 11 :2,5).
7. Multiplatform, polyhedral-spherical cores.

In terms of dynamic classification a preliminary analysis of materials from Maroulas allowed us to distinguish several, most important chaines operatoires:

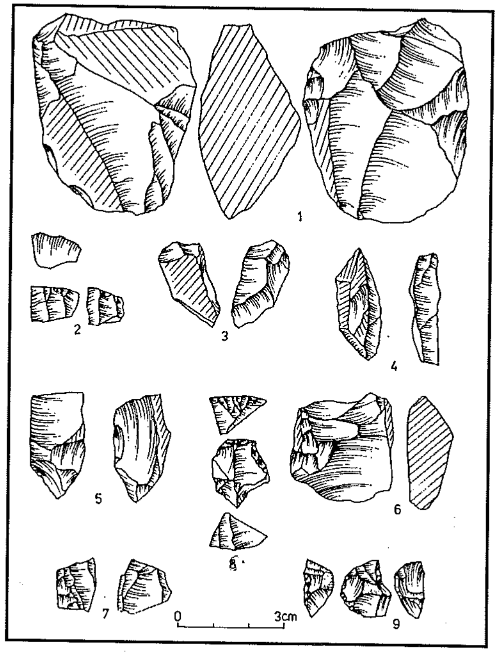

Figure 12. Maroulas. 1-7 cores, 8,9 - end-scrapers-becs (1, 3-6 - quartz, 2, 7-9 - obsidian).

1. Exploitation of flat concretions or plaquettes, mainly quartz ones, without preparation; reduction proceeded from one platform where flakes were detached on the flat side.
2. Reduction of more cubic concretions or chunks from one platform, sometimes preceded by preparation of the side; as the flaking surface extended onto the sides reduction was further continued. This enabled a much more advanced reduction, sometimes leading to microlithic cores. Flakes and bladelets were obtained. Reduction sequences 1 and 2 have been described also from the Upper Mesolithic of Franchthi Cave (phases VIII and IX) (Perles 1990, 50 and 86).
3. Preparation of sub-rectangular pre-cores with distinctly marked two, opposed platforms from which flakes were detached: alternately or sequentially.
4. A different chaine operatoire was centripetal reduction by detaching flakes around the circumference of a quartz plaquette. Sometimes, this reduction was preceded by a kind of treatment similar to that for splintered pieces, which yielded thin flakes. Centripetal reduction is also well represented in the phase VIII from Franchthi Cave (Perles 1990, 50).

Retouched tools

So far 156 tools and 2 burin spalls were found at Maroulas. The proportion between specimens made from quartz (90 specimens) and obsidian specimens (57) and white flint finds (9) is more equal than in other technological groups where the domination of quartz is stronger. Tools were very rarely made on blades and bladelets; tools made on flakes were in distinct ascendancy. Among quartz specimens plaquettes shaped directly into tools, were a frequent blank.

The size of tools, with the exception of quartz side-scrapers, is small. Among obsidian tools, especially, there are microlithic and hypermicrolithic specimens. Transformed tools and specimens reduced by secondary retouches occur in various tool groups but primarily among end-scrapers, notably among obsidian specimens. In the production of obsidian tools splinters and chips from the reduction of splintered pieces were sometimes used.

End-scrapers – there were 19 specimens (13 made from quartz and 6 obsidian ones). Two specimens were short: one had a convex front on a quartz plaquette (Fig. 13:7), the other was on a quartz flake and had an oblique, denticulated front (Fig. 13: 4). This specimen had some kind of a small proximal scar made by the pressure exerted on the protruding edge of the front. Two end-scrapers on quartz flakes

