Don't Forget the Dunnage: targeting plants on ships

It was so old a ship—who knows; who knows—
And yet so beautiful, I watched in vain
To see the mast burst open with a rose,
And the whole deck take on its leaves again.
(James Elroy Flecker, *Old Ships*)

It behoves diving archaeologists to prepare themselves for botanical finds. Raising them is a skilled job, but much the same applies to organic matter on land when it has been preserved in the dryness of Egyptian tombs or encapsulated in Siberian ice. Conserving such remains may not always be possible, but recording them and taking samples is essential. In addition to the standard archaeological questions as to who traded with whom at a given period, and where the ship was built, plant material opens countless windows onto topics such as social history, superstitions, religious practices, fishing-methods, and the history of medicine. The survival of wood and other plant material does, of course, depend on the chemical environment of the sea-floor on which it has come to rest, and chemical environments can vary significantly within even a small area. On a sandy floor and at great depth preservation ought to be good.

A 'sleeping beauty' perfectly preserved in death is a romantic myth hitherto unsupported by mummification, whereas, even without treatment, garlands, bouquets, fruits and seeds fare better than flesh in the dryness of Egyptian tombs, such as that of Tutankhamoun (Hepper, 1990), almost rivalling the carefully-desiccated flowers and leaves pressed between the pages of a Victorian *herbarium.* Divers have noted that on wrecks where plants have been sealed in anoxic conditions, myth briefly matches reality. At first sight I personally mistook for modern some green leaves found on a 3rd-century-BC hull which sank off a spit of sand called 'Isola Lunga' north of Lilybaeum (modem Marsala) in western Sicily.

The interest of this and other similar findings is that, potentially, the *archaeology* of plant-travel could take its place beside the *history* of plant-travel (such as the introduction of tobacco and potatoes to Europe, or Bougainville's gift of a vivid red creeper to the Mediterranean, as well as plants now taken for granted by the pharmaceutical industry). A feature of plants on wrecks, and one of the most interesting aspects archaeologically, is that their preservation does not depend on age or depth but on the speed with which they were buried. While excavating in air and under water is utterly different technically, it may be of interest to summarise a few submarine findings and recall some personal experiences—and the questions they invoke—relating to the sea-travel of plants around the Mediterranean.

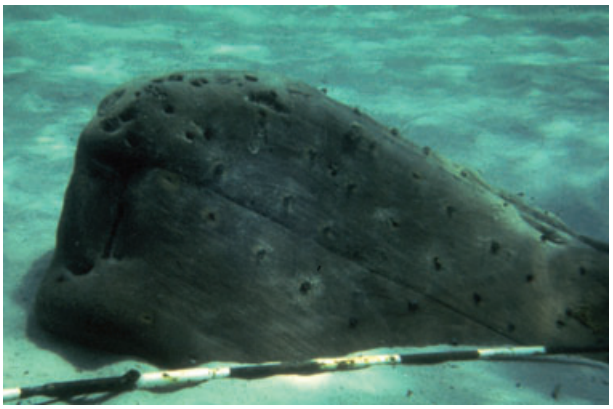

Figure 1. Dark tip of the eroded stern emerging from the sand on the Punic wreck. (H. Frost)

Revelations from the Punic shipwreck

On the Punic cargo-less, oared ship wrecked just north of Marsala, speedy burial in sand had created anoxic conditions, while iron sulphide (caused by decaying *Poseidonia*) combined to produce the ideal chemical environment for preserving organic matter. The vessel's stern had been driven down into the sea-floor by some unnatural force, perhaps ramming, leaving the keel at an unusual angle so that the prow had broken off and been washed away. After the wreck came to rest, at a depth of only 3 m, the flat sea-floor had quickly returned to equilibrium. Sand piled up round the obstruction, burying the wooden remains until only the tip of the sternpost and the ballast-stones (which had tumbled backward on impact) were left to mark the presence of hull-remains (Fig. 1). Moving some top ballast-stones revealed the blackened tips of ribs protruding from the sand, and, lower down, once the sand had been fanned off them, the colours of hardwood frames and floor-timbers began to show. Then, still further down, the yellowness of the hull's pinewood planking was revealed (Fig. 2). The remains of the ship looked as good as new although, in fact, the waterlogged wood had the consistency of soft cheese (Frost, 1973; 1974).

