

Chapter 35

'Cooking' Installations in LC IA Akrotiri on Thera: a Preliminary Study of the 'Kitchen' in Pillar Shaft 65

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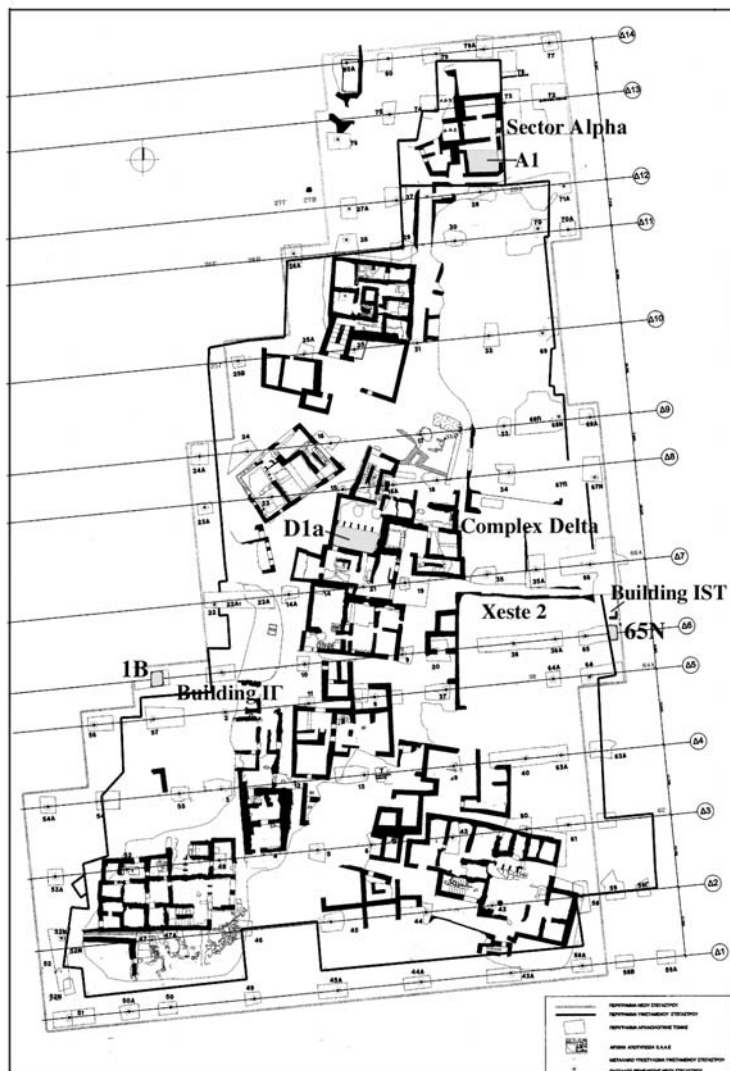


Figure 35.1. Akrotiri, Thera: general plan of excavated area.

The fixed hearths in LC IA Akrotiri Sector Alpha and Complex Delta

On the ground floor of Akrotiri's room Alpha 1 (Fig. 35.1), a small cooking pot, three coarse vessels and an ovoid funnel-mouthed pithos were found on a small rectangular built fixture with many layers of clay (Fig. 35.2), thought to be a hearth, though without many traces of burning (Marinatos 1968, 136–9, pl. 118; 1970, 150; Michailidou 2001, 268–73). Next to the hearth there was a large tripod cooking pot and a stone tripod mortar and pestle, whilst on its south side a stone trough was sunk into the floor. Large pithoi were lined up along the south wall of this area, some of which contained flour.

On the ground floor of the large room Delta 1a (Fig. 35.1), there is a fixture made from clay and stones just below the window, measuring 1.0 × 0.50 m. There are traces of burning on its upper surface, where three ceramic vessels — an ovoid funnel-mouthed pithos, a skyphos and a partially preserved amphoroid vase — were found (Fig. 35.3) (Marinatos 1971b, 18–20; Doumas 1974, 226; Grammenou in press). A clay bathtub was also found in direct contact with the structure (Kriga 2003, 466, fig. 8) and close to it there was a triangular stone vessel used for grinding (Fig. 35.3). A large number of pots (150 of various types and sizes) were found *in situ* on the floor of the room (Grammenou in press).

These two large ground floor rooms mainly functioned as store rooms, at least



Figure 35.2. Sector Alpha, room 1: the hearth on the west side of the store-room.

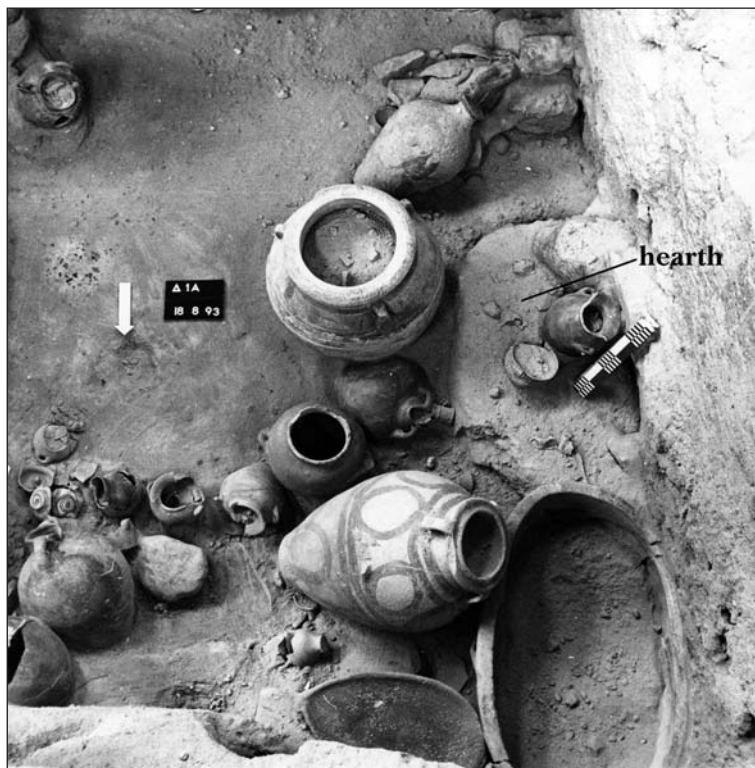


Figure 35.3. Complex Delta, room 1a: the hearth with the vessels on its upper surface.

in their final phase of use. Yet small-scale activities relating to the preparation and processing of food were also carried out there, and the relationship between the built fixtures and cooking utensils makes it possible to suggest that the fixtures functioned as cooking hearths. However, the concurrent use of the rooms for both storage and cooking would have posed

a problem: for reasons of health and safety, the kitchen never shares the same space with the larder. Good preservation of food requires a stable environment (humidity and temperature), and the storage rooms to be kept as clean as possible to avoid infestation by rodents, insects and so on. Both hearths showed only a few traces of a fire, and it can be suggested that they were probably used only occasionally, perhaps to provide the conditions necessary for food storage (cleansing of the room, temperature, processing of food before its storage etc.).

It should be noted that fixed hearths were not found in any of the three fully-excavated buildings in the settlement — the West House, the House of the Ladies and Xeste 3. Therefore, the use of hearths, mainly cooking hearths, in the settlement at Akrotiri is still under discussion. Some of the unanswered questions are: Where are the kitchens located? How many people did they serve? What was their functional capacity within the overall context (building, building complex, 'neighbourhood' etc.)?

There are two recent finds which go some way to answering these questions. In two of the Pillar Shafts recently dug for the construction of the new shelter (1B and 65N), two small rooms, with peculiar tall structures, were excavated that contain strong indications of activities related to food preparation (see Nikolakopoulou 2003, 564 for a brief report). However, the rescue nature of the excavation created difficulties in terms of understanding the rooms' functional relationships with adjacent buildings and neighbouring areas.

The 'kitchen' of Pillar Shaft 1B

The data for Pillar Shaft 1B were derived from the diary and archaeological report of excavator Mary Tsoulakou; a brief description is provided here, mainly to allow comparison of the finds with those found in Pillar Shaft 65N, described below.

The area of Pillar Shaft 1B is situated close to the west boundary of the excavated section of the settlement, south of Building IE and west of Building IG (Fig. 35.1), but it is not possible to determine if it belongs to either one of them. The whole of the interior of a room was uncovered but the excavation did not reach floor level. It is a ground floor room of small

dimensions (south side: 1.4 m; east side: 2.35 m; west side: 2.58 m; north side: 1.03 m) and it was accessed from a door in the southwest corner. The internal wall faces were blackened with soot and grime.

A tall horseshoe-shaped structure, built with rough stones and mud was uncovered in the northeast corner (Fig. 35.4). On its south side there was possibly a small opening that would have been blocked by stones placed one on top of the other (Fig. 35.5). The inside of the structure was full of fine-grained, ash-coloured material, containing barley awns. A similar but darker type of soil was found towards the lower part of the structure and beneath a stone (that was removed). On the upper surface, between the ash-coloured soil and some pieces of clay, two large, coarse, poorly baked horseshoe-shaped vessels were found with traces of burning. The one which was reconstructed was poorly baked; it has a flat base with almost vertical walls that decrease in height and cut off completely as they reach the straight end of the horseshoe (Fig. 35.19).

Two querns were found west of the structure and a large stone vessel was also found to the southeast (Figs. 35.4, 35.5). Apart from the base of a pot containing seeds, the study of the material derived from flotation revealed many examples of seeds, and the remains of fish, mammals and so on.

The 'kitchen' of Pillar Shaft 65N

Pillar Shaft 65N is situated on the same row of pillars as Pillar Shaft 1B but at its east end (Fig. 35.1). The 'kitchen' occupies the northwest corner of a building which extends to the east and possibly to the south as well, as testified by the doorway in the northeast corner of the room and the impressions of roof beams in the pumice level of the eastern section of the trench.

There is a narrow road to the north of the 'kitchen' oriented E-W and c. 1.10 m wide. There is possibly another one west of the 'kitchen'. The room



Figure 35.4. Pillar Shaft 1B: the built horseshoe-shaped hearth before the removal of the finely-grained, ash-coloured material, containing barley awns.



Figure 35.5. Pillar Shaft 1B: the built hearth and the stone tools in situ (final stage of excavation).

is thought to have been a part-basement and it is estimated to have protruded about 1 m above road level. The external west wall, the upper part of which has been preserved, reaches a maximum height above sea level of 21.15 m, the floor is at 18.10 m to 18.20 m.

The room was roofed and of small dimensions. The dimensions of the floor level are approximately

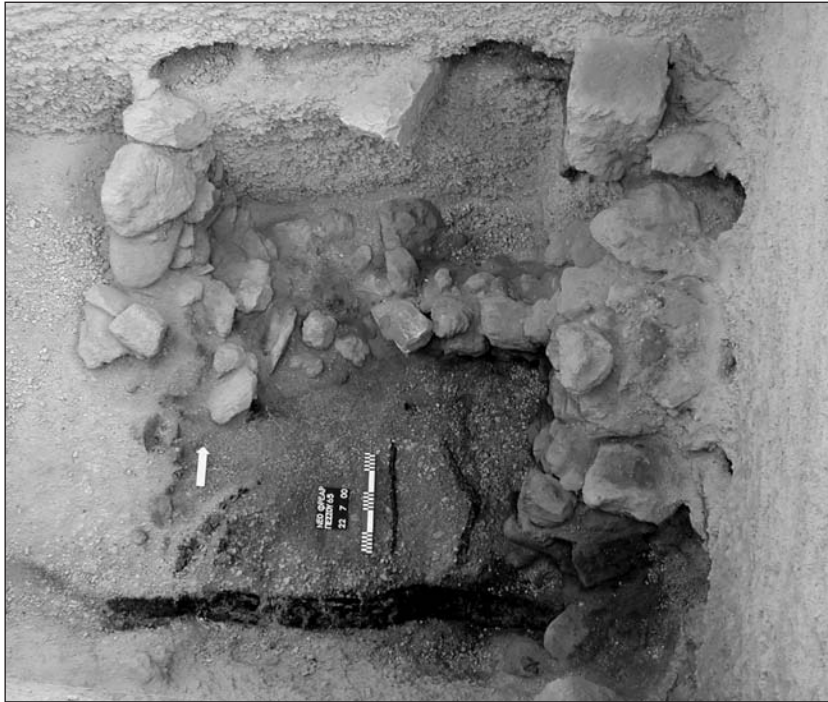


Figure 35.6. Pillar Shaft 65N: wooden ceiling beam from an unworked tree trunk and cross beams *in situ*, in pumice layer.

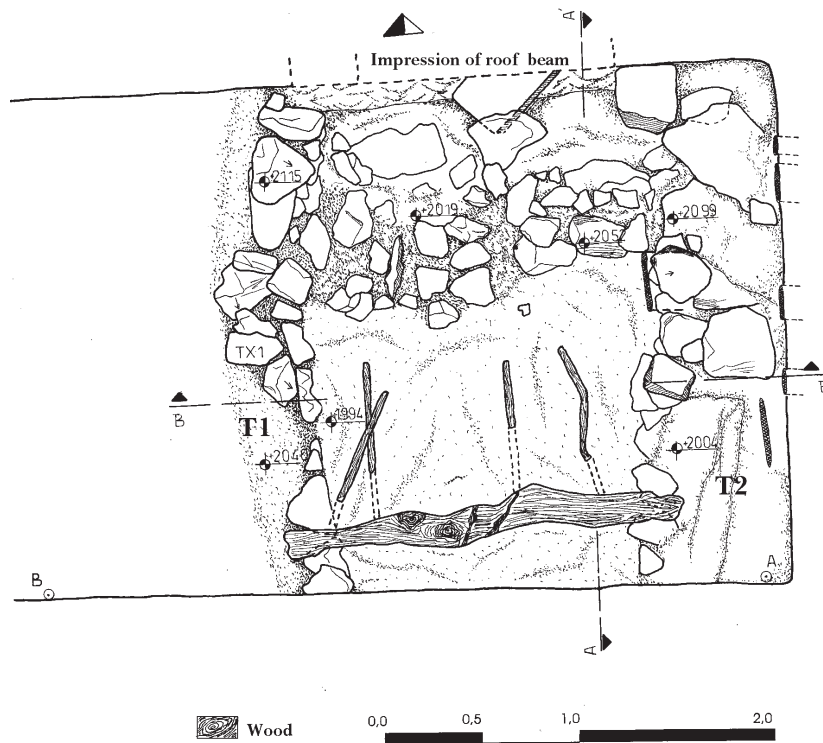


Figure 35.7. Pillar Shaft 65N: plan of the room at roof level. (Plan: R. Gouli.)

