PALAIKASTRO
TWO LATE MINOAN WELLS

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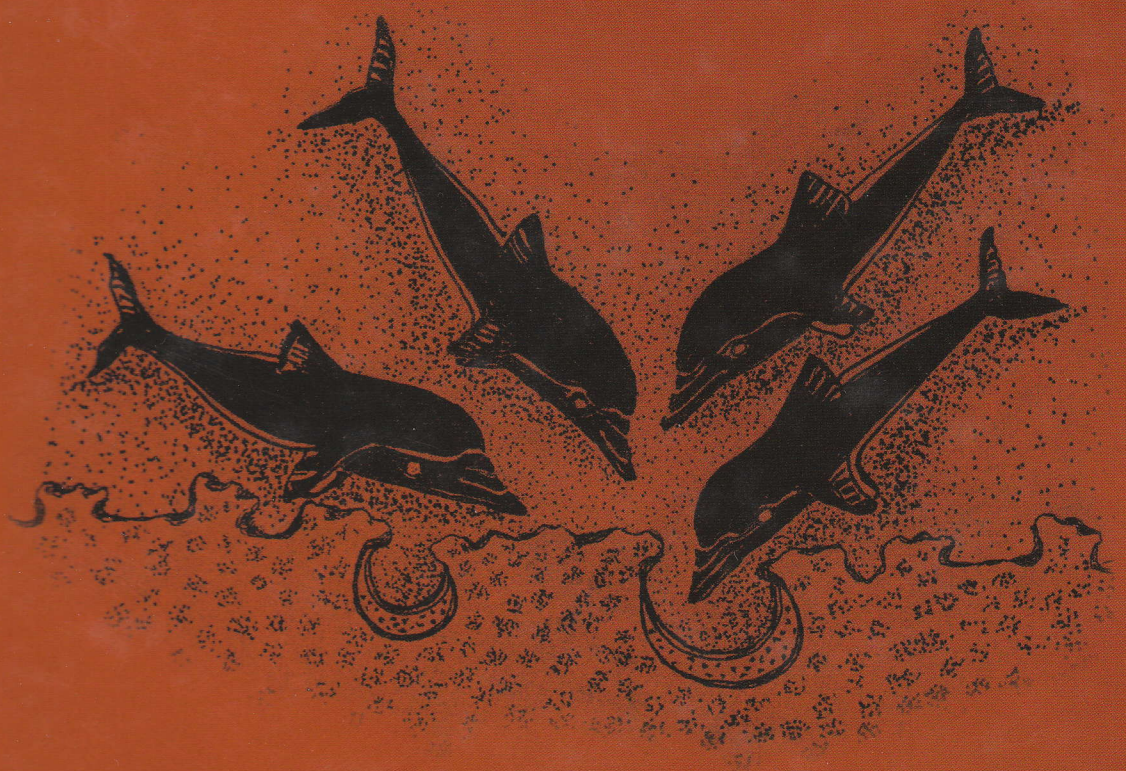

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Contents

Abbreviations

ANM	Ayios Nikolaos Museum
Athens NM	Athens National Archaeological Museum
C.F.	coarse flot
Class/Hell.	Classical to Hellenistic
D	diameter
ext.	exterior
F	flot
F.F.	fine flot
fr(s).	fragment(s)
H	height
Gc	gas chromatography
gm.	gramme
ill.	illustrated
incl.	inclusions
int.	interior
Ir	infrared reflectance spectroscopy
L	length
LBA	Late Bronze Age
LM	Late Minoan
m	metre
max.	maximum
MM	Middle Minoan
MNI	Minimum number of individuals
mono.	monochrome
MPD	maximum preserved depth
MPH	maximum preserved height
MPL	maximum preserved length
MPW	maximum preserved width
n.	footnote
OMA	oval-mouthed amphora
OXSAMP	sampled for analysis at Oxford
PK	Palaikastro
pres.	preserved
R	residue
SF	small find
SM	Siteia Museum
SS	soil sample
TC	terracotta
TCP	tripod cooking pot
Th	thickness
W	width
Wt	weight
Xps	x-ray photoelectron spectroscopy

Symbols

Λ	arbitrary level assigned to a distinctive layer during excavation.
#	'zembil' or basic site locus unit (named for the recycled rubber baskets used to collect ceramics during excavation) followed by four-digit number.
[o]	find number assigned during excavation.
↑	absolute height above sea level in metres.

