JOURNAL OF ROMAN ARCHAEOLOGY

SUPPLEMENTARY SERIES NUMBER 58

General Editor: J. H. Humphrey

AN INTERNATIONAL JOURNAL

ISBN 1-887829-58-X ISSN 1063-4304 (for the supplementary series)

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Appendix A

Archaeobotanical remains

Cheryl Ward

Ancient shipwrecks typically incorporate large amounts of plant materials in addition to the timbers present.[1] Because some of the artifacts at Skerki Bank were recovered in such a way as to preserve their contents, archaeobotanical remains also were recovered. Food supplies for crew and passengers, cargo, fuel (charcoal), medicines, packing materials, and personal belongings may all contribute to the mix of plant remains found. Because the anaerobic environment of the sediment-filled wreck slows decay caused by microorganisms, plant remains on wrecks are typically of quite different composition than most waterlogged terrestrial samples. Rather than being composed primarily of the charred remains of staples such as grain or legumes, samples from wrecks are primarily comprised of waterlogged fruit seeds, nut shells, spices, resins, cordage, charcoal, as well as wood fragments. Assemblages from wrecks are more comparable to those of arid sites such as Quseir al-Qadim or Mons Claudianus[2] because they are larger and more representative of ancient plant use.

Sample composition

The use of an ROV to retrieve artifacts from the sea bed permitted the archaeologists also to recover sediments. Individual artifacts recovered originally contained up to 3,000 g of sediment. When they arrived at the Florida State University Nautical Archaeology Laboratory, nine of the samples had already been processed in a flotation machine under the supervision of D. Piechota and had been separated into heavy, medium and light fractions. Seventeen other sediment samples of up to 200 ml had not been processed. Samples less than 50 ml were processed in their entirety, whereas half of the larger samples was processed so as to retain some for further studies.

Plant remains were separated from the heavy, clay-like particles by suspension flotation. Each of the 17 samples was placed in a liter of water, stirred gently until a vortex was created, and the suspended water and plant remains were poured through geological sieves (1 cm, 2 mm and 0.5 mm mesh sizes). The heavy fraction was examined and ceramic sherds, large charcoal or wood fragments, rocks, or shells caught on the 1-cm screen were isolated. All other fractions were examined by stereoscopic microscopy to further separate identifiable macrofossils. Comparison with botanical reference specimens permitted identification of the few species of seeds (Table 1); wood and charcoal specimens have not been identified except as noted. Almost all samples also included tiny fragments of wood and charcoal, fragments of mollusk shells, and corroded fragments and corrosion products of iron and/or copper metals. Seven samples included beetle and other insect remains.

The scarcity of plant remains is not surprising as most of the 25 artifacts had been collected from the surface of the sea bed. Usually, artifacts lower in the hull have higher numbers of macrofossils probably because, as containers disintegrate, their contents are dispersed into sediments or artifacts below them. It is also possible that differences in processing methods account for the dearth of seeds in samples put through a flotation machine. Because the seeds are waterlogged rather than charred, it is more difficult to make them float. The advantage of the flotation machine is that it requires less time and attention to process samples and separate the lighter remains (particularly chitinous insect parts) from heavier ones (charcoal, sherds, artifacts).

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1 Ward 2001 and 2003; Gorham 2001; Ward-Haldane 1991; Zohary and Hopf 1988.

2 See, for example, van der Veen 2001 and 2003.

Identification and analysis

Seeds of three economic plant staples and two more edible species were identified, all common food sources in the ancient Mediterranean:

Olea europaea L. Cultivation of the olive provided both olive oil and preserved fruits (often by pickling) for human consumption. The fat-rich olive is one of the most common foods in the Mediterranean basin and has long been a dietary staple.

A single stone from a round-bottomed pan on Wreck F was identified by its size, rugged surface, wall thickness and other gross morphological features.

Vitis vinifera L. Grape cultivation in the Mediterranean basin provided hundreds of varieties of grapes and grape products by the later Roman period. The sweet berry provided an important sweetener in the form of fresh or dried fruits, as well as a concentrated syrup made by boiling pressed juice. Wine is the most common source of grape seeds on shipwrecks, since filtering wine immediately before serving was a common procedure.

The two grape seeds from an open cooking pot probably came from a fresh or dried fruit that fell into the casserole during formation of Wreck F. Identification of the grape seeds relied on gross morphological features, wall thickness, and color.

Ficus carica L. Fig seeds are the most abundant seed type recovered, probably because of the large numbers of seeds in each fruit.

Two casseroles on Wreck F included fig seeds, a common find on Mediterranean shipwrecks that probably illustrates the dried fruit's contribution to diet as an important source of iron, sweetness, and calories. The seed's typical pyriform to obovate shape, golden yellow color, wall thickness, and hilum characteristics were used for its identification.

Cerastium arvense L. Field chickweed grows year-round and is an important contributor of vitamin C and minerals to a winter diet in parts of Turkey and other E Mediterranean countries both as a green vegetable in salads or boiled.

This use, or possibly its use as a food for domestic birds, which are known to have been caged and taken on ships to supplement the diet, may account for the relatively numerous seeds found in two casseroles from Wreck F. The seed's size, shape, color, and rugose surface permit its identification.