It took four annual seasons from 1971 to excavate the Punic wreck. The consistency of the bottom varied from place to place, as did the nature of the burial; soa variety of technical solutions had to be devised and applied. The only constant was that every morning the site had to be cleaned, as overnight currents washed in all manner of rubbish—plastic bags, old 'flip-flops', Coca-Cola cans—as well as the autumnal fall of blackened leaves of *Poseidonia* which floated to-and-fro above the bottom, carpeting the whole surface. The

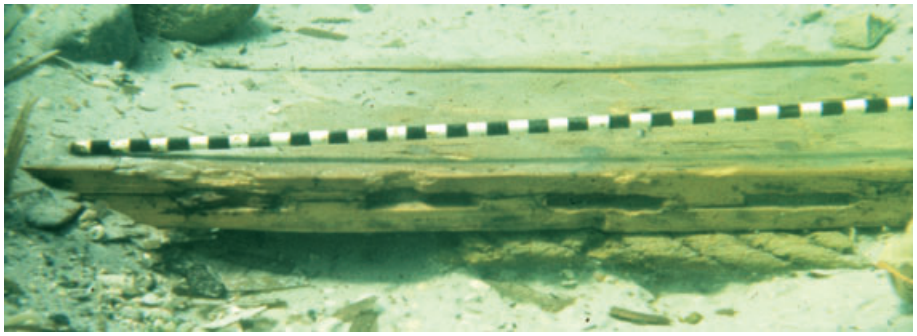

Figure 2. Newly uncovered pinewood plank shows up yellow on the Punic wreck. (H. Frost)

part due to be excavated had to be cleared by gathering up the detritus and dumping it down-current. Thus it was that, while working downwards towards the keel-cavity, I found myself disposing of leafy branches and wondering vaguely whether they had fallen off a boat, before realising that they might have been there since the mid-3rd century BC. The suspicion was soon confirmed by the appearance of more green leaves as I, now with the utmost care, fanned sand off the planking (Fig. 3).

The plant material represented dunnage; the freshly-gathered stems and branches which are laid over the bottom of a hull to protect it from being damaged by heavy cargo or, in this case, ballast-stones. I had already encountered and drawn bits of dunnage on the Late Bronze Age wreck off Cape Gelidonya, Turkey (1960), where the hull itself had perished and only scraps of organic matter survived, held down by stones and heavy cargo in a few sand pockets. The Gelidonya twigs were not as well-preserved, plentiful and informative as the dunnage on the Punic ship. The latter, for instance, included some bracken, the rachis of *Pteridium aquilinum* (Fig. 4).

While all wrecks carry some evidence of the ports they have visited and the nationalities of their crews, there is often no hint of where hulls were built. This exceptional hull was, however, visibly brand new, as the putty used inside it had not had time to harden before the green leaves of the dunnage had been put in place and the ballast thrown on top of them. Some leaves and stones remained embedded in the putty. The hull must therefore have been launched from a place where bracken grew. The ship was certainly Punic in origin, since its builders had marked their instructions onto its planking in Phoenicio-Punic symbols. Since bracken does not grow within walking distance of Marsala or, for that matter, Carthage, its presence showed that the vessel could not have been built in either of these Punic territories. The bracken scraps thus pointed instead to Latium on the mainland near Rome. Here bracken grew close to the sea and so could have provided packing for the hull.

More and more dunnage came to light as excavation proceeded. The keel-cavity was packed with a mix of