Glossary

ammouda	aeolianite sandstone, locally quarried at Ta Skaria
apothetis	receptacle or repository for refuse, often discarded from ritual usage
ashlar	square hewn stone masonry blocks laid in horizontal courses
elutriation	purifying clay by washing and/or straining
lime popping	surface spalling on pottery due to calcium carbonate absorbing moisture and expanding during or after firing.
polythyron	literally 'many opening', hence a Minoan Hall with multiple doors
sideropetra	blue limestone slabs from Cape Sidero
socle	stone-built foundation for a mud-brick wall
thymiaterion	incense burner
zembil	recycled rubber baskets used to collect ceramics during excavation, here used to designate lot or locus (see #).

Chapter 11

Archaeobotanical observations

A. Sarpaki

Wells 576 and 605 were sampled for bioarchaeological remains during excavation in 1994,[1] and produced results that, although fragmentary, give some indication of the possible use of plants and cultivation in the LM IB to LM IIIA2 periods.

METHODOLOGY

In both wells samples were taken from contexts judged, during excavation, to be potentially productive. These were generally small — under 11 litres each.[2] They were processed in a water flotation machine,[3] which is similar to the siraf type, and the primary separation of organic and inorganic material took place there. All residue material was trapped by a 1 mm mesh and was sorted for archaeological as well as bio-archaeological material, which sinks.[4] The material that floats is generally organic in nature, and is trapped in one of two sieves, one with a mesh of 1 mm, the other of 250 microns. This material is referred to as 'flot', coarse (C. F. in abbreviation) at 1mm, and fine (F. F.) at 250 microns. The flot is cleaned and separated into various categories, using a stereoscopic microscope, at variable magnifications from approximately × 6 to × 60. The samples were sorted in this manner and the quantities of archaeobotanical material listed numerically and tabulated in column form, taking either the whole sample, or a specified sub-sample. In either case, a second numerical figure was calculated mathematically to relate the proportion with the optimum sample size (for the wells 11 litres). This figure has been recorded in a second column to facilitate comparison of information between samples.

WELL 605

Of the 52 samples processed from Well 605 by water-flotation 11 had archaeobotanical remains, namely macrofossil plant remains, and one of the samples (#1805 cat. 44), identified visually during excavation, also provided seeds.

DEPOSIT 1 (LM IB)(TABLE 11.1)

This deposit, which represented the use of the well for drawing water, provided 15 samples for bio-archaeological remains. Two of these produced archaeobotanical remains: #1849 and #1852 SF 90 (**424**).

DEPOSIT 2 (LM IB–LM II)(TABLE 11.1)

This deposit provided 9 samples for bioarchaeological remains. Two of these produced information, both from #1844.

It is, of course, impossible from these results to extract much information on the agriculture and environment of Palaikastro in the LM IB period. But they are one part of the puzzle and will help us build this picture gradually. As this is the period of primary use, we believe that these seeds were either adhering to the pots used for drawing water or were blown in from the surrounding area. The persistent presence of the grape (*Vitis* sp.) in all four samples might be an indication that its cultivation

[1] We thank those who worked the water flotation machine during excavation: Jenny Jones for co-ordinating the system of sampling and the washing and sorting of the residue; Dimitra Marangaki, Niki Spanou and Lena Mandalara for sorting both coarse and fine flot.

[2] The quantity of soil collected for each sample is listed in the figures tabulating their contents.