1.30 m (E–W) by 1.70 m (N–S visible length) (Fig. 35.6). A wooden ceiling beam from an unworked tree trunk, of length *c.* 2.30 m and diameter 0.16–0.18 m, was uncovered *in situ* within the beam sockets of the east (T1) and west (T2) walls, in a level of fine pumice (Figs. 35.6–35.7). It was well preserved, which facilitated its consolidation and removal. Small cross beams — branches — were also found in direct contact with the ceiling beam.

Three sides of the room were uncovered (north, east and west) as well as the ‘door’ in the northeast corner, which, as will be seen further on, underwent secondary use, most likely functioning as a cooking installation. This room was probably accessed from the south (it is thought that the internal face of the south wall is not far off from the south section of the trench because fallen stones were observed in the southwest section, west of the built hearth). The floor was flat and consisted of beaten earth with pebbles and fragments of violet-coloured pyroclastic rock.

The walls are roughly-made. The east and west walls have subsided towards the south by about 1 m. From the study of the pottery derived from the collapsed and demolished north wall and from the upper levels of the eastern wall’s north corner, it is possible to date their construction to an early phase of the LC I period and thus place it within the rebuilding phase of the settlement carried out after the seismic destruction (see Palyvou 1984; Marthari 1984). Two construction phases can be discerned in the ‘kitchen’: the east wall (T2), west wall (T1) and wall T4 belong to the first phase; wall T3 belongs to the second phase and it was added directly south of wall T4, reducing the area of the original layout (Fig. 35.8). The ‘kitchen’ was in use right up to the final occupation phase of the settlement.

The destruction level below the volcanic deposits was particu-

larly thick, approximately 1.55 m. It consisted of loosely packed, soft, fine-grained, greasy black soil, fallen rough stones, broken slabs, parts of coarse horseshoe-shaped vessels (Figs. 35.9, 35.17, 35.18), sherds from other types of coarse wares and many animal bones (see Appendices B & C), primarily in the northeast part of the area, as well as stone tools (see Appendix A). Many of the finds bore traces of burning. The internal wall faces, mainly the east and west walls and especially their upper sections, were blackened, and covered with greasy grime.

Structures in the 'kitchen' of Pillar Shaft 65N

A fixed built structure (henceforth Main Hearth) was found in the 'kitchen' and there are indications for the existence of two other structures.

Main hearth

A built structure was revealed in the southwest corner of the room. It takes the form of a 'two-storeyed' niche with a rectangular internal plan (Figs. 35.8, 35.9). Its dimensions are: (a) external – 0.80 m (N–S) × 0.70 m (E–W); height 1.08 m; height including the clay layer 1.19 m, (b) internal – N–S 0.42 m at its highest point, 0.34 m at its base; E–W 0.54 m; height 0.87 m.

The large number of fallen stones to the east and the limited scattering of its contents supports the suggestion that the structure originally had a built east wall with a small opening, comparable to the corresponding structure in Pillar Shaft 1B.

The side walls were formed by vertically placed slabs (Fig. 35.10): from pyrombrite in the upper section (with a height of about 0.57 m) and hard volcanic rock in the lower section (with a height of about 0.30 m). It is thought that the choice of building material was not random and that it was possibly related to the function of the structure, as the heat tolerance,

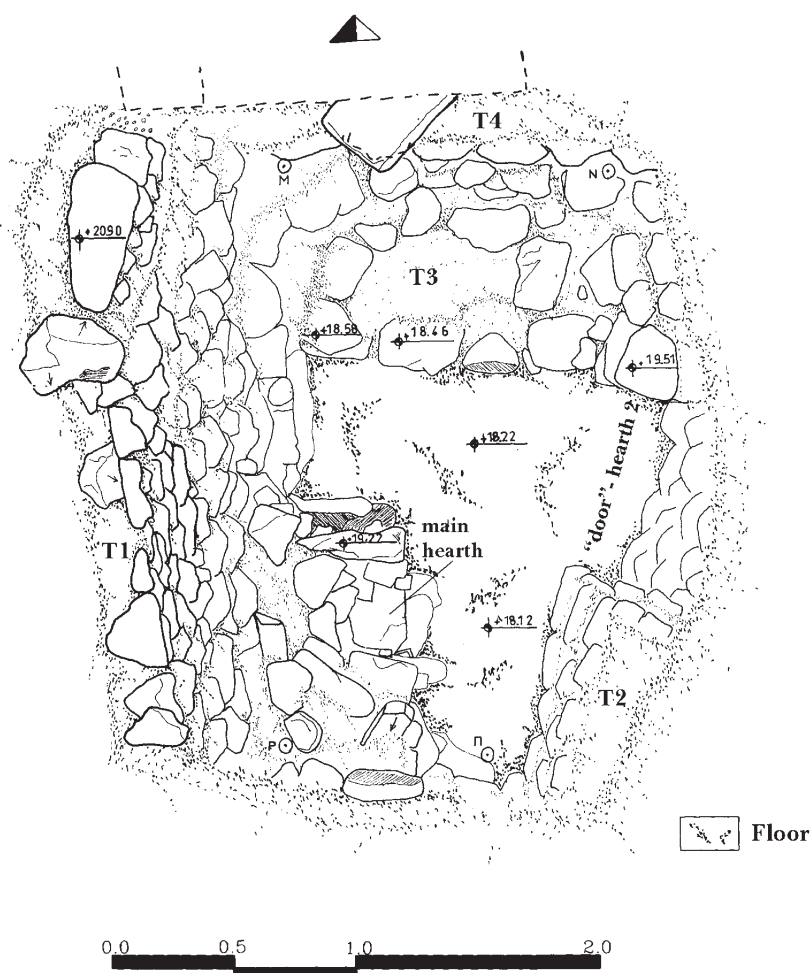


Figure 35.8. Pillar Shaft 65N: final plan of the room. (Plan: R. Gouli.)

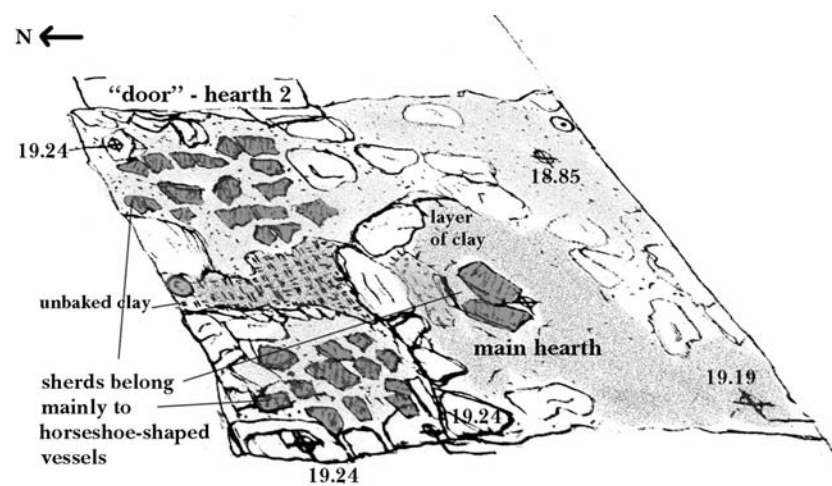


Figure 35.9. Pillar Shaft 65N: level of the upper surfaces of the structures. (Drawing in the daybook by K. Birtacha.)



Figure 35.10a. Pillar Shaft 65N: interior of the Main Hearth after the removal of its content.



Figure 35.11. Pillar Shaft 65N: interior of the Main Hearth after the removal of its content.

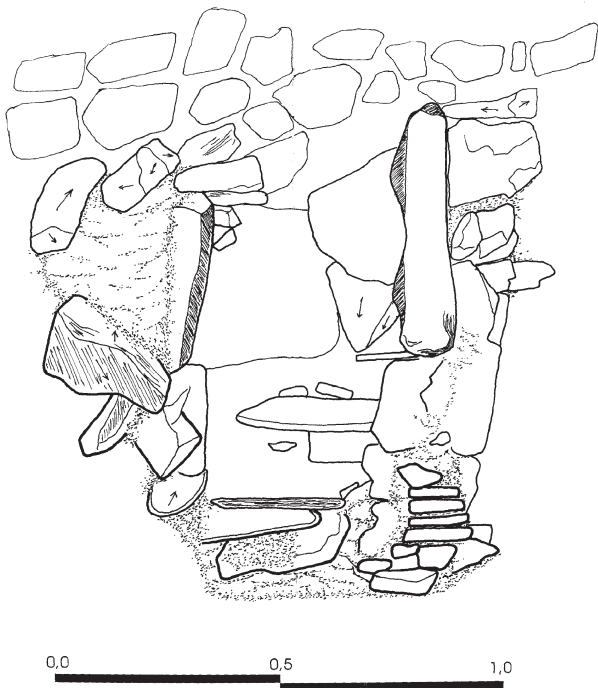


Figure 35.10b. Pillar Shaft 65N: elevation of the Main Hearth.

conductivity and retention of the two materials are different. The two storeys were probably separated by a flattish stone that had rolled east away from the hearth. Originally, it would have rested on a step created by the lower course of stones and on thin slabs that jutted out into its interior (Fig. 35.11).

The upper section contained fine-grained, soft ash-coloured material with barley awns. A similar but darker soil was extracted from the inside of the lower section.

On top of the structure, slabs supported a layer of reddish clay, 10 cm thick (Fig. 35.12). On the flat surface of this layer, part of a horseshoe-shaped vessel was found with blackened walls. Potsherds, very likely belonging to that vessel, were discovered to the north and east of the Main Hearth and on various levels.

Door in wall T2 – Hearth 2

In the original door leading east in the northeast corner of the room there was another hearth (Fig. 35.8). It is 0.87 m wide, of maximum height 1.52 m. The door jambs are about 0.47 m wide. After the door was cleared to floor level, it proved to be a blind opening (Fig. 35.13). The east side of the door was blocked by

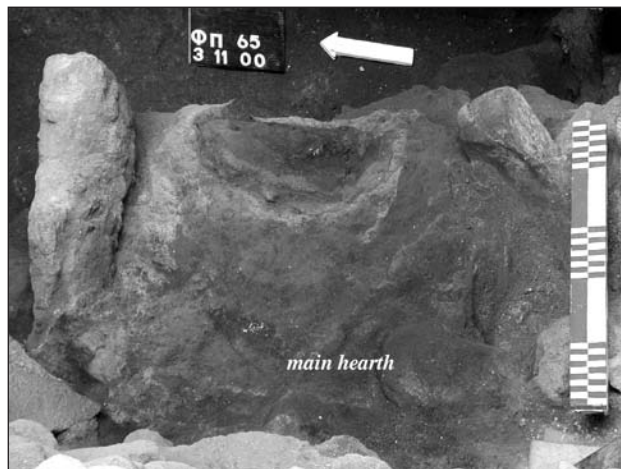


Figure 35.12. Pillar Shaft 65N: layer of clay in the upper surface of the Main Hearth.



Figure 35.14. Pillar Shaft 65N: northeast corner of the room. Sherds of horseshoe-shaped vessel with traces of burning in a layer of black soil.



Figure 35.13. Pillar Shaft 65N: 'door'/Hearth 2 in the final stage of excavation.

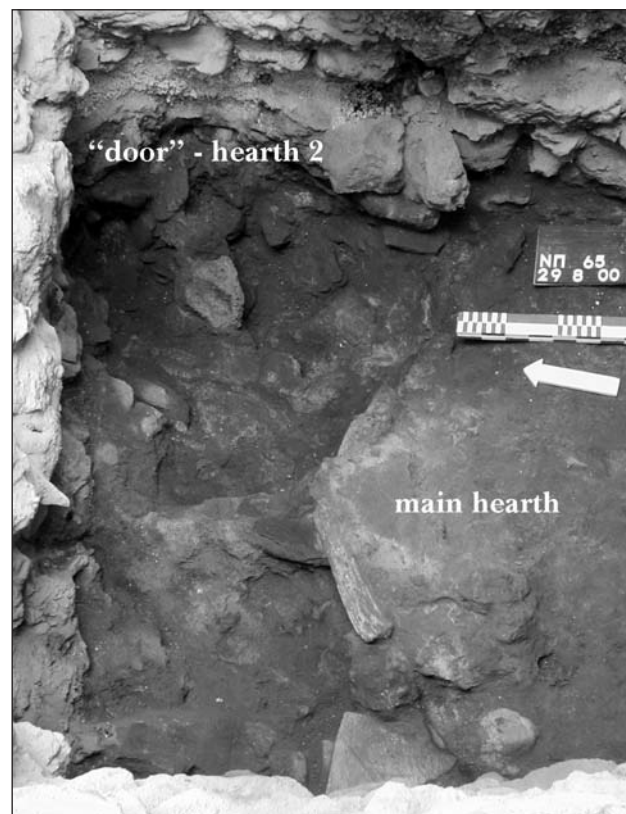


Figure 35.15. Pillar Shaft 65N: the upper surface of the Main Hearth and the upper part of the 'door' (Hearth 2).

a wall, the upper surface of which was situated below the lintel.

The deposit from lintel to floor level, which filled the internal area as well as that west of the opening, was particularly interesting. The upper

deposit consisted of potsherds belonging to one or two horseshoe-shaped vessels (Fig. 35.14) and a large amount of plant remains (see Appendix D). The lower deposits contained smaller sherds from the same vessels, greasy, black soil, as well as a large number

of plant species, mammals and fish remains (see Appendices B & C), some shells, fallen stones, tools (see Appendix A), fragments of slabs, pebbles and lumps of clay (Fig. 35.15). Apart from the distinctly greasy black soil, some of the other material in this deposit was also particularly blackened or partially burnt, such as the stones, potsherds and bones. The evidence mentioned above, as well as the fact that there was a vertically-placed rectangular flattish stone (its topmost part was on the same level as the top end of the north built wall of the Main Hearth) in the section of the north wall (T3) and west of the opening's north door jamb (Fig. 35.15), supports the view that the door was in secondary use and probably constituted part of a structure that functioned as a hearth, its upper surface being on the same level as the top of the main hearth.