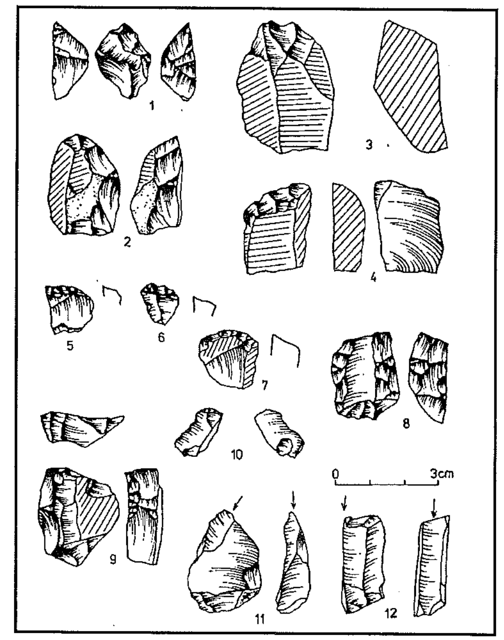

Figure 13. Maroulas. 1-10 end-scrapers, 11,12 burins (1,5,6,10 - obsidian, 2-4, 7-9, 11 - quartz, 12 - flint).

had steep lateral retouch: one specimen was with a slightly convex, denticulated front (Fig. 13: 8); the retouch of one lateral edge is contiguous with the scars of the trimming edge (unilateral crest). The other specimen had a slightly asymmetrical, nosed front (Fig. 13: 9). Three end-scrapers were high, carenoidal made on thick quartz flakes (Fig.13: 2,3). Only one obsidian end-scraper had retouch on nearly the whole circumference; it represents discoidal scrapers (Fig. 13:1). Moreover, there were three hypermicrolithic end-scrapers on fine obsidian flakes (Fig. 13: 5, 6, 10).

End-scrapers and becs – there were two such specimens, both from obsidian. These were short and thick specimens with steep fronts; one of them had an asymmetrical bec located perpendicularly to the flake axis, the other had a proximal bec shaped by two Clactonian notches (Fig. 12: 8, 9).

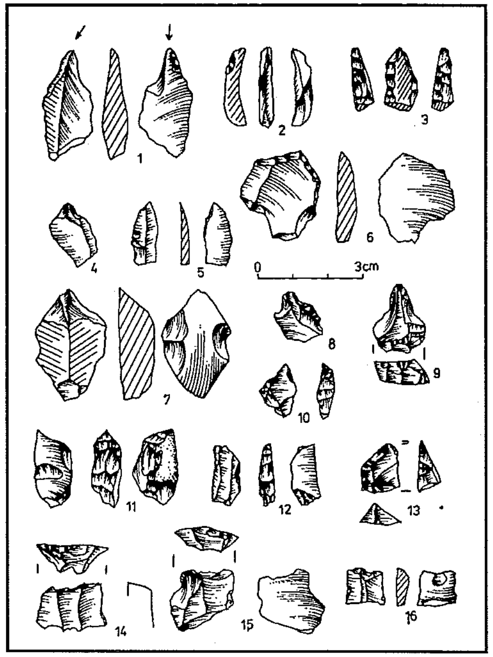

Figure 14. Maroulas. 1 - burin, 2 - burin spall, 3-10 perforators, 11-13 backed implements, 14, 16 backed implements, 15 - notched tool (1,3,6,7 - quartz, 2,4,5,8-14, 16 - obsidian, 15 - flint).

Burins – these are, rather, accidental forms, with individual burin blows resulting from the pressure on the distal part of quartz flakes (two specimens – Fig. 13: 11; 14: 1). The third burin, made from white flint, was a core – like specimen associated with an attempt at detaching bladelets on the side of a thick blade (Fig. 13: 12). There are moreover two burin spalls (Fig. 14: 2).

Perforators and becs – 14 specimens (8 made from quartz and 6 from obsidian). Two bigger specimens were on quartz flakes: one had a broad and blunt tip shaped by semi-steep retouch (Fig. 14: 6), the other was shaped by two Clactonian notches on the lateral side of a flake (previous to that the flake had undergone splintering – Fig. 14: 7). A very regular perforator was made from a quartz plaquette; its sides are retouched on their whole length and the point is weakly distinguished (Fig. 14: 3). Obsidian specimens are microlithic: one perforator was made on a tablet, with the front shaped by Clactonian notches with fine retouch on the tip (Fig. 14: 9); three specimens were shaped by fine Clactonian notches only (Fig. 14: 4): one by very fine retouch (Fig. 14: 8) and the other by fine and steep retouch (Fig. 14: 10). One atypical perforator is on a more regular blade (Fig. 14: 5).