[3] Not a froth flotation machine.

[4] Residue (listed as R) is defined as the non-floating portion of the inorganic material. With this is trapped all archaeological material too small to have been observed visually in the field.

TABLE 11.1. Archaeobotanical remains from Well 605, Deposit 1 (LM IB) and Deposit 2 (LM IB–II).

Plant species	*Deposit 1*				*Deposit 2*		
	Amphora 424		Jug 427		#1844 SS 23(1)		#1844 SS 23(3)
Quantities of soil washed (litres)	1	(X)[5]	1	(X)	½	(X)	11 ½
Quantity sorted	All (R)[6] All (F)		All (R) ¼ (F)		All (R) All (F)		Al (R) All (F)
Vitis sp. frags.	1	10			1	11	23
cf.Vitis sp. frags	5	50	2	22	1	11	
cf. Legume frags.							2
Malva sp.	2	20					
Ignota (damaged)	3	30					9
Total	11	110		22	2	22	34

was, if not exclusive, at least of great importance. The reason for this emphasis is unclear, but might have been connected to the great Theran tephra fall in LM IA. Volcanic ash benefits soils used for grape production,[7] though we should not exclude the olive tree. There are also economic considerations to take into account, so environmental explanations alone are incomplete.

We know from anthropological parallels that the area around a water well is often an ideal gathering spot for social 'get-togethers' and gossip, a place where people would have brought a light 'nibble' such as nuts, olives and seasonal fruit. If this was the case at Palaikastro, it was not preserved archaeologically. Had the botanical material been thrown in the well without being charred, the probabilities are that it would have rotted and disappeared, unless it had been waterlogged. Waterlogged material was not observed macroscopically at the time of excavation and so was not sampled for. Therefore, we believe that this botanical material had either adhered to the utensils used for drawing water, or perhaps been carried on garments or even been blown in. These suggestions are reinforced by the fact that these seeds were fragmented and charred. The finding of charred and very finely fragmented pips does not suggest a by-product of grape-pressing, since they were subjected to further fragmentation either by being used as fuel or perhaps being exposed to intense burning in a fireplace. Had the material only been a by-product of grape pressing exposed to accidental fire, one would have expected a number of whole pips in the assemblage.

DEPOSIT 3 (LM II)

This sedimentation deposit of *c.* 70 cm. (7.00 to 7.70↑) provided 3 samples — one from each zembil — none produced archaeobotanical remains.

DEPOSIT 4A (LM IIIA1) (TABLE 11.2)

This deposit of gradual fill provided four samples for bioarchaeological study, three of which had archaeobotanical remains.

[5] This quantity is multiplied by 10 ½ times in order to make the presence of archaeobotanical macrofossil remains comparable to each other. For numbers of seeds we used the slightly lower fractions of this calculation (i.e. if 10 ½ occurs, we calculated 10). Thus, the quantity of material was multiplied for each zembil so as to make it comparable to the highest quantity of soil, which we sampled. For this exercise it is 11 ½ litres.

[6] (R) is the residue or 'heavy' fraction and (F) is the flot. When this is simply listed as (F), it comprises both coarse (C.F.) and fine flot (F.F.).

[7] This is observed from sites with volcanic soils, such as Thera where vines form a type of mono-culture, or around Vesuvius which has grapes on its slopes.

TABLE 11.2: Archaeobotanical remains from Well 605 Deposits 4a and 4b (LM IIIA1).

Plant species	*Deposit 4a*		*Deposit 4b*				
	#1805–24[8]	#1804	#1803 SS 12		#1802 SS 12	#1802 SS 11(3)	#1799 SS 10
Quantities of soil washed (litres)			1	(X)		*c.* 11	
Quantity sorted			All			All (R) 6/16 (C.F. & F.F.)	
Vitis sp. frag. cf. Vitis sp. frag.			1	10		23	
Olea europaea[9] -stone	2						
Olea europaea frags.		2[10]				3	1
Cerealia Cerealia frag.						11	
cf. Rubiaceae (v. damaged) Ignota			1	10		11	
Total	2	2	2	20	None	12	1

DEPOSIT 4B (LM IIIA1) (TABLE 11.2)

This deposit of gradual fill provided 11 samples for bio-archaeological remains, and of these 4 had archaeobotanical data.