At the top of the room's east wall, 1.30 m higher than the lintel, a large trapezoid socket, measuring 0.23 m by 0.27 m and with a depth of 0.48 m inside the wall, had been preserved containing greasy black soil (Fig. 35.16). It could be interpreted as a flue hole. In this instance, the wall above the door would be expected to have a vertical opening up to the socket, but it was not possible to verify this, as a substantial section of the wall collapsed during the excavation. Another possible means of venting the smoke that is both simpler and probably more efficient would have been through the void created between the back wall of the hearth and the lintel of the doorway.

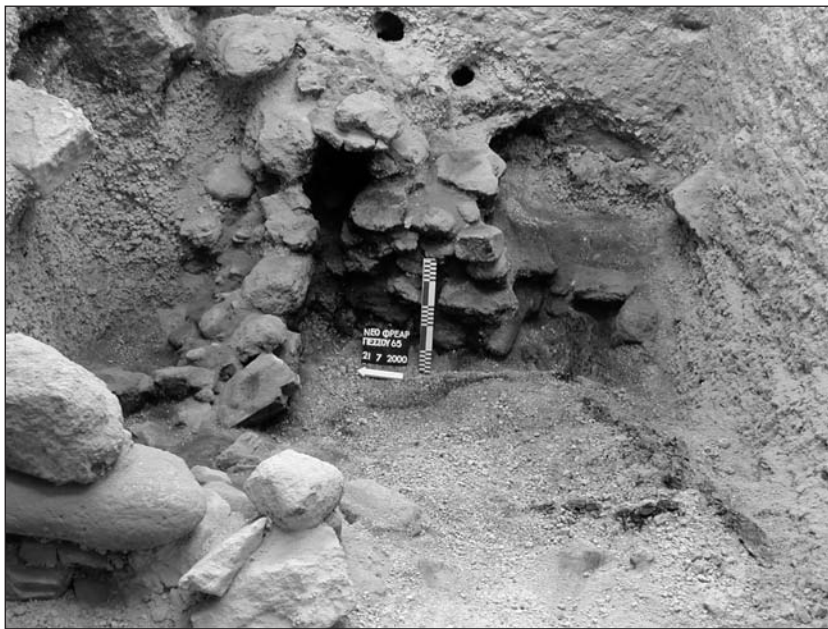


Figure 35.16. *Pillar Shaft 65N: socket at the top of the room's east wall, perhaps a type of flue hole.*

Although the evidence does not allow for a precise reconstruction of the structure in the northeast corner of the room, it is certain that it was partly inside and directly west of the original doorway, its upper surface being on the same level as the upper surface of the main hearth. Evidently, the working surfaces of both hearths were on the same level. Did they have the same function? Coarse poorly-baked large shallow clay vessels with traces of burning were found on the surfaces of both structures. The walls of Hearth 2 were covered with grime, whilst no sign of grime was noted in the interior of the Main Hearth and there were no traces of burning. It is possible that food was cooked or smoked on Hearth 2. Some activities relating to food processing may also have been carried out, as is indicated by the presence of many stone tools (see Appendix A). Naturally, the possibility that the organic material constituted the remains of meals, which were recycled as fuel, cannot be ruled out.

A possible structure

There was possibly another roughly-made structure in the northwest corner of the room, where a rectangular carved stone block was uncovered, resting vertically position and in direct contact with wall T3, as well as broken slabs and potsherds belonging to a coarse clay vessel with traces of burning. It is worth noting that here too the Main Hearth and upper surface of the stone that possibly formed part of the structure were on the same level (19.24 m above sea level) (Fig. 35.9).

Pottery from Pillar Shaft 65N

A large number of potsherds from large coarse poorly baked clay vessels, with flat bottoms, low walls and blackened surfaces (mainly on the inside), possibly soot and organic remains, were found throughout the deposit (Figs. 35.17, 35.18). The crumbling condition of the fragments makes it impossible to refit the pieces and conserve the vessels, thought to number five. The maximum diameter estimated for these vessels is c. 0.60–0.65 m. They belong to the same class as the two horseshoe-shaped vessels from Pillar Shaft 1B (Fig. 35.19). The fact that these vessels were fired at low temperatures, as well as their large size, probably did not allow for their frequent or convenient transportation. The opening along the narrow end served for emptying their



Figure 35.17. *Pillar Shaft 65N: sherds of a horseshoe-shaped vessel.*



Figure 35.18. *Pillar Shaft 65N: sherds of a horseshoe-shaped vessel.*

contents without needing to lift or move them. These vessels were intended for cooking meat, fish or edibles made with flour and other plant-derived ingredients. In other words, they constituted a type of pan, the descendants of the similar EBA vessels known in the literature as 'baking pans'.

Conical cups (six almost complete, one complete miniature and many sherds), one bowl, the upper part of a jug with a funnel-shaped mouth and roughly half of a tripod cooking pot were also found. The rest of the potsherds mainly belong to one-handed cups, Cycladic cups and coarse closed vessels, both local and imported. There was a relatively high percentage of MC sherds compared to potsherds dating to the beginning of the LC I period (in the seismic destruction phase). The earliest material probably comes from the collapse of the upper part of the southern section of the east wall (T2) and the north wall (T3).

General observations

Both 'kitchens' in Pillar Shafts 1B and 65N are small, ground floor, roughly built rooms, possibly annexes to major buildings. In the corner of both rooms, fixed built structures of similar form, content and context were found with their upper working surfaces quite high up with regard to the floor (c.1.0 m). These fixtures functioned as hearths and/or ovens.

The 'kitchen' of Pillar Shaft 65N presents a more complex picture. There were at least two installations and many grinding tools. Movement would have been difficult for the people working therein. The general picture given by the finds shows an intensive use of the area with multiple activities being performed related to food preparation.

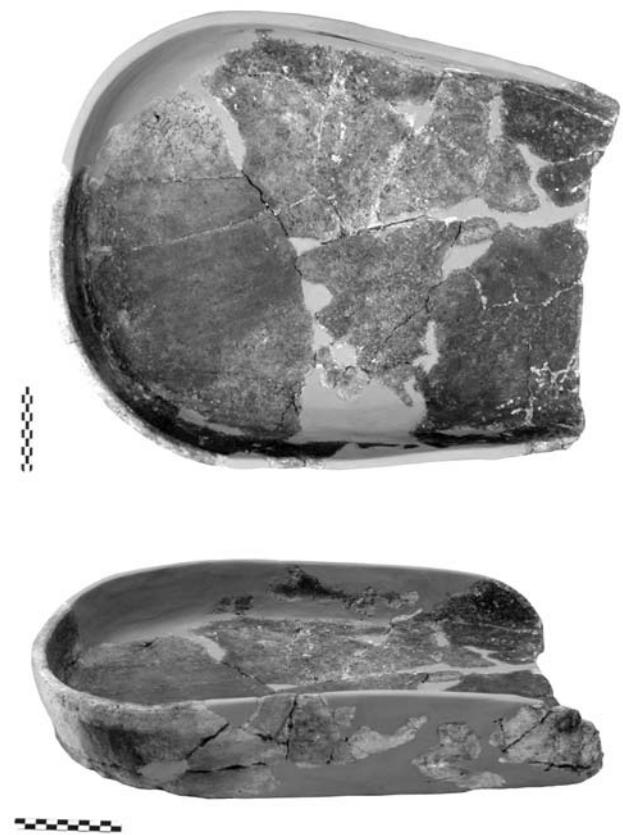


Figure 35.19. *Pillar Shaft 1B: coarse horseshoe-shaped vessel with traces of burning.*

Only one incomplete cooking pot was found in each of the 'kitchens'; thus, one should rule out the process of cooking by boiling ingredients in a deep vessel. Under no circumstances did cooking in deep

cooking vessels (tripod cooking pots, funnel-mouthed pithoi or jugs) require a tall built structure and it is possible that cooking was also undertaken outdoors.

Even though none of the published hearths or any other related structures are of similar form to those found in the areas of Pillar Shafts 1B and 65N, specific examples of areas whose finds and function display common features with the structures at Akrotiri are:

Ayia Irini

(a) A crude fireplace was excavated in the room interpreted as a kitchen (Period IVb) above the earlier House CJ building (Overbeck 1989b, 24–6). In the same area, stone vessels attest to food processing. (b) In the region below House E, an area was excavated (Period IV) containing a structure interpreted as an oven. The floor was covered in ash and black soil (Overbeck 1989b, 91). There is a room in House A that functioned as a kitchen. (c) The central area 30 (Period VII) was used as a kitchen (Cummer & Schofield 1984, 14–15, 35, 37, pls. 9, 12, 13). The hearth had two fire pits and a low stone curb; fuel was piled on the western side of the room and the smoke escaped from the flue holes in the courtyard floor.

Galatas

A semi-open air area of MM date (11, 12) was believed by the excavator to be a cooking area where large scale activities were carried out (Rhethemiotakis 1999). After this area was abandoned in the LM IA period, activities were transferred to area 14 ('Column Hall'), where a low built hearth was found, together with cooking vessels and many stone tools and food remains.

Kommos

Structures thought to be hearths or ovens were excavated in areas of multiple functions (Shaw 1990; Shaw & Shaw 1996).

Pseira

In room AF6, a large raised platform with a rectangular hearth was excavated and the area was interpreted as a kitchen (McEnroe 2001, 46–8, fig. 23, pl. 33B).

Vathypetro

In the southern room of the complex was the kitchen. Five clay structures are mentioned, bearing traces of fire and charcoal. The excavator interpreted two of the structures as kneading-troughs for bread, which would have been baked in the hearth that would have been found at the side of the trough (Marinatos 1952, 606–7).

'Kitchens' have also been excavated in other areas — domestic and palatial contexts — on Crete, such as at Sklavokampos (Marinatos 1939–41), Prasa (House B, room A: Platon 1951, 253–7, fig. 5), Zou (Platon 1955, 291–2, fig. 1, pl. 109b), Riza in Achladies at Siteia (room E in the MM House A was thought to be a kitchen and vessel storage area and it also contained pounding and grinding implements: Platon 1959, 210–19, fig. 1), Kastelli Khandia (House I, Room M: Hallager & Tzedakis 1984, figs. 1–3), and Vryses Kydonias (Building A, room 2: Zois 1976, 24–7, fig. 33). The large 'kitchen' and 'dining area' at the Palace of Zakros (Platon 1964, 152–4) are particularly interesting because the numerous bones found, as well as the structures and the cooking utensils, all testify to large-scale activities being carried out for food preparation, which is also the case at Galatas.

Acknowledgements

We are most grateful to the McDonald Institute for Archaeological Research for accepting our contribution. We would also like to thank the Director of the excavations at Akrotiri, Professor C. Doumas for entrusting us with the study and publication of the material from Pillar Shaft 65N, and for encouraging our research in every way. Thanks are due to Lucy Valassi for the English translation of my text and of Appendices A and B. Drawings and photographs are courtesy of the Archaeological Society at Athens, Excavations at Thera. We would also like to thank Yiannis Sarakinis for taking the necessary photographs and Dimitris Sakatzis for the digital processing of the images. Thanks are also due to Professor C. Palyvou for discussions regarding the architecture of the area of Pillar Shaft 65N.

APPENDIX A

Lithic material from the 'kitchen' in Pillar Shaft 65N

ANASTASIA DEVETZI

The lithic material from Pillar Shaft 65N is truly impressive due to the quantity of finds, their state of preservation, and their use. If the finds deriving from the destruction of the walls or those which are in fragmentary condition or found in the topmost deposits are excluded, there remain 21 artefacts. They are all tools, mainly grinding tools for the preparation of foodstuffs.

Types

Querns

Eight intact black andesite querns were found (Fig. 35.20). They are all made from natural water-worn boulders which explains their naturally smooth and often polished surfaces. Most of the querns have been modified to a greater or lesser extent by hammering around the margins of the working surface.

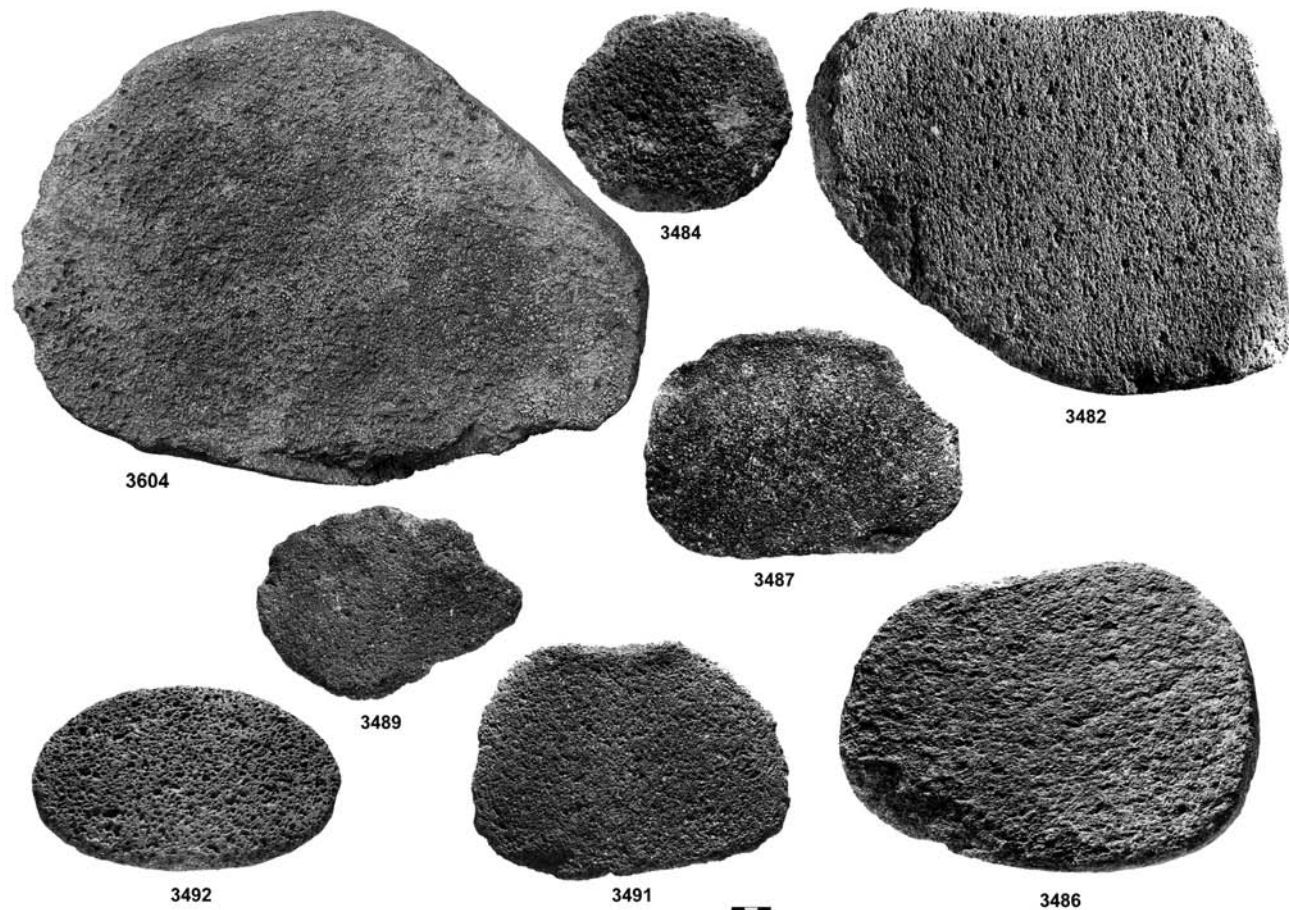


Figure 35.20. Pillar Shaft 65N: querns.