Blacked implements – there were three obsidian specimens, all belonging to arched backed implements. Two specimens were made on flakes (Fig. 14: 11, 13) and one on a bladelet (Fig. 14: 12). The thickest specimen was on a cortical flake with bipolar retouch, a thinner specimen had a convex blunted back and the

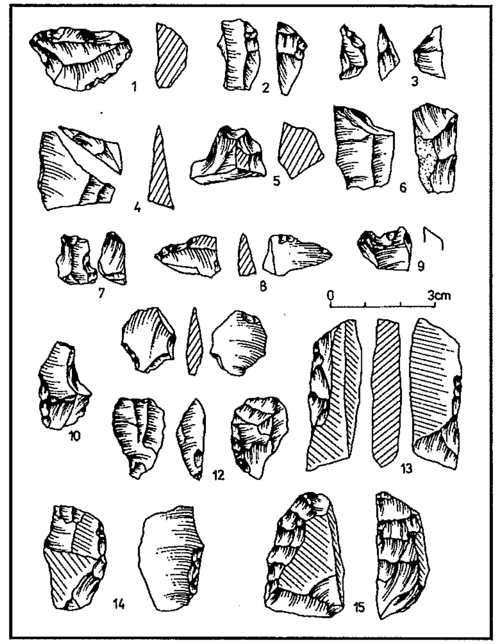

Figure 15. Maroulas. 1-9 denticulated and notched tools, 10, 12-15 side- scrapers, 11 - retouched flake (1,13-15 - quartz, 3,5,7,8,11,12 - obsidian, 2,4,6,9,10 - flint).

base was steeply cut by retouch. The specimen made on a bladelet resembled closely a microlithic segment. It had a slightly denticulated blunted back and scars from impact fracture on the ventral side of the base.

Retouched truncations – there were two obsidian truncations (on a bladelet and on a blade) with steep, slightly concave retouch (Fig. 14: 14, 16). They might be fragments of trapezes, especially the specimen on a bladelet.

Denticulated and notched tools – this was the biggest typological category (44 specimens). We could distinguish: transversal specimens on flakes, with denticulated-notched retouch (made from quartz, obsidian and white flint – Fig. 15: 1,4,5,8,9); lateral-distal specimens with steep, denticulated retouch (for example: a specimen from white flint – Fig. 14: 15). However, the most numerous group were uni- or bilateral specimens on flakes, sometimes fairly thick, made from quartz, less often from obsidian, and one item made from white flint (Fig. 15: 2,3,6,7). A separate group were denticulated tools made on thick flakes, which might be a kind of cores for detaching fine flakes (Fig. 15: 6). They were made from obsidian and white flint.

It should be stressed that two of the denticulated tools have convergent sides, resembling Tayac points, and one obsidian specimen is a kind of bec burinant alterne (Figs 14: 15; 15: 3).

Side-scrapers (18 specimens) – most often side-scrapers were made on quartz plaquettes or flakes (Figs 15: 10, 13-15; 16: 1-3). The specimens on flakes were, as a rule, lateral, oblique-convex. The retouch-

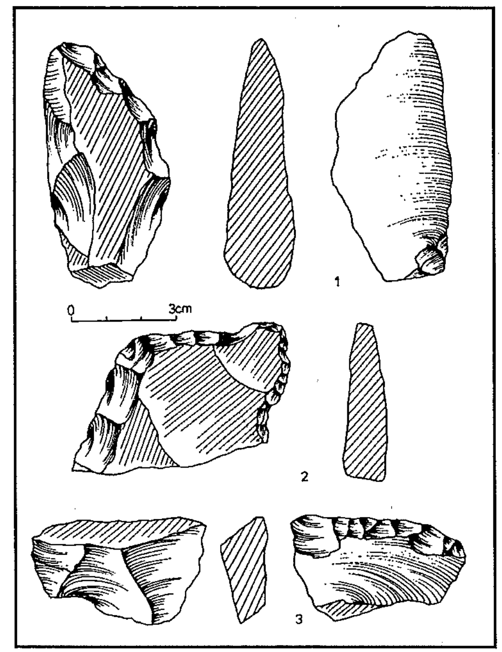

Figure 16. Maroulas. 1-3 side-scrapers (1-3 - quartz).