In the LM IIIA1 period at Palaikastro some burning, which trapped and charred seed material, occurred in the vicinity of this well. This time olives occurred in the same approximate proportions as grapes. We say this with caution, as the samples are extremely few and small.

DEPOSIT 5A (LM IIIA2) (TABLE 11.3)

This deposit was excavated as zembils ##1790–96, from which 12 samples were collected for bioarchaeological remains. Two produced archaeobotanical data.

DEPOSIT 5B (LM IIIA2) (TABLE 11.3)

This deposit was excavated as zembils ##1788–89, from which two samples of soil were water floated and studied, one of these produced archaeobotanical remains.

DEPOSIT 5C (LM IIIA2) (TABLE 11.3)

This deposit was excavated as zembils ##1776–8 and ##1785–7, from which 12 samples of soil were water floated, two of these contained archaeobotanical remains.

These results from the LM IIIA2 deposits show a period of preponderance of the cultivation of the olive tree, though we continue to stress caution due to the paucity of this seed material. The olive stone fragments, like the grapes, are very fragmented. They could be material blown or brought in, as suggested for LM IB above, but in this last case the olive fragments might have been used as fuel. An alternative explanation is that these samples reflect different seasons: September to November for the by-products of the grapevine, December–January onwards for the by-products of olive pressing. A

[8] This sample was not water floated.
[9] These seem to have the characteristics of the wild olive.
[10] Although 1 litre was water floated no archaeobotanical finds occurred. Since this olea was collected during excavation by eye, the sample was not used for the calculations.

TABLE 11.3: Archaeobotanical remains from Well 605 Deposits 5b and 5c (LM IIIA2).

Plant species	*Deposit 5b*	*Deposit 5c*		
	#1796 SS 23	#1788 ass. 21	#1778 SS 2	#1788 ass.21
Quantities of soil washed (litres)	½ litre	11 litres	11 litres	1 litre
Quantity sorted	All (R) + (C.F.); 1/16 (F.F.)	All	All	All
Olea europaea frags.		1		3[11]
Ignota (v.damaged)	2	2	1	
Total	2	3	1	3

third explanation could lie in different agricultural practices. Perhaps grapes were predominant in the LM IB period, but there was equalised cultivation between grapes and olives in the LM IIIA1 period. Then, in the LM IIIA2 period the agricultural emphasis was on olive cultivation.

WELL 576

Of the 16 samples taken from Well 576, seven provided archaeobotanical information.

DEPOSIT 1 (LM IB)

This deposit refers to the period of the building and usage of the well as a water provider. Two samples were collected, neither of which contained archaeobotanical remains.

DEPOSIT 2 (LM IB–II)

No archaeobotanical sampling was implemented from this sediment level.

DEPOSIT 3 (LM IB–IIIA1)

This period sees the re-use of the well as a source of water. One sample was collected, but provided no archaeobotanical evidence.

DEPOSIT 4A AND 4B (LM IB–IIIA1) (TABLE 11.4)

Three samples were taken from this jumbled deposit of building debris from site clearance; two of these produced archaeobotanical remains.

DEPOSIT 5 (LM IIIA1) (TABLE 11.4)

This deposit saw a short-lived re-use of the well for water. The sample from the contents of jug **134**, produced archaeobotanical results.

DEPOSIT 6B (LM IIIA1) (TABLE 11.4)

We recovered four samples with archaeobotanical material from this layer, which the excavators consider a period of site clearance and fire destruction in the town.