Hand tools

Eleven small tools were found which, according to their use-wear traces, could be characterized as polishers, pounders and pestles. Most of them are made from volcanic pebbles and had plano-convex or flattish disc-like forms (Fig. 35.21). It is quite ordinary for such tools to have more than one use and this can be discerned from the traces they bear; they have one or more abraded faces, as well as flaking, pecking and pockmarks — mainly at the two opposite ends. Two of them are probably pestles that are associated with mortars as their ends have been ground to a convex, smooth surface (Fig. 35.21: 3466, 3467). One axe can be counted amongst the tools of the 'kitchen'. It has a triangular shape with two equal bevels and a broad chopping end with a sharp edge. It is smooth all over and manufactured from black andesitic lava (Fig. 35.2: uninventoried). Finally, a small spool-shaped pestle of limestone was also discovered. The better-preserved end is smooth and worn from use (Fig. 35.21: 3474).

Trough

A small vessel was found made from friable volcanic

rock, possibly tuff, with a circular circumference and roughly formed faces. A thin layer of a white substance covers the bottom of the vessel and is certainly associated with its use (Fig. 35.22).

Various

A small conical object of whitish tuff has been found, with a flat base on which it balances at an angle in relation to its perpendicular axis (Fig. 35.23). Many such conical objects have been found at Akrotiri and it is possible that they are lids or even gaming counters (Marinatos 1969, 45; Lamb 1936, 195). There is also an elongated, flattish artefact of elliptical form made from tuff. At the centre of each broad face a shallow depression has been formed; there are no signs of use (Fig. 35.24).

Room function and the stone-tool industry

The lithic material from the 'kitchen' was mainly concentrated in two areas. Eleven artefacts came from the northeast corner and from the opening in the east wall, by one of the built structures (door/Hearth 2;

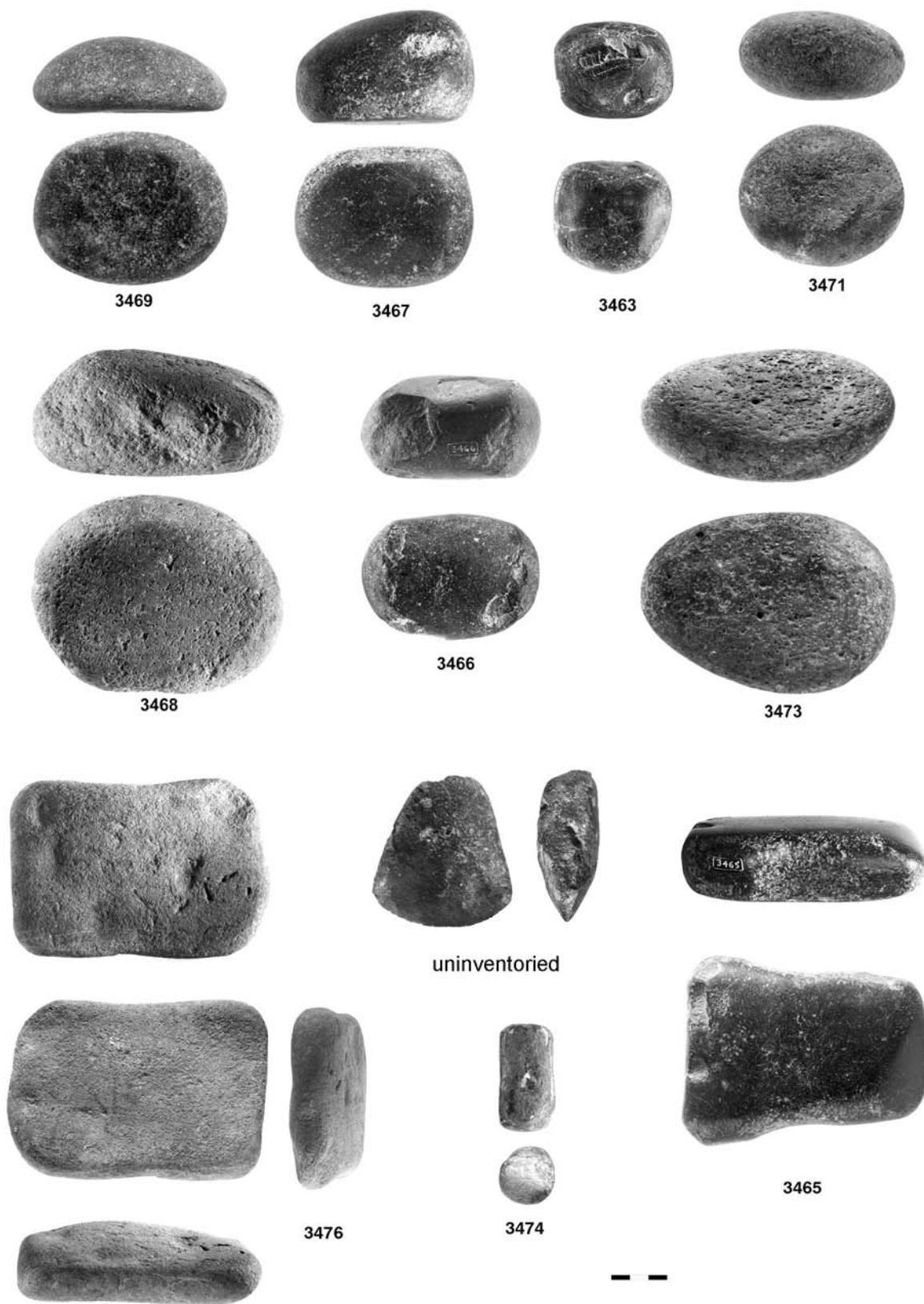
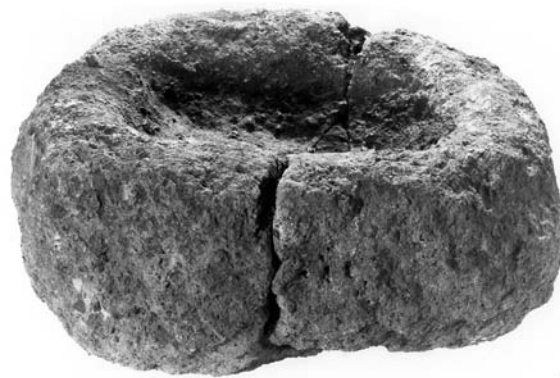
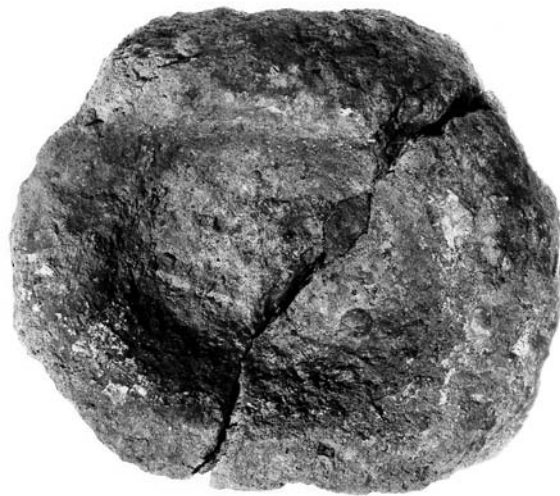


Figure 35.21. Pillar Shaft 65N: stone hand tools.



3493

Figure 35.22. Pillar Shaft 65N: stone trough.

Fig. 35.25). Eight are exclusively hand tools. During the excavation, they started to appear at the same time as the first large pieces of the clay hearth, but with a greater concentration at the lower levels.

The second largest concentration of material was observed east of the Main Hearth. Eight tools were discovered: five querns, a hand tool, the axe and the little trough (Fig. 35.25). However, querns are also visible in the south section of the trench wall and therefore there must be more tools in the south that have not yet been excavated.

A hand tool (3476) was found in the northwest corner and the massive quern (3482) which had fallen and rested in an almost vertical position was found north of the Main Hearth (Fig. 35.25).

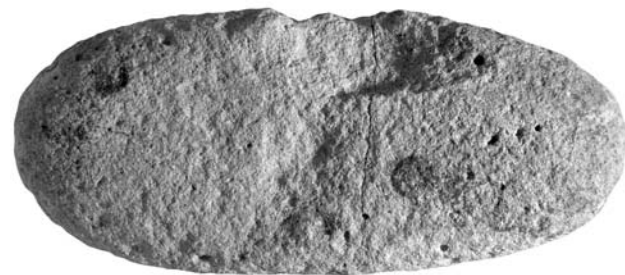
The questions which arise are why were so many tools found in this area, and to what extent were they directly associated with the function of the room?

When studying the stone tools and vessels of a specific area, two of the main criteria in determining whether such material formed part of the equipment in use are the context in which it was found,



3478

Figure 35.23. Pillar Shaft 65N: small conical object.



3477

Figure 35.24. Pillar Shaft 65N: stone object of uncertain function.

and its degree of preservation. The material being studied here comprises intact artefacts found in the destruction level in between the built structures. It is, therefore, supposed that these tools were in actual use. Their relationship with the function of the area is obvious. Both the built hearths and the tools are associated with food preparation. Querns are the most appropriate implements for grinding cereals and seeds for the production of flour. Perhaps the presence of so many querns suggests a correlation between the built structures and bread production. Most of the hand tools can be associated with the processing of other foodstuffs. Many of these hand tools bear dark possibly greasy stains from organic matter. They might be associated with olives as a large quantity of olive pits came from the area.

In the few areas at Akrotiri which contain hearths, lithic tools similar to those from the 'kitchen'

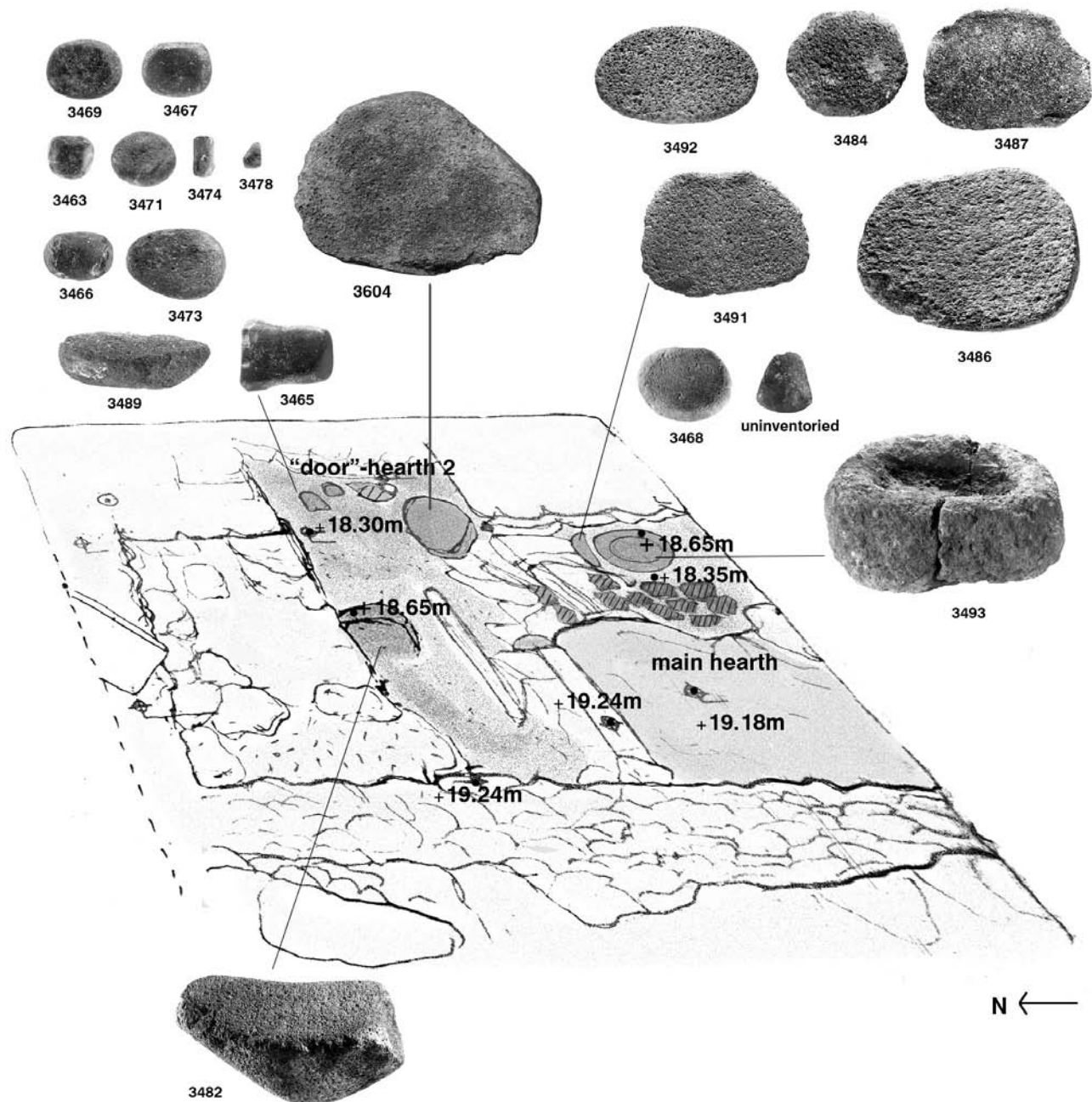


Figure 35.25. Pillar Shaft 65N: distribution of stone tools.

of Pillar Shaft 65N have been found. For example, in the south storeroom Alpha 1, a stone trough sunk into the floor and a mortar with its pestle were found near the hearth (Marinatos 1968, 28–9, 34, 37–9) (Fig. 35.2). On the ground floor of room Delta 1, a small mortar was found that had fallen directly in front of the hearth, and there was also a triangular pestle placed relatively close to it (Fig. 35.3). In the kitchen of Pillar Shaft 1B, a stone trough was found in front of the hearth with a quern nearby (Figs. 35.4, 35.5). It is

obvious that the tools from the kitchen of Pillar Shaft 65N were similar to the examples presented above, but we do not have the same concentration of material in any of these cases. This implies that, contrary to the picture derived from Pillar Shaft 65N, activities related to food preparation were undoubtedly small scale and evidently covered very specific needs.