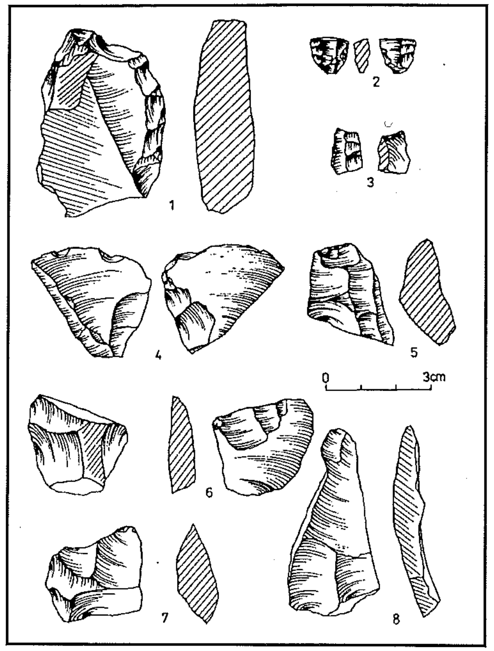

Figure 17. Maroulas. 1 side scraper, 2,3 pieces with flat retouch, 4 - retouched flake, 5-8 splintered pieces (1,4-8 - quartz, 2,3 - obsidian).

es were steep, uni- or, less frequently, multiseriate, occassionally denticulated. Transversal side-scrapers were rare; one of such specimens had inverse retouch (Fig. 16: 3). The specimens on quartz plaquettes had one retouched lateral side: straight or convex, less often the retouch was on most of the circumference (Fig. 16: 1,2). There was a specimen with partially bifacial retouch. The only obsidian side-scraper was made on a splinter (Fig. 15: 12). It had a convex side with flattish retouch.

Retouched flakes – are the second most numerous tool group (38 specimens). As many as 14 tools were on fine obsidian flakes (Fig. 15: 11). The retouch is almost exclusively lateral, rarely on the whole circumference. The fact that the retouches are usually steep, discontinuous causes that often it is difficult to distinguish between the denticulated-notched implement and the retouched flakes. There was only one quartz flake with flat, ventral retouch.

Of special interest are a bladelet and an obsidian flake with flat retouch (Fig. 17: 2,3). On its preserved base the bladelet fragment has bifacial, thinning retouch resembling micro-pointe a face plane. The small flake has flat dorsal retouch in the distal part accompanied by a lateral micro-notch.

Splintered pieces – Splintered technique for shaping tools (Fig. 17: 6) and producing thin flakes is well represented (Fig. 17: 5,7,8). There are 251 splintered pieces from quartz, 5 from obsidian and 2 from flint.

Conclusions

The chipped stone industry at the site of Maroulas is on the one hand a manifestation of adaptation to available raw materials, which is seen in the specific features of the flaking technique adapted primarily to the properties of quartz (fissibility and concretion shapes). On the other hand, when we compare this industry with the Late Mesolithic industries of continental Greece (first of all with the nearest site in the Franchthi Cave - phase VIII and IX - Perles 1990) we can find the dissimilarities in the morphological structure of retouched tools, especially in the quantitative ratio of common tools to microlithic truncations and backed implements. In phase VIII at Franchthi this ratio was 179:206, whereas at Maroulas 151:5. This difference can be explained by the different basic functional structure, notably a very small participation of projectile points at Maroulas. Regretfully, the quartz and the strongly polished obsidian artifacts from Maroulas are unsuited for use-wear analysis which does not allow us

to identify in greater detail the functional structure of the stone tools.

Besides adaptational and functional factors that shaped the technology and morphology of lithic artifacts from Maroulas we cannot ignore two additional factors influencing the picture of the lithic industry:

a) the Epigravettian technological and typological tradition, manifested first of all in the occurrence of backed implements and truncations,

b) the tendency, in common for the Early Holocene industries in the Eastern Balkans which derived from the Epigravettian tradition, to replace blade technologies by flake technologies (Kozlowski 1996).