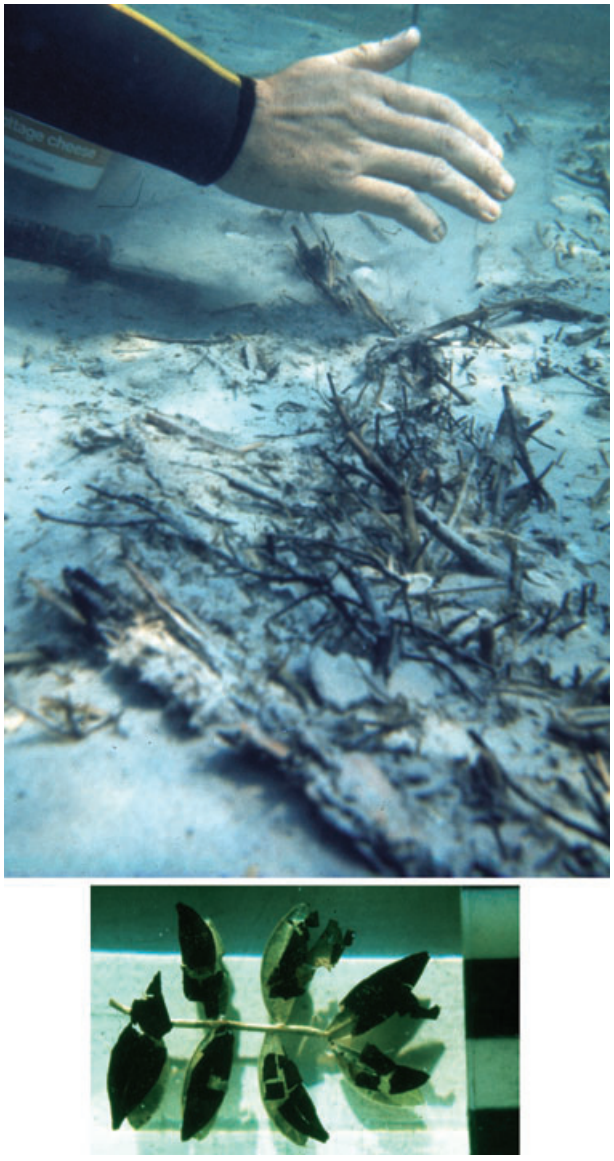

Figure 3. Top: fanning sand off the dunnage on the Punic ship. Bottom: recovered green leaves under glass. (H. Frost)

Figure 4. Bracken (*Pteridium aquilinum*). (John Wood)

leaves and branches and the dropped remains of the oarsmen's meals. The eatables included butcher-cut meat-bones as well as the shells of almond, pistachio and hazel nuts; olive stones were also present—we had to stop eating olives on the dive-boat. Among the 'gunge', fragments of some kind of plant stalk stood out because they had turned bright yellow. Later, more examples were found in two baskets in the kitchen area (Fig. 5). They were identified as *Cannabis sativa by* the Jodrell Laboratory of the Royal Botanic Gardens, Kew (Fig. 6).

During the first stages of excavation we had agonised over raising leaves so fragile that they tended to turn to powder when touched. Borrowing techniques from paper conservation, we gradually learned how such fragile scraps could be picked up by sliding something like blotting-paper under them and depositing them into plastic sandwich-boxes. Once raised the seawater could be exchanged by using pipettes. Among the easily recognisable organic objects aboard were a besom (Fig. 7) and an eyesplice knot (Fig. 8) as well as much string and rope. When, however, we were faced with cubic metres of plant material, all that could be done was to fill plastic bags with random samples, leaving laboratories to chose what they wanted for plant-identification purposes.

Figure 5. Top, basketwork from the kitchen area within which the cannabis was found; bottom, cannabis dried and mounted. (H. Frost)

Anoxic conditions

The predominant influence on the preservation of plants on wrecks is the anoxic conditions produced by swift burial under deposits such as sand or mud. Age and depth are immaterial. For instance, on four wreck-sites ranging from 3 to 60 m deep and periods separated by more than a millennium, there is no difference between the degree of preservation of the juniper branches and pine-cones packed round the cargo of *c.* 6000 amphoras on the 1st-century-BC wreck off the Madrague de Giens, France, the plant material on the 3rd-century-BC Punic ship off Sicily, and that of the magnificent Bronze-Age Uluburun wreck (which

Figure 6. *Cannabis sativa*. (John Wood)

Figure 7. Besom from the Punic wreck. (H. Frost)

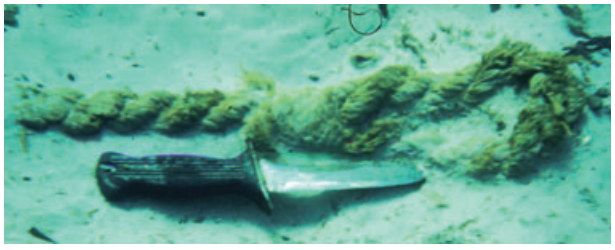

Figure 8. Rope from the Punic wreck. (H. Frost)

besides edibles and dunnage contained logs of rare woods in its cargo). Environmentally, both the Bronze-Age wrecks off Turkey (Gelidonya, 13th century BC, and Uluburun, 14th century BC) lay below headlands with steep cliffs which continue undersea to a considerable depth before reaching a sandy plain where wooden hulls are most likely to be undisturbed before burial. More than a decade had passed between some twigs attracting attention at Gelidonya and larger amounts of dunnage being found and studied at Uluburun. Not only were there bigger patches of sand there, but also more heavy cargo to pin down organic matter. Methodological skills had improved and there was an archaeological botanist, Cheryl Ward, among the divers.