Food-preparation activities were also carried out in House CJ at Ayia Irini on Kea, where there was a permanent grinding installation with movable

tools (Overbeck 1989b, 24–6, pls. 7, 25e, f, 38). Similar activities were also identified at Kommos in large open areas with built hearths, where there were permanent grinding installations and movable tools. Such areas included room N17 in the North House (Shaw & Nixon 1996, 37; M. Shaw 1996, 366; J. Shaw 1996, 385, pls. 2, 4, 48) and Space 2 in the House with the Press (M. Shaw 1996, 121–2, pl. 2.165).

It is at the palace of Galatas where there is irrefutable evidence for the intensive and large-scale production that would have served the needs of large numbers of individuals. Area 11–12, which was part of the original palace plan, and Area 14 functioned as kitchens as well as areas for food preparation, as demonstrated by the large number of grinding tools (Rhethemiotakis 1999, 722–3).

Conclusions

In the area of Pillar Shaft 65N, the built hearths testify to its exclusive use as a 'kitchen', with the capability to meet the needs of more than one household, and the quantity of lithic tools is appropriate to the scale of the demand.

APPENDIX B

The microcosm of a kitchen: evidence from the mammal remains

KATERINA TRANTALIDOU

Excavation location and sample size

1143 bone fragments have been collected¹ from an area of 1.82 m², which is the area of the floor space in Pillar Shaft 65N free of structures. The picture presented here, with a plethora of grinding tools as well as the bone evidence, leads us to believe that complex culinary techniques were carried out.

These remnants of megafauna as well as the fish residues (Appendix C) confirm, though on a smaller scale, what is already known of the animal species from the whole settlement at Akrotiri (Trantalidou 2000, 701–34; 2001b, 193–204), and throw further light on their role in food-preparation activities.

Taphonomic research, the exploitation of bones and the use of space

The bone evidence from a settlement can give us information about:

1. The use of physical and social space.
2. The secondary use of bones as building material.
3. The use of bones as fuel², again a secondary use, and

in particular their contribution to more elaborate cooking procedures. According to the Mesopotamian textual evidence, it seems that people, even from this early period, had a varied diet and sophisticated cooking techniques, such as placing food on an open fire or on glowing coals. To control the heat of the fire, hot ashes (prepared outdoors?) or potsherds could be placed on the coals (Bottéro 1984, 38). Could bones also be used in such a way even though they do not produce a particularly strong flame?

4. Unexpected events, such as a sudden fire due to a cook's negligence.
5. Possible sanitary conditions.

Even though only 1.83 per cent of the inventoried bones have survived intact, mainly metapodials and teeth, the bone material from the kitchen can be separated into the following categories:

Building material

0.17 per cent of bones were used as building material; they were found among the mud brick and the debris of the demolished wall.

Burned specimens

23.05 per cent of the bone fragments, found among burnt potsherds, were carbonized. Very few flakes were calcined.

Sarpaki's observations on the material sorted from flotation confirm the presence of carbonized bone only a few millimetres in length and breadth. Bones, regardless of class and taxon, even those of mice, were recycled; the same can be said of the non-edible parts of plants and the near-universal use of animal dung (White 1999, 932–3; see Appendix D). Thus, small stocks may have existed waiting to be put to use as fuel.

If food preparation or cooking did take place there, people would have cleaned and thrown the waste material into designated pits or open spaces outside the kitchen on a regular basis. They may also have burnt the discarded material.

Gnawed material

We know that animals gnaw to remove bits of soft tissue so as to increase their calcium. In the kitchen only two bone fragments bore the characteristic parallel grooves of rodents' incisors and three others bore pit-like fractures caused by the carnassial teeth of carnivores. The virtual absence of gnawed specimens proves that food portions or bone from which the meat had been removed were not exposed on the floor or in the cooking pots for any length of time and, therefore, were not easily available to dogs and the hundreds of mice that wander about the Akrotiri storing places.

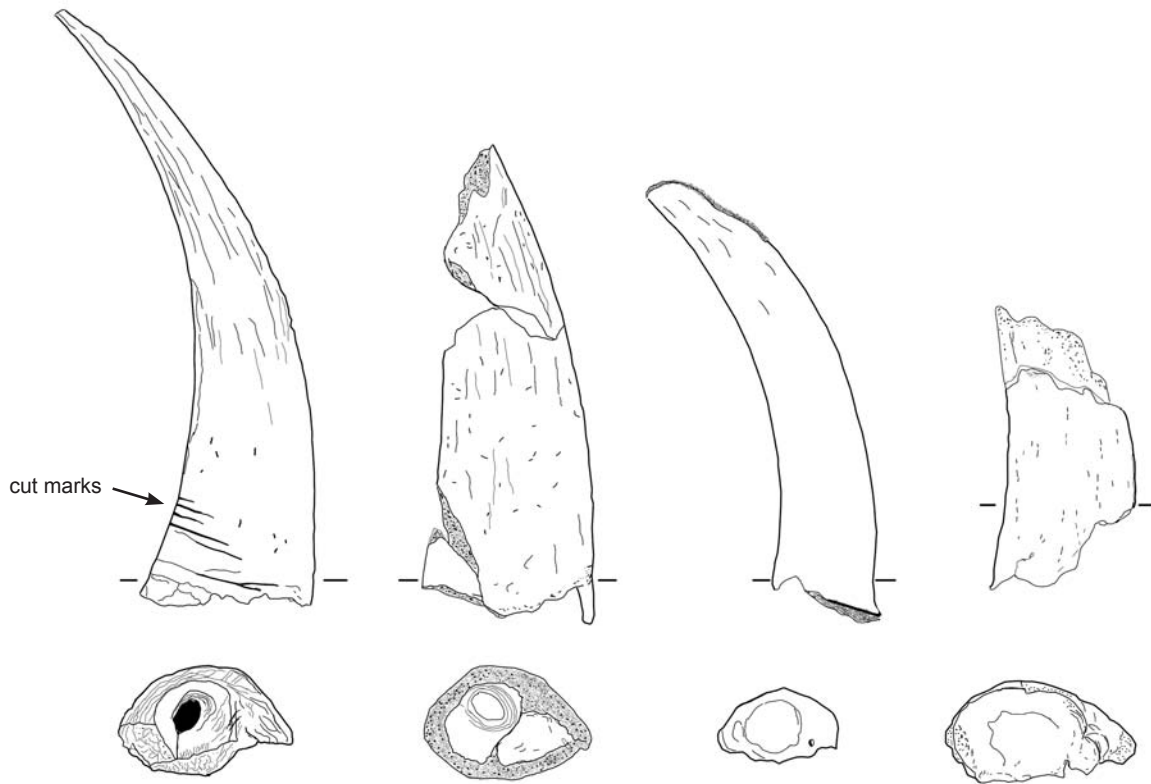


Figure 35.26. Twisted horn cores of *Capra hircus* from Akrotiri, Pillar Shafts 58 and 65. Scale 1/2. (Sketches by the archaeologists M. Theodosi and A. Kotsi. Drawing in ink by K. Birtacha.)



Figure 35.27. *Cervus elaphus* antler. Akrotiri, Pillar Shaft 65N. Scale 1/2. (Sketch by A. Kotsi. Drawing in ink by K. Birtacha.)

Cut marks

Skinning (skull, base of horn cores: Fig. 35.26), disarticulation marks from primary butchery on the humerus, pelvis and femur, secondary butchery in the form of the subdivision of meat from the ribs and long bones into smaller units, and blows are distinguishable on the bones from the kitchen.

Saw marks, which are usually related to the fabrication of bone tools, can be seen on a goat horn core and on an antler from a red deer; the pedicle and the first tine of the antler were also sawn (Fig. 35.27).

Our observations of the cut marks correspond with details known from the literature on the subject (Noe-Nygaard 1989; Fischer 1995; Trantalidou in press a).

Anatomical elements represented and the relative abundance of different taxa

82.67 per cent of the total material are fragments that often do not exceed 3 cm in length and a few millimetres in breadth, constituting less than 20 per cent of an entire bone, regardless of species. In the kitchen of Pillar Shaft 65 at Akrotiri it must be assumed that

‘Cooking’ Installations in LC IA Akrotiri on Thera

Table 35.1. Specimen distribution and traces of intentional human modification for, at least, two domestic bovids, one juvenile and one adult animal.

Element	Total	Fragment size preserved					Side		MNI	Modification		
		1/5	2/5	3/5	4/5	5/5	R	L		Cut marks	Burned specimens	
											300–350°C	650–700°C
Max. tooth M3	1	..	..	..	..	1	..	1	1	..	..	..
Mandible	1	1	..	..	..	..	..	..	..	1	..	1
Ribs	2	..	2	..	..	..	..	..	..	..	2	..
Thoracic vertebra	..	1	..	..	..	..	..	..	..	..	..	..
Lumbar vertebra	2	1	..	..	..	..	..	..	..	..	2	..
Humerus, distal	1	1	..	..	..	..	..	..	1	..	1	..
Metacarpus, proximal	3	2	1	..	..	..	2	1	2	..	2	..
Metapodium, shaft	1	1	..	..	..	..	..	..	..	..	..	..
Tibia, shaft	1	1	..	..	..	..	1	..	1	..	..	..
Navicular	1	..	..	1	..	..	..	..	..	..	..	..
Cubonavicular	1	..	..	1	..	..	..	..	..	..	..	..
1st phalanx	1	..	..	..	1	..	..	..	..	..	..	..
2nd phalanx	1	..	..	..	1	..	..	..	..	..	1	..
Total	15	8	..	2	1	1	..	..	2	2	8	1
Percentage		53.3									60.0 %	

Table 35.2. Specimen distribution and traces of intentional human modification for, at least, two domestic pigs. Their approximate age could be 16–24 months.

Element	Total	Fragment size preserved					Side		MNI	SEX	Modification		
		1/5	2/5	3/5	4/5	5/5	R	L			Cut marks	Burned 300–350°C	Gnawing
Skull	9	9	..	..	..	..	..	..	..	..	..	..	..
Maxilla	2	2	..	..	..	..	..	..	..	..	1	..	..
Mandible	6	6	..	..	..	..	3	..	..	..	1	..	..
I	1	1	..	..	..	..	1	..	..	..	1	..	..
C	2	1	1	..	..	..	1	..	1	F	..	1	..
dP2	1	..	..	1	..	..	..	..	1	..	..	1	..
dP4	1	1	..	..	..	..	..	..	..	..	..	..	..
P	1	1	..	..	..	..	..	..	..	..	..	..	..
M	9	9	..	..	..	..	..	5	..	..	..	..	..
Ribs	3	3	..	..	..	..	..	..	..	..	..	..	..
Atlas	1	1	..	..	..	..	..	..	..	..	..	..	..
Thoracic vertebra	1	..	..	1	..	..	..	..	..	..	..	..	..
Lumbar vertebra	4	1	1	2	..	..	..	..	..	..	..	..	..
Sacrum	1	..	..	1	..	..	..	..	..	..	..	..	..
Ind. vertebra	1	1	..	..	..	..	..	..	..	..	..	..	..
Scapula	3	2	..	1	..	..	..	1	1	..	1	2	..
Humerus, shaft	2	1	..	1	..	..	..	..	..	..	..	..	..
Radius, shaft	1	1	..	..	..	..	..	1	..	..	..	..	..
Radius, distal	1	..	..	1	..	..	..	1	1	..	..	..	..
2nd metacarpus	2	..	..	2	..	..	..	..	..	..	..	..	..
3rd metacarpus, proximal	1	..	1	..	..	..	..	..	..	..	..	..	..
4th metacarpus	2	..	..	..	1	1	..	..	..	..	..	..	..
Ind metacarpus	1	1	..	..	..	..	..	..	..	..	..	..	..
Innominate	2	1	..	1	..	..	1	1	1	..	1	1	..
Tibia, proximal	1	1	..	..	..	..	..	1	1	..	..	..	..
Tibia, shaft	2	1	1	..	..	..	1	1	..	..	..	..	..
2nd Metatarsus	1	1	..	..	1	..	..	..	..	..	..	..	1
2nd Phalanx	1	..	..	1	..	..	..	..	..	..	..	..	..
Total	64	45	4	9	2	1	..	..	..	1 F	2	8	1
Percentage		70.31%										14.06%	

Table 35.3. Specimen distribution and traces of intentional human modification for, at least, four domestic goats. The younger animal did not live more than 1 year and the others were killed at the age of approximately 36–48 months.