Thus, a hypothesis can be put forward that the Island of Kythnos was settled by Late Mesolithic groups which sailed from continental Greece (probably from Argolide or Attica), and which quickly adapted to the production of chipped artifacts from local raw materials and specific local economy – differing from the economy of continental Greece – the economy that required from its tool kit to cope with a different range of functions.

FOOD REMAINS - MISCELLANEOUS FINDS

Terrestrial molluscs (snails) have occurred in enormous quantities in the entire extent of the settlement, particularly Trenches 2 and 3. In the latter one, it seems that a deposit pit of food remains has been located. Terrestrial malacofauna is composed of a relatively few species. The dominant species is Helix figulina (Rossmassler) (more than 75%). In trench 3, layer 4 it is accompagned by Helicella conspurcata (Draparnaud), Vitrea contracta (Westerlund), Cecilioidea acicula (Muller) and Monacha cartusiana Muller). In layer 3 the ratio of other species than Helix figulina is lower.

Helix figulina is a snail typical for Greece and Anatolia, living in open, sunny environments. Other species, particularly Vitrea contracta and Helicella conspurcata occur in shadier, medium humid environments. If the accumulation of Helix figulina is probably anthropogenic the other species lived on the site and register the natural environment during the occupational episodes. Analysis of terrestrial malacofauna has been performed by prof.Stefan W.Alexandrowicz from the Polish Academy of Arts and Sciences.

Marine shells have occurred in smaller quantities, while fish bones are also represented. The majority of shells belong to the patella species, most common in the Greek coasts.

Animal bones have been scanty and mainly belong to small-sized animals unidentified yet. Some of the animal bones have been found at burial locations. The bone of a dog has been found next to Burial 2. However, it is not possible to define whether it belongs to a domesticated or a wild species. Nevertheless, it is known that dog is one of the earliest domesticated animals. A significantly large number of bird bones have occurred in all areas, Trench 3 in particular.

Apart from the great number of stone implements, the remaining finds are limited, what is to be expected in reference to sites of the specific age. The Mesolithic Cave of Cyclop on Youra has also yielded a small number of finds. Five stone grinders in Trenchs 2 and 3 (Fig. 18) are to be considered as rare finds, while a sickle-type tool of schist is uncommon. Moreover, two beads of shell have been found in Trench 8, and a schist disc with central perforation (Fig. 18: 5).

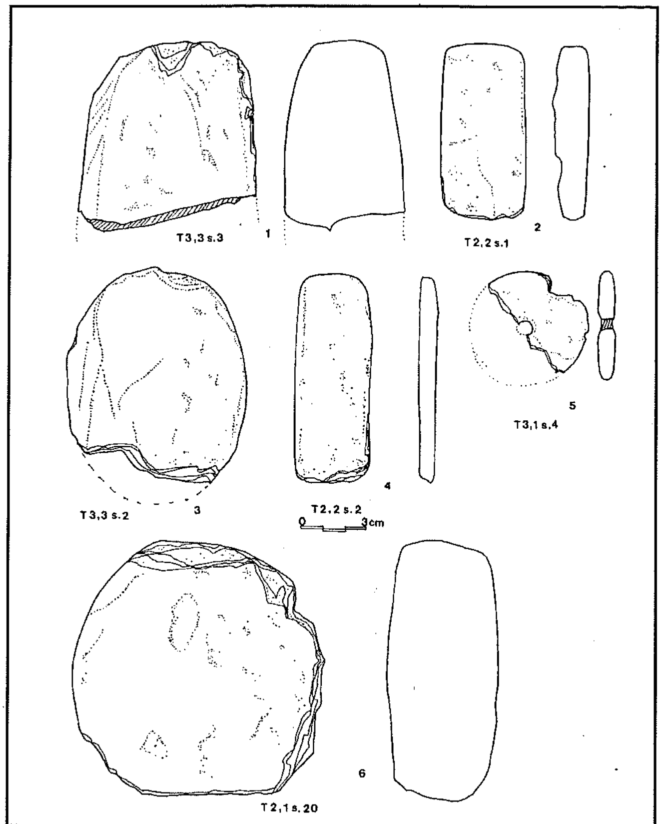

Figure 18. Maroulas. stone grinders.