The potential of documentary evidence

Textual evidence can now be examined in a new light. Despite half-a-century of experience in sub-aquatic excavation, interest has focused on the ubiquitous pot-sherd which every diver sees and every archaeologist understands. A diver with an eye for anomalies occasionally finds perishables—but they are more often uncovered by engineers laying pipelines or the foundations for harbour-works. In Sicily it was the captain of a dredger taking up sand for glass-making who scooped up bits of wood and reported them to the authorities, which led to a survey of the wreck-filled zone and the discovery of the Punic ship.

There is no reason why the remains of Bronze-Age cedar-carriers should not be preserved in either deep or shallow waters between Byblos and Pharaonic Egypt. Shipping cedars for Egyptian shipbuilding from Byblos (modern Jbeil) in Lebanon is well attested from the 3rd millennium BC. The Pharaoh Sneferou from the 2nd Dynasty (*c.*2513–2493) ordered 40 large vessels to bring 'Byblian timber' (that is, cedar) to Egypt. A funerary barge over 40 m long was built to convey Sneferou's successor, Cheops (Khufu), down the Nile to his final resting-place, and is now on display

near his pyramid. It contains substantial amounts of cedar-wood. How are we to find the remains of these cedar cargoes and where?

The plant known as *byblus* in antiquity, otherwise *Cypera papyrus,* was particularly associated with the site of Byblos on the Levantine coast where trade in the manufactured material papyrus was concentrated. To avoid confusion the italicised form is used for the plant, and 'papyrus' for the flexible writing material made from it. The word 'Bible, the Book', and 'biblio' meaning 'of books' arose because books were originally written on papyrus, which was linked with Byblos. To convert the plant into 'paper' the pithy stem was cut into thin slivers and laid out in two overlying rows running vertically and horizontally which were then pounded, forming a homogeneous whole as the starch present in the released sap dried. Papyrus was produced on a relatively large scale in Egypt from at least the 1st Dynasty.

Byblos acted as a staging-post for shipping Delta papyrus to Greece in the Hellenistic period. During the Bronze Age the city's best-documented trade had been export of timber (cedars) to the Delta. Cedar trees grow in many parts of Lebanon but, at Byblos, the tree-covered hills behind the town came nearest to the sea, with deep tributary valleys to raft timbers down, making logging easier. (Even by the Roman period there was noticeable deforestation and today the hills are bare.) Timber export from Byblos is exceptionally well attested, by comparison with the early history of the town's connection with the papyrus trade. There is little doubt, however, that the import of papyrus or the raw plant antedated Hellenism, although by how long has yet to be established.

References to the export of timber from Lebanon go back to the 3rd millennium BC, but not until the Iron Age is there is any mention of papyrus. Its context, however, gives a hint that the plant material had already been traded at an earlier date. A priest of Amon who had been sent to Byblos to buy wood for the sacred barge in Amon's temple at Thebes. Unlike his predecessors, Wen-Amon had to do his shopping during a period of recession in Egypt. At Byblos, King Zaker Baal *(c.*1075 BC) complained that the trade-goods brought by the priest—which included papyrus—were insufficient to pay for the wood he wanted. To prove the point, the king ordered ancestral accounts to be produced. This raises two questions: how many generations of ancestors did the accounts represent?; and were the accounts themselves written on clay tablets or papyrus? Translations speak of 'scrolls' and 'journal rolls' which have to be unrolled, and of forefathers and ancestors. One may wonder, therefore, whether papyrus as a writing material might not have been in use several generations before King Zaker Baal, in the early Iron Age. Also, despite the invention of the alphabet being associated with Byblos, no clay tablets have been found there—in contrast to the comparable sites of Ugarit and Mari, where libraries of clay tablets have been unearthed.

Since wreck-sites are usually dateable, the discovery of a buried hull containing some of its plant material intact, suggesting a cargo (cedar logs, papyrus), would help to throw light on these questions. Small submersibles and remote-controlled vehicles have mechanical arms which could pick up some solid object containing a sample of vegetable matter, and the straight lines of large tree-trunks under a blanket of sand might well show up under a ROV's floodlights. One hesitates to urge a systematic search for such hulls off the Levantine coast, but one may ask the diving and archaeological community to be vigilant.

Apart from cedar logs or parchment, there are a number of other ways that plant material can find its way onto an ancient hull. Boats have been garlanded down the centuries to the present day, not only at launching but on feast-days and special saint's days. It can occur as food, as the nuts and olives eaten by Punic oarsmen have shown; or as dried herbs to liven up the sponge-diver's snacks, *leguminos* to add to his evening fish *corba* (soup); or in Sicily as a bunch of garlic to ward off the evil eye. They all give meaning; add texture to the period and people of long ago which is the point of archaeology above or below water.

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