Element	Total	Fragment size preserved					Side		MNI	Sex	Modification	
		1/5	2/5	3/5	4/5	5/5	R	L			Cut marks	Burned 300–350°C
Horn core	7	..	1	3	2	..	4	3	4	2 F,M	1	2
Skull	1	1	..	..	..	..	..	..	..	..	..	1
Max. teeth M1	1	..	..	1	..	..	1	..	1	..	..	1
M2	1	..	..	..	..	1	1	..	1	..	..	..
M3	1	..	..	..	..	1	1	..	1	..	..	..
Mand. teeth d4	1	..	..	1	..	..	1	..	1	..	..	..
M1	1	..	..	..	1	..	..	..	1	..	..	1
M2	6	..	1	..	2	3	2	3	3	..	..	..
Scapula	1	..	1	..	..	..	..	1	1	..	..	1
Radius, proximal	1	1	..	..	..	..	..	..	1	..	..	..
Ulna, proximal	1	1	..	..	..	..	..	..	1	..	..	..
Metacarpus, proximal	1	1	..	..	..	..	..	..	1	..	..	..
Tibia, shaft	1	..	..	1	..	..	..	..	1	..	..	..
Calcaneus	3	..	1	..	2	..	1	2	2	..	..	..
Metatarsus, proximal	3	2	..	..	1	..	1	1	2	..	..	2
Metatarsus	1	..	..	..	1	..	1	..	1	..	..	1
2nd Phalanx	1	..	..	..	1	..	1	..	..	..	..	..
Total	32	6	4	6	10	5	..	..	4	2F,M	1	11
Percentage												34.37%

Table 35.4. Specimen distribution and traces of intentional human modification for two domestic sheep that have been slaughtered at the age of 1–2 years and up to 3.5 years old.

Element	Total	Fragment size preserved					Side		MNI	Sex	Modification	
		1/5	2/5	3/5	4/5	5/5	R	L			Burned	
											300–350°C	500°C
Max. teeth PD4	1	..	..	1	..	..	1	..	..	..	..	..
M1	3	..	..	..	1	2	2	1	2	..	1	..
M2	2	..	1	..	..	1	1	1	..	..	..	..
Mandible (+D2, D3, D4, M1)	1	1	..	1	..	..	1	..	1	..	..	..
Teeth I	1	1	..	1	..	..	1	..	1	..	..	..
PD4	1	..	..	1	..	..	..	1	1	..	..	..
P4	2	..	..	..	..	2	1	1	1	..	..	..
M1	1	..	..	..	..	1	1	..	..	..	..	..
M2	1	..	..	..	..	..	..	..	..	..	1	..
M3	2	..	..	..	1	1	1	..	..	..	2	..
Scapula	2	1	1	..	..	..	2	..	2	..	1	..
Radius, proximal	2	1	..	..	..	..	1	1	1	..	1	..
Innominate	1	..	..	..	..	..	1	..	1	..	1	..
Tibia	1	..	..	..	..	1	1	..	1	..	..	..
Tibia, distal	1	1	..	..	..	..	1	..	1	..	..	1
Astragalus	1	..	..	..	..	..	..	..	..	F	1	..
Navicular	1	..	..	..	1	1	..	..	1	..	1	..
Metacarpus, proximal	1	..	..	..	..	..	..	1	..	..	1	..
Metacarpus, shaft	1	1	..	..	..	..	..	..	..	..	..	..
Metacarpus, distal	1	..	1	..	..	..	1	..	1	..	..	..
Metapodium, shaft	1	..	1	1	1	..
1st Phalanx	4	4	3	..
3rd Phalanx	1	1
Total	33	7	4	4	3	14	2	F	14	..
Percentage											45.45%	

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Table 35.5. Specimen distribution and traces of intentional human modification for the ovicaprids.

Element	Total	Fragment size preserved					Side		MNI	Modification					
		1/5	2/5	3/5	4/5	5/5	R	L		Cut marks	Burned			Gnaw marks	
											300–350°C	500°C	650–700°C	Carnivores	Rodents
Skull	24	23	..	..	..	..	..	1	..	..	7	..	..	..	..
Maxilla	14	13	..	1	..	..	..	..	..	..	2	..	..	..	..
M1	3	..	1	..	1	1	1	2	2	..	..	..	..	..	..
M2	4	..	..	1	..	3	2	1	2	..	..	..	..	..	..
Mandible	79	79	..	..	..	..	..	..	..	..	17	..	..	..	..
dP4	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
P2	1	..	..	..	1	..	..	1	..	..	..	..	..	..	..
P3	1	..	..	..	1	..	..	1	..	..	..	..	..	..	..
M2	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Hyoid	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Ribs	209	136	53	15	5	..	..	..	..	1	33	6	9	..	..
Atlas	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Axis	4	4	..	..	..	..	..	..	..	..	..	..	..	..	..
Cervical vertebra	6	4	2	..	..	..	..	..	..	..	1	..	..	..	..
Thoracic vertebra	19	15	4	..	..	..	..	..	..	..	2	..	..	..	..
Lumbar vertebra	13	9	..	4	..	..	..	..	..	..	1	..	..	..	..
Caudal vertebra	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Sacrum	1	..	..	1	..	..	..	..	..	..	1	..	..	..	..
Ind. vertebra	21	21	..	..	..	..	..	..	..	..	5	..	..	..	..
Scapula	9	9	..	..	..	..	..	..	..	..	1	..	..	..	..
Scapula, proximal	3	3	..	..	..	..	1	2	2	..	..	..	..	1	..
Humerus, shaft	17	17	..	..	..	..	1	2	2	..	2	..	..	1	1
Humerus, distal	1	1	..	..	..	..	1	..	..	1	..	..	..	..	..
Radius, proximal	1	..	1	..	..	..	..	1	1	..	..	..	..	..	..
Radius, shaft	20	19	1	..	..	..	..	2	..	..	7	2	2	..	..
Radius, distal	2	1	..	..	1	..	1	..	1	..	..	..	..	..	..
Ulna	4	4	..	..	..	..	1	1	1	..	..	..	..	..	..
Radius + Ulna	1	1	..	..	..	..	..	1	..	..	..	1	..	..	..
Innominate	19	19	..	..	..	..	6	6	..	4	4	2	..	1	..
Femur, proximal	1	1	..	..	..	..	..	1	1	..	..	..	..	..	..
Femur, shaft	12	12	..	..	..	..	1	..	..	1	1	1	..	..	..
Femur, distal	3	3	..	..	..	..	2	..	2	..	1	..	..	..	..
Tibia, shaft	45	43	2	..	..	..	3	2	..	1	17	3	..	..	..
Tibia, distal	2	2	..	..	..	..	..	..	..	1	1	..	..	..	..
Metacarpus, proximal	3	2	..	..	..	1	1	1	1	..	..	..	..	..	..
Metacarpus, distal	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Metatarsus, proximal	4	3	..	..	..	1	1	..	1	..	..	..	..	..	..
Metatarsus, shaft	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Metatarsus, distal	2	1	..	..	1	..	1	..	1	..	1	1	..	..	..
Sesamoid	2	..	..	..	2	..	..	..	..	..	..	..	..	..	..
Metapodium, shaft	20	19	1	..	..	..	1	1	..	..	6	1	..	..	..
Metapodium, distal	5	5	..	..	..	..	1	1	..	..	2	..	..	..	..
1st Phalanx, proximal	2	1	..	1	..	..	..	..	..	..	..	..	..	..	..
2nd Phalanx, distal	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Long bone fragments	411	<3 cm 358 cm <6 cm 53	..	..	..	..	..	..	..	..	50	14	14	..	..
Total	996	883	67	25	13	6	..	..	2	9	159	31	25	3	1
Percentage		88.65%									21.58%				

whole carcasses of sheep and goats were present since virtually all anatomical body parts are present.

There were at least eight animals, although more might be counted if factors like the age at slaughter and the sex of the animals could be taken into account. The cooks also brought in one pig (Tables 35.2–35.4). The sample (Table 35.1) shows good cattle representation, although not all parts belonging to the two individuals are present, either because attendants had not transported the whole carcass or because meat-rich portions such as femora were not taken to the kitchen, but were carried away or stored in some other room. However, the goat horn found in the kitchen shows that tissues considered inedible but useful for fuel or bone tools were not discarded. On the contrary, inedible material could have accumulated, waiting to be used, as may have olive pits and dung.

Food preferences

Cooking trays could be used to roast meat and fish (the tuna slices testify to this; Appendix C). In this case, the size of such cooking vessels and the Minimum Number of Individuals (MNI) indicate that portions were designated for a large number of people. Tripod cooking pots may have been preferred for boiling meat and these have been found all over the south Aegean, indeed one has in fact been found in the kitchen. Chemical analysis of the cooking vessels and the greasy soil could provide further evidence to determine whether butchered portions were cooked in the kitchen. Certainly, such results cannot in themselves provide conclusive proof for the manner in which meat was cooked since culinary practices were quite diverse.³

Analysis of human skeletal material, even if it comes from sites of the Early/Middle Bronze Age (Marthari 2001c, 105–20), can provide evidence for the nutritional status of the Cycladic population on Thera. We know that at Akrotiri people had access to various kinds of plants (Sarpaki 1990), fish (Mylona 2001), shellfish (Karali-Yannakopoulou 1990, 410–15) and mammal meat. It is difficult to conclude if the nutritional level was adequate, since requirements depend on age, sex, physiology, temperature, demography, distribution, exchanges and cultural parameters, but the evidence from the excavated part of the settlement in fact shows us that the population had quite a balanced diet. As for animal protein we think that most energy/kilocalories came from domestic fauna (bovids, ovicaprids and pigs). The percentage of fish and shellfish is somewhat smaller and the representation of hare is insignificant in comparison.

Deer were not hunted as the ecosystem in the Cyclades could not sustain them, nor were they nor-

Table 35.6. The tendencies in meat diet, excluding fish and shellfish, at a Late Bronze Age kitchen area at Akrotiri (Thera).

Taxon	NISP	%	MNI
<i>Bos taurus</i> d	15	1.31	2
<i>Sus scrofa</i> d	64	5.59	1
<i>Capra hircus</i>	32	2.79	4
<i>Ovis aries</i>	33	2.88	2
<i>Capra/Ovis</i>	996	87.13	2
Caprinae subtotal	1061	92.85	8
<i>Lepus europaeus</i>	2	0.17	1
<i>Cervus elaphus</i>	1	0.08	1
Total	1143		12+1

mally eaten. However, antlers and some other parts were introduced from the mainland. The finding of an antler in the kitchen presents us with a problem as to its use, for which two possible explanations can be proposed: antlers could be used for hanging dried, smoked or salted portions of meat and fish; or as sticks for threshing grain, just as stones could be used to crush nuts and other plant foods.⁴

Conclusions

It should be remembered that the 1.50 m thick lower deposits of the kitchen should reflect some of the last preparations of meals before the final destruction. With this in mind, and in view of the fragmentary nature of the animal remains, we can draw some tentative conclusions regarding the nature of these remains.

1. It is evident that the bone material found in the kitchen was the result of human intervention.
2. If the antler found in the kitchen can be considered a grinding implement, then in this case one can infer that certain animal remains contributed to food-preparation activities.
3. The choice of food tends to be one based on domestic mammals (sheep, goat, pig and cattle), with additional fish, molluscs and plants.
4. The association of the meat that could have been cooked with the large cooking trays that have been found, indicates that meals could be prepared for quite a large number of people.
5. Good sanitary conditions seem to have been upheld in the kitchen since penning, killing, skinning and evisceration would have taken place outside buildings, although so far we have no clear indications of this at Akrotiri. However, the presence of a whole pig in a room of Complex Delta (Marinatos 1976, 15–16) led us to suppose that animals were sometimes chosen for fattening and therefore waited their turn on the ground floors or they were

brought to the settlement for butchering.⁵ Furthermore, waste material seems to have been recycled, resulting in hygienic conditions that would not have attracted mice.

For a fuller assessment of the economy, the use of the raw material and the use of the space concerning the animal processing, we have to combine data from the whole of the presently excavated settlement at Akrotiri.

Notes

1. When this article was written the author had not seen the remains extracted from the water-sieving process.
2. Mention of the bone trade between Thessaly and the Cyclades in early twentieth-century Consular Reports is referenced in Trantalidou (2001a, 270).
3. In Mesopotamia the recipe tablets mention dishes prepared with meat, vegetables, water and fats (Bottéro 1984, 39–44).
4. A room on the ground floor in the Neratzi-Aivazi's mansion of eighteenth century AD at Kastoria, northwest Greece, was transformed for the kneading process. Antlers of red deer were hanging from the ceiling (visited in 2000).
5. For similar conditions in Egypt see Tooley (1995, 49); Strouhal (1997, 17); Janssen & Janssen (1989, 49); Curtis (2001).

APPENDIX C

Fish remains from the 'kitchen' in Pillar Shaft 65N: the tuna slices in the 'baking-pan'

DIMITRA MYLONA

The excavation in the 'kitchen' of Pillar Shaft 65N produced a considerable number of fish remains, most of which were retrieved from water-floated soil samples. Only a small group, comprising five caudal vertebrae and some unidentifiable bone splinters of a large fish, has been hand collected. The majority of the fish bones are burned brown and black; few are calcified white or gray. This state of burning is quite distinct from that of the fish remains from most of the rest of the site. Most of those remains are light brown in colour, and this is probably due to their exposure to the heat of the volcanic materials during the destruction of the site.

In the case of this particular context, the burning of the fish bones is consistent with the condition of all animal remains — larger mammals and micro-faunal bones (mice, etc.) alike.¹ This observation poses an interesting problem concerning the taphonomy of this particular part of the settlement. All animal remains have been collected from dark, fatty deposits, associated with several constructions that appear to have

functioned as hearths. The question is whether these burned bones represent food remains that had been burned during cooking or in the process of garbage disposal. Perhaps this is true for some of the remains. Examination of the large fish bones collected from the hearth in Pillar Shaft 65N, however, suggests another alternative explanation, which is discussed below.