CHRONOLOGY

The complete absence of pottery, the kind of food remains and other evidence lead to the early character of the site, which based on a bone sample radiocarbon dating, had initially been defined to the 7th millennium BC (Honea 1975).

All evidence shows to a dating in the Mesolithic period that in Greece has been fixed between 8500 and 6500 BC. Two recent radiocarbon samples, provided by the Institute of Nuclear Physics NCSR Demokritos in collaboration with other laboratories in America and Germany, have been analysed and date with relative precision the settlement and cemetery on Kythnos to the 9th and 8th millennium (9346± 67 BP, 8068-7668 BC 68% probability and 9571± 65 BP, 8263-7911 BC 68% probability). This dating corresponds to the ones already known from the Cyclop's Cave on Youra and Franchthi in Ermionida.

A somewhat later age of the site at Maroulas is suggested by the dates obtained at the C-14 Laboratory of the Institute of Physics of the Silesian Technical University in Gliwice. The analysis is made by Prof.Anna Pazdur. The following dates were obtained on organic fraction:

Trench 2, at a depth of 38 cm (just above the lower pavement): 7 240±120 (Gd-15 368)

Trench 2, at a depth of 50 cm (lelow the lower pavement): 7 680±120 (Gd-15365).

After calibration these dates correspond to calendar dates of 6 230-6 410 (68% probablility) to 7 000-6 200 years B.C. (95% probability) and 6 230-5 990 (68% probability) to 6 400-5 800 years B.C. (95% probability). Thus, they are later than the determinations obtained by the Demokritos Laboratory. A possibility that the occupation of the site covered a longer time span cannot be excluded. But as we are unable for the moment to correlate the profiles of the various trenches (separated by sedimentational and erosional hiatuses) we cannot reconstruct the uninterrupted stratigraphical sequence of the site.

The Laboratory in Gliwice has obstained the three dates on the carbonates from trenches 2 and 3 mentioned above. The dates were obtained on epigenetic carbonates and do not, directly, pertain to occupational event but give the age of the episodes when the humidity and temperature favoured migration and concentration of carbonates.

DISCUSSION

Although the excavation at Maroulas is still in progress and new evidence is possible to come out, certain preliminary comments should be made. It is obvious that the people who lived here were economically orientated toward sea activities, mainly fishing. At the same time, they were also involved with food collection and the hunting of small animals or birds, as the excavation has yielded no bones of large animals. Moreover, it is possible that they were not permanently settle at Maroulas and that they moved around different sites and islands. Generally, circular structures have been associated with nomadism, while rectangular architecture with sedentism (Lieberman 1998, 77). The fact that they used obsidian rather commonly proves that they had easy access to Melos. Studying the position of the island, one would assume that Kythnos is part of a chain formed between Melos and the Greek mainland related to the trading of obsidian (Melos - Kimolos - Siphnos - Seriphos - Kythnos - Keos - Attica - Argolid). Following this route, one could avoid the dangerous open sea from Melos to the Eastern Peloponnese in the Myrtoon region, especially in the case of Franchthi, where obsidian from Melos occurs since the Mesolithic period (Perles 1987, 142; Cherry 1981). Moreover, the results of surface investigation we have conducted in 1999 on the islands of Parapola and Falkonera, located between Melos and the Argolid, did not yield any finds of a date earlier than the Early Helladic and Early Cycladic period (3rd millennium BC), when there has been remarkable progress in navigation. It is logical that these islands constituted a natural bridge for island transhumance to Melos in the Mesolithic and Neolithic Ages. A long sea voyage was to be taken, since obsidian from Melos was being regularly transported to the Northern Aegean (Cyclop's Cave on Youra), already since the 8th millennium BC (Sampson and Kozlowski 1999). This course would possibly have followed certain sea or land passages through the southern and northern Euboean Gulf.

Nevertheless, movements taking place between Aegean islands in visual contact with one another are unquestionable. Moreover, it is most possible that Mesolithic seamen would reach out to the western Asia Minor coast. Therefore, similarities between the stone industry from Cyclops Cave on Youra and the corresponding one from Antalya in Asia Minor should not seem odd (Sampson and Kozlowski 1998, 1999).