Rubus sp. The blackberry and raspberry group had long been common in Europe and the Mediterranean. The edible berries encompass individual drupes, each with its own seed. Fruits may be eaten fresh, dried, or preserved in compotes or jams.

The kidney-bean shape, strongly reticulate surface, and size (1.6-2 mm in length) permitted identification of *Rubus* seeds, which may belong to *R. idaeus* L., a wild red raspberry originally from the E Mediterranean.[3] The presence of *Rubus* in sediment from an amphora (one seed) on Wreck B and a glass lamp (5 seeds) on Wreck A probably is due to its use as a food supplement.

Sediments in casseroles from wreck F provide the most interesting samples. The conglomerate in cat. F12 requires further analysis with the help of comparative reference collections and perhaps with starch grain analysis. Large numbers of grass caryopses (max. length 0.7 mm) are indicated by fragmentary remains. Abundant insect parts and frass suggest a pest in stored food. Mediterranean staples are represented in other samples from this wreck. Fig, grape, and olive are the most common species in samples from a wide range of E Mediterranean shipwrecks,[4] but most of those samples come from narrow-mouthed shipping amphoras rather than open cooking pots. About 40 ml of botanical remains recovered from 200 ml of sediment inside cat. F23 consisted predominantly of fig seeds. A 4-ml sub-sample of this produced 1,200 fig seeds, 32 seeds of field chickweed (*Cerastium arvense*), one complete and a second fragmentary grape seed, and the broken half of an olive stone. Fig and field chickweed seeds also were present in cat. F21, suggesting a common origin for the seeds in cat. F21 and F23, particularly since chickweed has not previously been identified in more than 10,000 samples from shipwreck sites which I have examined.

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3 Zohary and Hopf 1988, 179.

4 Ward-Haldane 1991.

A single fig seed from the glass cup cat. A9, *Rubus* sp. (blackberry-type) seeds in sediment from the glass lamp cat. A7, both from Wreck A, and a *Rubus* sp. seed in the amphora cat. B4 from Wreck B provide the only other identifiable seeds in the assemblage.

The variety of seeds, and in particular the presence of field chickweed, suggests that some of the casseroles from Wreck F were not cargo items but were part of the ship's galley appointments, and the seeds in them components of the crew's diet.

Conclusion

The presence of seeds of economically significant species in ceramic and glass objects recovered from the surface of deep-water shipwrecks suggests that preservation will be good for objects lower in the hulls. The small number of samples and species recovered so far prevents broad conclusions being drawn, but the fig, grape and olive all probably represent foodstuffs. Field chickweed and blackberry are common on disturbed ground, and blackberry is edible, as are the leaves of field chickweed. Weedy species are common in shipwrecks, possibly because of the presence of weeds at the time of food processing or in materials collected for packing and to serve as dunnage (e.g., a protective layer of branches or plant materials between cargo and hull). If an entomologist can be found to study the fractured beetle carapaces, wings and egg cases, additional information about foodstuffs may be forthcoming.

Table A.1. Composition of archaeobotanical samples from wrecks A-F

A plus sign (+) indicates that a material was present; a minus sign (-) indicates that the material was present but in minute quantities. Absence is indicated by a blank square.
NHFA = no heavy fraction available. NPR = no plant remains. S = sediment sample. F = flotation sample*

No.	*Artifact*	*Wreck*	*Type*	*Charcoal*	*Wood*	*Pine pitch*	*Ficus*	*Cera-stium*	*Other seeds*	*Insects*	*Metal*	*Other*
A7	glass lamp	A	S	-	-	-			5 *Rubus*		Cu	
A8	glass lamp	A	S								Fe, Cu	NPR
A9	glass cup	A	S	+	+	+	1			Frass only	Fe	dyed hairs
A10	glass cup	A	S	-	-	-					Fe	conifer charcoal
B1	amphora	B	F	+	+							NHFA
B4	amphora	B	F	+	+	+			1 *Rubus*			NHFA
B9	bowl	B	F	+	+	+				+		NHFA
B10	sauce pan	B	S	+	+						Fe	
B11	cook pot	B	F	+	+	+				+	Fe, Cu	bark
B12	cook pot	B	F	+	+					+	Fe, Cu	potsherds, mostly conifer wood
B13	cook pot	B	F	+	+	+				+	Fe	dyed hairs, slag blobs
B15	FB pan	B	F	+							Cu	mineralized reed remains
B17	jug	B	F	+	+						Fe	slag blob
B20	cook pot	B	S	-	-							
B21	anchor	B	S		-						Fe, Cu	
B21	anchor	B	S									NPR
D24	jar	D	S								Fe, Cu	NPR
D34	pot	D	S			-					Fe, Cu	
F4	amphora	F	S	-							Fe, Cu	
F12	lid	F	S	+	+				Graminae*	+		dyed hairs
F21	RB pan	F	S	+	twigs		77	10		+	Fe, Cu	
F23	RB pan	F	S	+			1200	32	2 *Vitis*, 1 *Olea*		Fe	subsample
G2	amphora	G	S		-						Fe, Cu	fish bone
No #	mud	"Isis"	F		-						Fe	

* Conglomerate of 10 cc with insect remains, frass, caryopses and other plant remains.