The majority of the fish bones from the 'kitchen' are typical of Akrotiri (see Mylona 2000; 2001). They are mostly the vertebrae of small fish. Sparidae (sea breams) are the most common taxa within the assemblage, along with Centracanthidae (sand smelts). Other fish are present in smaller numbers. Some of these are extremely small with vertebrae 1–1.5 mm in length, representing fish only a few centimetres long. A dense scatter of similar remains has been detected from various excavated areas around the settlement and in most cases they represent food waste which found its way either into floor or filling deposits or in some cases into sewers.

What is new, and particularly interesting, for Akrotiri is the presence of tuna bones, mostly vertebrae and some non-diagnostic splinters. They all derive from one spot, between the sherds of a 'baking tray' (Fig. 35.14) in the northeast corner of the excavated area, in a matrix of black, fatty soil, associated with Hearth 2. The bones are probably from a small blue-fin tuna (*Tunnus thynnus*).² Their lengths are 2.0 cm, 2.0 cm, 1.85 cm, 1.82 cm, and 1.70 cm respectively. They belong to two groups. The first two bones, which appear to articulate (Group A: Fig. 35.28), originate from the mid-caudal region of a fish, roughly 1.0 m in length and perhaps 15–20 kg in weight. They represent a slice of the fish, about 4.5 cm thick. The second group, of three articulating vertebrae (Group B; Fig. 35.29), forms part of the vertebral column, lower down the tail; it is possible that they belong to the same individual as the previous group, or to a different fish of similar size. These three vertebrae represent a slice of fish about 6.5 cm long. The two pieces do not join. All the vertebrae and accompanying splinters are burned brown. Those of Group B are also burned black on one side, apparently the one most exposed to heat.

Apart from the fact that these bones have been found *in situ* and practically within the cooking pan, they are very important because they represent the first case of identified bones of pelagic, migratory, seasonal fish in LC Akrotiri. In the archaeological literature, the position of tuna in the economy of the prehistoric Aegean is not clear (e.g. Bintliff 1977; Gamble 1979; Rose 1994; Renfrew *et al.* 1968). Although they are generally considered to have been a potentially important resource for maritime communities around the Aegean, their actual importance is heavily

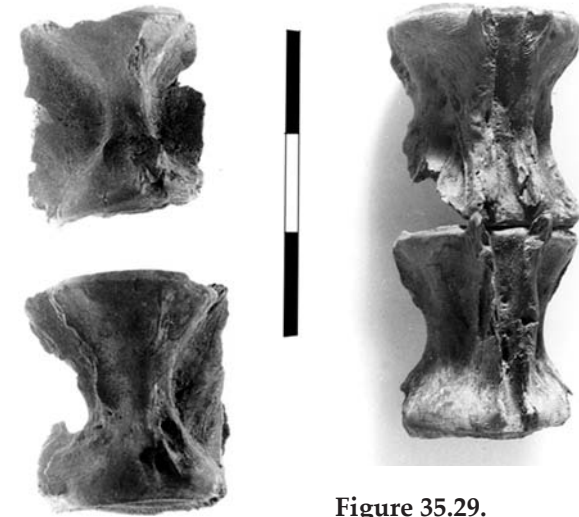


Figure 35.29. *Articulating tuna vertebrae (Group B).*



Figure 35.28. *Articulating tuna vertebrae (Group A).*

contested. Akrotiri, until recently, had not figured in this debate. Although some bullet tuna (*Auxis rochei*) or little-tuna (*Euthynnus alleteratus*) was depicted in one of the 'little fishermen' frescoes (Rose 1994, 160–61; Mylona 2000; Economidis 2000), not a single bone of the seasonally migratory Scombridae had been identified among the several thousands of widely sampled fish bones from Akrotiri. Thus the presence of the tuna bones from the 'kitchen' once again raises the question on the role of migratory fish in the maritime economy of Akrotiri.

The tuna remains under consideration probably represent a meal in preparation that was never consumed. It appears that two slices of a relatively small tuna fish were cooked (fried?) in a baking tray on a permanent hearth. Apparently, the cooking was unexpectedly disturbed. One group of vertebrae (Group B) was burned black on one side, as if it was exposed to intense heat. This could perhaps be the result of prolonged burning in the pan.

Based on the above observations a possible scenario may be formulated, which would explain some of the features of the assemblage. Some tuna was being cooked when an earthquake or other sudden event forced the cook to leave the hearth unattended and leave quickly. This event could have caused the

food to burn to such an extent that even the bones were burned black on the side that was in contact with the pan.

Notes

1. This statement originates from observation of the bone remains which have been collected from the water-floated samples. For burning patterns of the larger bones see Trantalidou, Appendix B.
2. The bones have been identified as belonging to a blue fin tuna after comparison with a reference specimen. Their identification however cannot be certain if they are not compared with pelamid bones (*Katsuwonus pelamis* and *Sarda sarda*). Such reference species were not available for comparison.

APPENDIX D

A glimpse through a kitchen key-hole of Late Bronze Age Akrotiri: the organic remains

ANAYA SARPAKI & ELENI ASOUTI

The area excavated for Pillar 65N of the new shelter at Akrotiri revealed a kitchen. Of the 16 contexts sampled for organic remains (Figs. 35.30–35.33; Table 35.7), eight were water-floated using the Ankara-type water flotation machine, and another eight were sampled *en bloc* and examined through a stereoscopic microscope, since the organic content of the soil, which was very fine with minute inclusions, might otherwise have been 'washed out'.¹

It is clear from the architecture and the ceramic and stone vessels that the room was being used for food processing at the time of the site's destruction. This seems to be confirmed by the archaeobotanical material that does not indicate any storage function for the room, irrespective of whether storage could have been in textile and/or leather sacks, or wooden containers. The plant remains are more reminiscent of sources of fuel mixed together with 'sweepings' and tail-ends discarded after cleaning and/or processing the crops. No dung pellets were noted but some fragments seem to be an amalgam of seeds and other plant remains² and could, rather than dung cakes, belong to large herbivore dung (possibly equine or bovine), as this is rarely preserved intact. What is certain though is the flexibility in using several categories of material as fuel. It was perhaps either a strategy to overcome the general shortage of wood or, probably, to save it for other technologies. The expected use of the hearth as an area of rubbish disposal is, of course, accepted as a *sine qua non*, but other patterns embedded within the archaeobotanical material/information are worth exploring.

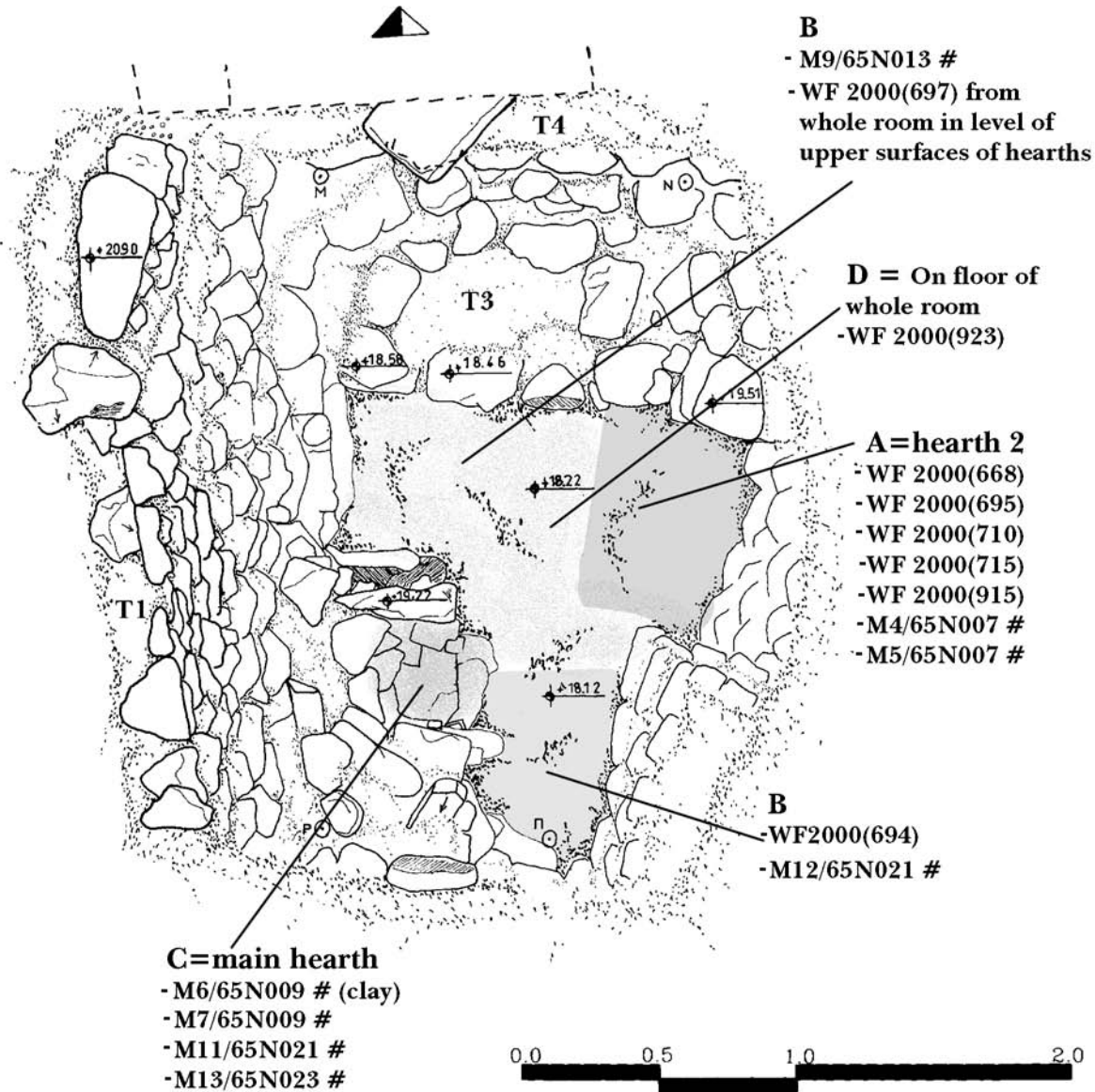


Figure 35.30. Find spots of sampled soil for organic remains.

Analysis

The ubiquitous presence of the olive (*Olea europaea*) in all the samples (both as olive stone fragments and wood) reinforces our belief that olive was a major source of fuel as early as the LC I and probably even earlier. The earliest use of olive fragments as fuel known thus far has been documented from an MM IA house at Tzambakas, Rethymno (Sarpaki 1999; Asouti 2003). In Pillar Shaft 65N, a small number of whole olives (Table 35.9) together with fragmented stones³ were recovered from Hearth 2 (area A), area B and area D. This is exactly the pattern expected from the occurrence of olive pressing. The first author's experience

from examining the crushed paste of olive pressing conducted in traditional olive pressing installations agrees with the published observation that 'not all the pits were crushed. Most of those that broke were smashed into many tiny pieces, although a few broke only into large pieces' (Tyree & Stefanoudaki 1996, 174). This is a pattern similar to that observed in the archaeobotanical assemblage.

Another type of fuel seems to have been animal dung. Fragments have been distinguished under the microscope that seem to be from large herbivore dung.⁴ There is a concentration of these fragments in sample WF2000 (715) from Hearth 2. Another factor which reinforces this observation is the proportion-

Table 35.7. Sampled areas of Pillar Shaft 65N from LCI Akrotiri, Thera: water-floated and non-floated contexts.

Loci	Location	Context code	Sample no.	Litres floated	Description
A	Pessos 65N	M1/65N006	WF 2000(668)	42	Soil around horseshoe-shaped vessel
A	Pessos 65N	M10/ 65N020	WF 2000(915)	7.5	Soil around stone vessels
A	Pessos 65N	M3/65N007	WF 2000(695)	8	Under M1 – deeper
A	Pessos 65N	M3/65N007	WF 2000(710)	25	All around the above context
A	Pessos 65N	M4/ 65?007	#		Soil around bones, sherds
A	Pessos 65N	M5/85N007	#		Soil around bones, sherds
A	Pessos 65N	M8/65N007	WF 2000(715)	24	
B	Pessos 65N	M12/ 65N021	#		In front of structure 1 – near sherds
B	Pessos 65N	M2/65N007	WF 2000(694)	10.5	Soil around stone vessels
B	Pessos 65N	M3/65N007	WF 2000(697)	62	Under M1 – deeper from the whole room
B	Pessos 65N	M6/ 65N009	#		Clay
B	Pessos 65N	M9/ 65N013	#		Balk on N. side of room
C	Pessos 65N	M11/ 65N021	#		Structure 1 – bottom
C	Pessos 65N	M13/65N0023	#		Lower level of hearth 1
C	Pessos 65N	M7/65N009	#		Structure 1 – top
D	Pessos 65N	M14/ 65N024	WF 2000(923)	36	On floor of whole room
Total				215	

Key for loci : A = hearth 2; B = from other areas of the room; C = main hearth 1; D = floor of whole room; # = not water floated.

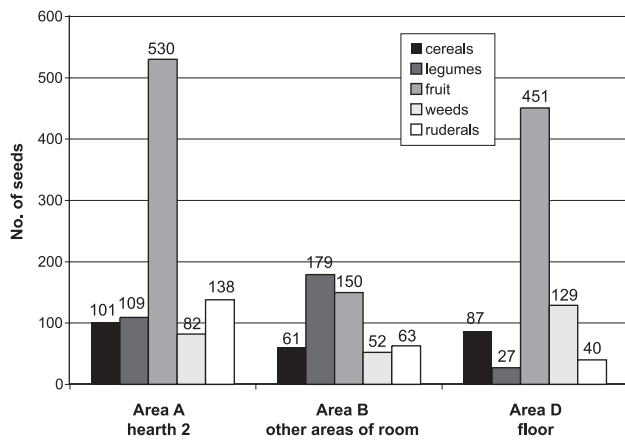


Figure 35.31. Histogram showing the number of seed types.