The recovery of circular constructions on Kythnos, burial practices, and burials under the floors of houses appear to find parallels in the Natoufians, a civilisation that flourished in Syria and Palestine between 13000 and 9500 BC (Perrot 1966). Likely similar are the circular constructions in the pre-Ceramic phase from Cyprus (Sillourokampos), chronologically corresponding to the Mesolithic period in the Aegean (Katsarou 2001). Although it is for the moment premature to make reference to immediate contacts between the regions of the Aegean and the Near East, since any intermediate links in the regions of the Dodecanese and SW Anatolia have not been discovered, yet a parallel development or the diffusion of ideas from the direction of the Middle East as well as their late survival in the Aegean could be identified.

We should bear in mind, however, that in the Northern Balkans, in the region of Iron Gates, stone architecture occured in the Late Mesolithic context, stemmed from Epigravettian tradition, that showed no connection with the impulses from the Near East. The discoveries in Lepenski Vir (Srejovic 1969; Radovanovic 1996) and in Padina (Jovanovic 1974) confirmed the presence of semi-sedentary Late Mesolithic groups in the Danube Gorge, which based on a hunting-fishing-foraging economy. These groups paved their living areas and built overground habitations with trapeze-like or rectangular bases. These structures were preceded, in the early phase of Lepenski Vir culture, by semi-dug outs with oval base made from slabs (e.g. Vlasac, layer I, house no 2a) and large overground constructions with a circular base and a rectangular hearth inside (Vlasac, layer III, houses VI and IX) (Srejovic, Letica 1978; Radovanovic 1998, 128).

Nevertheless, all recent finds testify for the assumption that at least 10000 years ago navigation activities in the Aegean were considerably more expanded than we