As we only recovered samples with archaeobotanical data from Deposits 4, 5 and 6b in Well 576, it is very difficult to draw firm conclusions. What is immediately apparent is the presence of the olive and grape, though not in the same order of abundance. The complete absence of the grape in the earlier deposits is replaced by a strong presence in LM IIIA1 Deposit 6b.[12]

[11] Fresh breaks suggest that this was one piece.

[12] The 'wine-press' found in Area 6, EN87, is dated earlier to MM IIIB and obviously did not co-exist with this well, which was built in LM IB, *PK 1991*, 126–7 fig. 5, pl.5.

TABLE 11.4: Archaeobotanical remains from Well 576 Deposits 4a and 4b, and Deposit 6b.

Plant species	*Deposits 4a & b and 5 (LM IIIA1)*			*Deposit 6b (LM IIIA1)*			
	Jug 134	# 0846 SS 16	#0849[13]	#0825 SS 10	#0828 SS 11	#0830 SS 12	#0835
Quantities of soil washed (litres)	1 litre	14 ½ litres		16 litres	20 litres	16 litres	10 litres
Quantity sorted	ALL	¼ (R) & C. C.&F.F.		¼ (R) & 1/12 C.& F.F.	2/3 (R) & C. & F.F.	¾ (R) & C.&F.F.	¼ (R)& C.&F.F.
Olea europaea frags		1		2	2	2	
Vitis sp. Frags				4	7	11	1
Amygdalus sp. Frags					1		
Legume frags.	2						
Legume/cerealia frags					2	6	
Ignota							1
Total	2	1	None	6	12	19	2

The co-existence of the cultivation of certain plants is interesting. With the olive (*Olea europaea*), the grape (*Vitis vinifera*), cereals (*Hordeum* — barley; *Triticum* — wheat), and pulses (legumes),[14] the Mediterranean quartet is well represented. The almond tree (*Amygdalus communis*) is also part of the scene, but the total absence of the fig (*Ficus carica*) cannot be explained, as it is nearly ubiquitous in other samples from Palaikastro. We can conclude that the archaeobotanical material trapped in the wells was not material incidentally eaten and spat out on the spot, as the preservation conditions would not have saved these palimpsests.[15] The archaeobotanical material preserved in the wells was charred and probably would have been transported there either by association with pottery, or on people's garments and footwear. It could also have been blown in from the vicinity by the strong prevailing winds. Perhaps this explains the absence of the fig, which is not normally found in cooking areas where fuel (which in this instance could have been by-products of olive and grape crushing) and the remnants of the cleaning of crops such as weeds, and the spilling over of foods are all common.

[13] Sterile archaeobotanically.

[14] The legumes in our samples are so fragmentary and damaged that it is impossible to identify the species or even the genus.

[15] We know that, had material been preserved by water logging, such 'moments of time' could have been trapped.

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When Sir Arthur Evans was establishing the chronology of the Minoan period at Knossos in the early twentieth century, Robert Carr Bosanquet and his team from the British School at Athens began to define the contemporary sequence at Palaikastro in eastern Crete. One of the aims of the recent British School excavations at Palaikastro is to refine the early excavator's results and to explore social, political and environmental change within the Cretan Bronze Age. The discovery of two wells with undisturbed layers of the LM IB to LM IIIA2 periods (the fifteenth and fourteenth centuries BC) provided a rare opportunity to study the pottery chronology and development in detail, but also to look at diet, foreign connections, and religious practices at that time. One surprise was the discovery of the remains of several dogs related to the modern Cretan Tracer Hound. Another was part of an exquisite stone vase with dolphins carved in relief.

This volume gives the first detailed template of LM IB to LM IIIA2 pottery at Palaikastro along with final reports on the wells' excavation and complete contents by members of the international team of specialists who excavate at Palaikastro.

COVER ILLUSTRATION: adapted from the drawing by Joannah Wilmerding of the stone rhyton fragment (no. **531**) from Well 605.

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