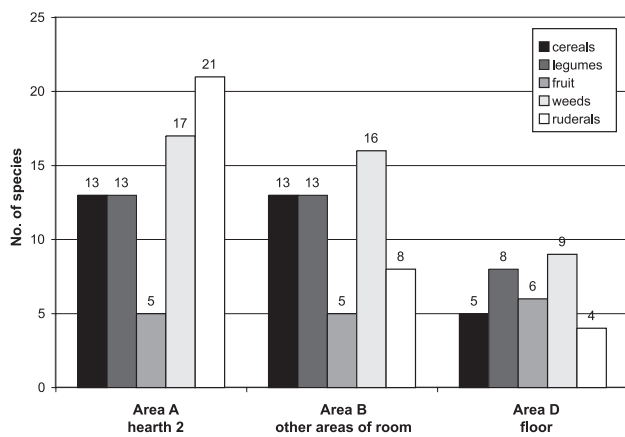


Figure 35.32. Histogram showing the number of plant species.

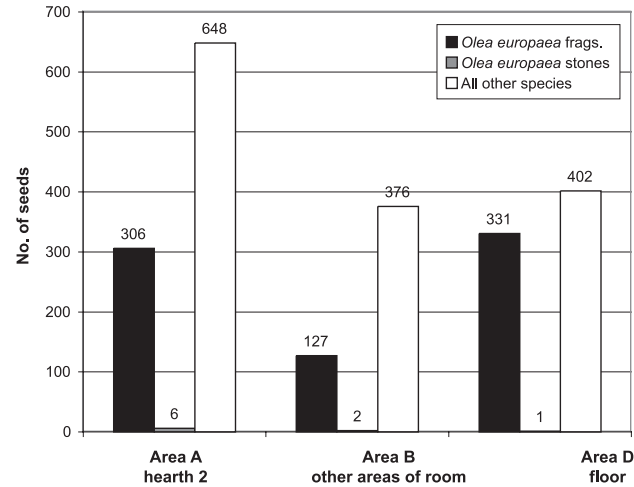


Figure 35.33. Histogram showing the relative abundance of olive.

ately large number of seeds and leaves which belong to ruderal and phrygana/maquis vegetation. The presence of *Labiatae* leaves, together with *Thymelaea* and very tiny twigs of phrygana bushes, all indicate phrygana and maquis environments probably not too far from the site. Maquis vegetation is also indicated by the charcoal analysis. Together with weeds, fruit⁵ (see Tables 35.8, 35.9) and a few cultivated seeds it could well have been used as fodder for partly pegged or stalled animals. Their abundance lends further support to the ‘dung’ fuel interpretation.⁶ Nevertheless, it is not possible to exclude the possibility that some of these plant assemblages are not only by-products of crop processing but could also have come from several

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Table 35.8. Archaeobotanical (seed) material from Akrotiri, Thera, Pessos 65N – water-floated samples.

Volume (litres)	42	8	24	25	7.5	total	10.5	62	36
Loci (see Table 35.7)	A	A	A	A	A	A	B	B	D
Sample number	WF 2000(668)	WF 2000(695)	WF 2000(715)	WF 2000(710)	WF 2000(915)		WF 2000(694)	WF 2000(697)	WF 2000(923)
Plant species									
Cereals									
<i>Triticum</i> cf. <i>aestivo-compactum</i>				1		1			
<i>Triticum monococcum</i> spkt. fork				1		1			
<i>Triticum</i> sp. spikelet fork-indet.					1	1			
<i>Triticum</i> cf. <i>monococcum</i> - glume base	1			2		2			
<i>Triticum</i> sp. - glume base						0		1	
<i>Triticum</i> sp. - awn	1			1		2			
<i>Hordeum</i> sp. - hulled	8			15		23		17	
<i>Hordeum</i> sp. - hulled 6-row						0	3		9
<i>Hordeum</i> sp. (hulled) frags.						0		2	
<i>Hordeum/Triticum</i> grains				8	2	10		3	6
<i>Hordeum</i> (bulgur frags.)						0		3	
<i>Hordeum</i> cf. <i>distichum</i> rachis frags.			2			2			
sterile florets cf. <i>Hordeum</i> sp. (cf. <i>distichum</i>)			4			4			
<i>Hordeum</i> sp. rachis			1	4	1	6	2		1
<i>Hordeum murinum</i> -type rachis						0		1	
<i>Hordeum</i> wild (?) rachis			1			1			
<i>Hordeum</i> sp. - awn (charred)		1	3	2	22	28		11	48
Cerealia frags.	5		5		9	19	9	4	23
Cerealia (cf. <i>Hordeum</i> sp. rachis)						0		1	
Cerealia - awn (# <i>Hordeum</i> ; # <i>Triticum</i>)						0		1	
cf. <i>Catapodium</i> sp.						0		4	
Legumes						0			
cf. <i>Vicia faba</i>	1					1			
<i>Lathyrus cicera/sativus</i>					1	1	4	10	
<i>Lathyrus</i> cf. <i>cicera</i> (cotyl.)			2		2	4		1	2
cf. <i>Lathyrus</i> sp.						0			1
<i>Lens culinaris</i>			2			2	2	9	4
<i>Lens</i> sp. (cotyl.)						0	2	1	
cf. <i>Lens</i> sp. frag.		1				1			3
<i>Pisum sativum</i>	1					1		4	1
<i>Lathyrus</i> cf. <i>ochrus</i>						0	1		
<i>Lathyrus clymenum</i>						0		8	3
<i>Lathyrus clymenum</i> cotyl.		1				1		5	
<i>Vicia ervilia</i>						0		1	
<i>Cicer arietinum</i>				1		1			
legume frags.	14	7		33	4	58	12		3
Legume (large)	1		25	1		27			
Legume (medium)			7		2	9	2	38	10
Legume (small)		2		1	1	4		2	
Leguminosae (v. damaged)						0		42 (++)	
Fruit						0			
<i>Vitis vinifera</i> pips						0		3	
<i>Vitis vinifera</i> frags.			3			3		4	4
<i>Vitis vinifera</i> stalks			2	4		6			
<i>Olea europaea</i> stones	1/2		0.5	1	1 1/2	3.5	1	1 1/2	(1/2)
<i>Olea europaea</i> frags.	91	15	49	45	107	307	27	95	331
<i>Ficus carica</i> - charred		74	24	59	52	209		13	108
<i>Ficus carica</i> - mineralized						0			1

Table 35.8. (cont.)

Volume (litres)	42	8	24	25	7.5	total	10.5	62	36
Loci (see Table 35.7)	A	A	A	A	A	A	B	B	D
Sample number	WF 2000(668)	WF 2000(695)	WF 2000(715)	WF 2000(710)	WF 2000(915)		WF 2000(694)	WF 2000(697)	WF 2000(923)
Plant species									
<i>Malva</i> sp.		1				1		1	
<i>Sherardia arvensis</i>						0			1
<i>Silene</i> cf. <i>behen</i>						0			
<i>Silene gallica</i>		4	1	1		6		1	1
<i>Silene</i> sp. (cf. <i>creticus</i>)						0		1	
<i>Silene</i> sp. (cf. <i>alba</i>)						0		1	
<i>Silene</i> sp.						0			
<i>Cynodon dactylon</i>		14				14			
Gramineae (Type A)		1				1			
Gramineae (Type B)		1				1			
cf. <i>Lolium</i> sp.						0		1	
<i>Trisetaria</i> sp.			1			1			
Gramineae (v. small)					1	1			1
<i>Scaligeria</i> cf. <i>napiformis</i>						0		3	
<i>Bugglosoides arvensis</i>						0		1	11
cf. <i>Bugglosoides</i> sp.					1	1			
cf. <i>Echium</i> sp.					1	1			1
<i>Rumex</i> sp. (large)						0			
<i>Rumex</i> sp.			1		1	2		1	
Papaveraceae (v. small)		1				1		1	
Caryophyllaceae				1		1		1	
<i>Adonis</i> sp.						0			1
cf. <i>Adonis</i> sp.						0			1
Cruciferae						0		1	
Cruciferae (cf. <i>Malcolmia</i> sp., <i>Barbarea</i> sp.)						0			1
shell frags.						0			3
Ignota (identifiable)		1				1		6	
Ignota			1		1	2			
Ignota (v. damaged)	4	6	7	1	3 (++)	18		30	3(+++)
Ignota mineralized				1		1			
Ruderals						0			
<i>Thymelaea hirsuta</i> seeds		1	1	20.5		22.5	2	13	
cf. <i>T. hirsuta</i> frags.		1				1		2	5
<i>Thymelaea hirsuta</i> leaves			7	(++)		7	4	16	
cf. <i>T. hirsuta</i> leaves		2				2			
<i>Asphodelus</i> cf. <i>aesrtivus/microcarpus</i>				1		1			
cf. <i>Asphodelus</i> sp. frag.			1			1			
<i>Juncus</i> sp. (cf. <i>heldreichianus</i>)						0		1	
cf. <i>Sarcopoterium spinosum</i>			1			1			
Labiatae			1			1		2	
<i>Satureja thymbra</i>						0			1
<i>Lavendula</i> sp.			1			1			
Leaf (cf. Labiatae) frag.		1		6		7			
Leaf (cf. <i>Thymus capitatus</i>)			3	4		7		3	
Leaf (type A)			1			1			
Leaf (type B)			1			1			
Flowers with seeds (?)				9		9			
Flower (charred)			1			1			
<i>Hyoscyamus</i> (cf. <i>albus</i>)				1		1			

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Table 35.8. (cont.)

Volume (litres)	42	8	24	25	7.5	total	10.5	62	36
Loci (see Table 35.7)	A	A	A	A	A	A	B	B	D
Sample number	WF 2000(668)	WF 2000(695)	WF 2000(715)	WF 2000(710)	WF 2000(915)		WF 2000(694)	WF 2000(697)	WF 2000(923)
Plant species									
Leguminosae (cf. <i>Ononis</i> sp.)		1				1			
<i>Schoenus nigricans</i>						0			1
Dung (mouse/rat)		2	3	47		52	16	64	
Dung (charred) fuel			4			4			
TOTAL	127.5	148	165.5	234.5	224.5	897	57	335.5	625

other contexts, for example, ‘sweepings’ and/or tinder⁷ for lighting a fire.

In brief, the archaeobotanical material from Hearth 2 (area A) stands out as being different from the other samples as it has a high component of phrygana and ruderal plant seeds, which makes us believe that dung was one of the fuels used. Although dung generates lower temperatures than wood, a dung-fuelled fire would act like a ‘slow’ oven and could be left burning while other chores were attended to.

From area B (Fig. 35.30), samples WF 2000 (694, 697) (Table 35.8; Figs. 35.25, 35.30) provide evidence of ‘cracked’ legumes and cerealia. It is no coincidence that many stone vessels were around these samples and could be responsible for this fragmentation.

Area C, which is Hearth 1, has produced non-water-floated samples which remain an enigma. What is evident from this preliminary examination is that most identifiable material is barley awns. As it is a unique type of hearth, more like an indoor oven, it is possible that barley (*Hordeum* sp. hulled) chaff, including awns, was used to temper the clay plaster. This material would possibly have retained heat for longer periods – a type of slow cooking.

Regarding wood charcoal (Table 35.9), there is a high incidence of olive wood (*Olea* sp.) with tamarisk (*Tamarix* sp.), pine (*Pinus* sp.) and deciduous oak (*Quercus* sp.) following in frequency. However, the presence of pear/hawthorn (Rosaceae-Maloideae) and maquis/garrigue (Labiatae) low shrubs should be noted. Their importance lies in their closed context, so that we can be sure of their simultaneous use by the LCI ‘kitchen’ users. The high abundance of unidentifiable charcoal fragments is also worth noting here as a result of post-depositional fragmentation and offering potential for palaeoenvironmental studies (Asouti 2003). A number of very small twigs (<2 mm) were also present in the coarse fractions but they proved impossible to identify due to their small size and the lack of clearly defined anatomical characteristics, but provide evidence of the high use of maquis/garrigue in the room.

Table 35.9. Presence and relative abundance of wood charcoal taxa in the wood charcoal of 65N Akrotiri, Thera.

<i>Olea</i> (olive)	xxxxx
<i>Pinus</i> (pine)	xx
<i>Tamarix</i> (tamarisk)	xxx
<i>Quercus</i> (deciduous oak)	xx
Rosaceae-Maloideae (pear/hawthorn)	x
Labiatae indeterminate	x
Indet. charcoal fragments	xxxxx

Conclusion

The study of these organic samples has presented us with a unique opportunity to investigate, amongst other things, the fuel used in a closed context in the period just before the LC I destruction. The use of mixed sources of fuel such as crushed olive fragments, dung, wood from olive and other trees, low shrubs and the by-products of crop processing is important due to their complete contemporaneity, and suggests the presence of variable micro-environments probably within walking distance of the site. Our analyses should open up new avenues for the interpretation of man–animal–environment interactions on the island of Thera during the LC I period. Such case studies of organic material from closed contexts also serve to emphasize the need to consider different forms of evidence simultaneously (archaeobotanical, zooarchaeological, archaeoentomological), in order to reconstruct the interface between past agricultural systems and ‘scrub-land’, as well as to offer some insight into the intricate operation of a kitchen in ‘full action’.

Notes

1. In the non-water-floated material, the excavator observed very fine particles of vegetal material which were exceptionally brittle and would have disintegrated on contact with water. These were identified as fragments of cereal chaff and awns.
2. These are leaves and plant parts which will be studied more extensively for the final publication.

3. In most cases it was clear that the olive fragments had eroded breaks and therefore reassure us that the breaks are ancient but that the fragments had 'rolled' around before being deposited.
4. A very interesting study of ethnographic work on dung fuel was published by Anderson & Ertuğ-Yaraş (1998). There is no way at present to say whether the dung was part of dung cakes. It is also impossible to exclude stable manure used as fuel. This aspect should be further investigated in the final Akrotiri publication when Eva Panagiotakopoulou will perhaps be able to isolate indicator groups of insects of stable manure, which would clarify this problem (Kenward & Hall 1997). Another point worth taking up in the future is also the study of mites, which might also be able to isolate the particular domestic animal which produced the dung (Schelvis 1992).
5. The high frequency of fig seeds could also be from fodder as we know that when figs have maggots, they could be fed to livestock (Foxhall 1998, 37).
6. If pegged or stalled, these animals must have also visited uncultivated areas. This indication is apparent in the phrygana/maquis type of plants which was noted in the seed assemblage, unless the plants were used for fuel too.
7. Cereal chaff (rachis, awns and so forth) would have been used as tinder.