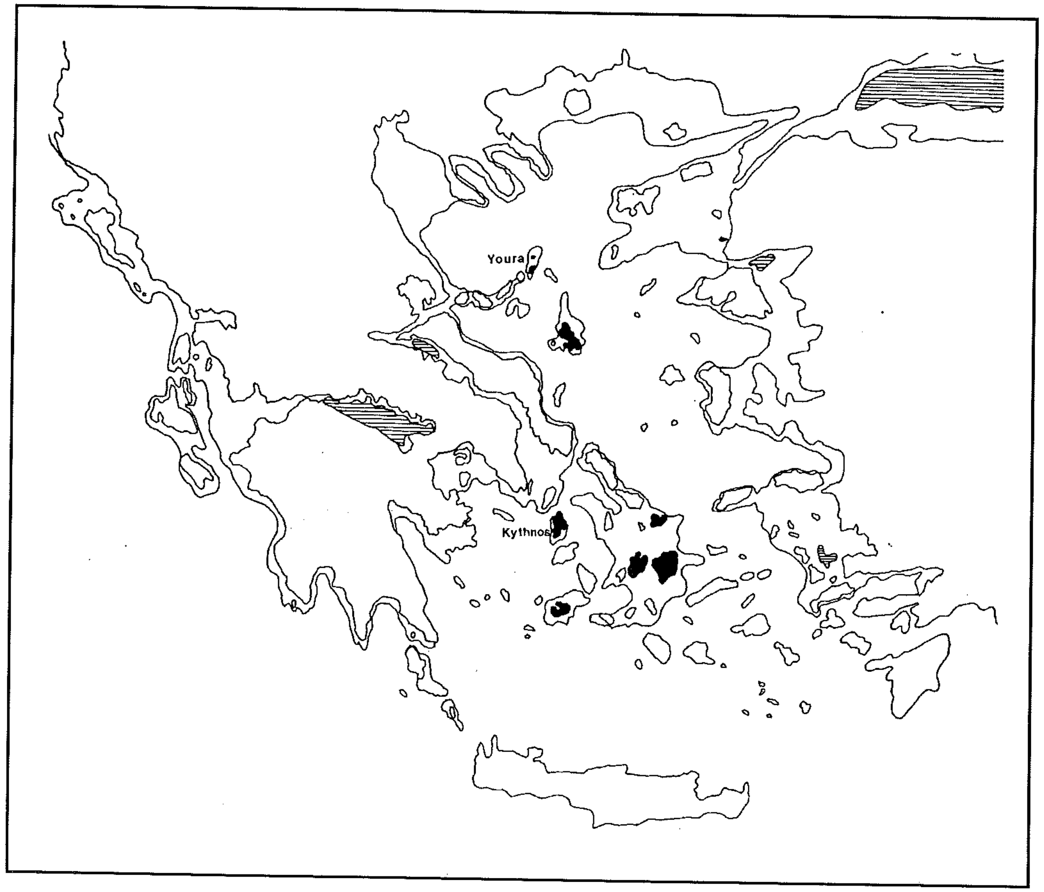

Figure 19. The Aegean basin around 18000-16000 years ago.

have previously imagined. Thus, apart from the sea route in the Northern Aegean that united Thessaly with NW Asia Minor, one should study the occurrence of more sea routes in the Southern Aegean. From the southern end of Euboea, the islands of Andros, Tenos, and Mykonos form another geographical chain (Fig. 19). Then, Mykonos has visual contact with Ikaria and it would not be difficult for people of this chronological period to cross this distance in good weather conditions. From there, the course to the Asia Minor coast and the SE Aegean islands would be rather an easy case. Another piece of evidence for early navigation is the settlement of Crete in the 7th millennium BC, by small groups of people assumed to have originated from the East. However, a population movement from the direction of the Southern Peloponnese cannot be excluded in this case.

As previously mentioned, Kythnos lies in relative proximity to the Greek mainland, while even in times when the sea had reached its lowest level (120-140 m lower than today), around 18000-16000 years ago (van Andel 1982; Fairbanks 1989), a rather narrow channel was formed between Kythnos and Keos (Fig. 19). This, similarly to the channel between Alonnessos and Kyra-Panayia in the Northern Sporades, would not have been hard to cross. It should be noted that in most of the deserted islands in the Northern Sporades, Middle Palaeolithic remains have been recovered, a fact that proves that also in times of a higher sea level communication between the islands was possible.

During the Higher Palaeolithic period, the majority of the Cycladic islands except for Kythnos, Melos, and certain others, used to form a huge island with 2/3 the extent of Cyprus (Broodbank 1995). This enormous island would have offered a rich fauna and flora to support the Palaeolithic hunters and food collectors. Distances from the Greek mainland were limited and it they would be easily covered with primitive crafts of this age. It is possible that future research will locate a number of Palaeolithic sites also in the Aegean region.

Till now, all theories relevant to animal and plant domestication refer to possible diffusion of species in the Balkans from the direction of the East, since these achievements have spread considerably earlier in the East. After the recent discoveries in the Aegean and the case of early animal domestication on Youra, we should accept that such innovating economical ideas and strategies did arrive from the East, most possibly through the established sea routes. Since, an appropriate ecological environment has existed in the Aegean, the local population would have been ready to accept such innovations in a time earlier than the Greek mainland.

A characteristic feature of this period is the engagement with intensive fishery. For the first time in the history of prehistoric archaeology, we approximate in detail close to the circumstances of fishing activities among so early population groups, particularly in the cases of the Cyclop's Cave on Youra and Franchthi. On the contrary, very limited archaeological evidence has been yielded for similar activities in Neolithic times. This can be explained by the fact that, although the Aegean Sea and generally the Mediterranean never ceased to be rich in fisheries, new economical tendencies have been formed in the Neolithic period (cultivation, the expanse of herds etc.).

For all the above-stated reasons, the unique significance of the open-air site at

Maroulas should be underlined. The case of Maroulas on Kythnos and the Cyclop's Cave on Youra represent the earliest discovered sites in the Aegean islands. However, the island of Kythnos has been inhabited also in the following Neolithic age, as shown by surface finds from numerous sites. Early Bronze Age sites (3rd millennium BC) are also known. The project for systematic survey on the island has been planned for the coming years along the continuation of the excavation, in order to locate and map all cases of prehistoric sites on Kythnos.

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