



HUNT FOR THE ANCIENT MARINER

Armed with high-tech methods, researchers are scouring the Aegean Sea for the world's oldest shipwrecks.

BY JO MARCHANT

Brendan Foley peels his wetsuit to the waist and perches on the side of an inflatable boat as it skims across the sea just north of the island of Crete. At his feet are the dripping remains of a vase that moments earlier had been resting on the sea floor, its home for more than a millennium. “It’s our best day so far,” he says of his dive that morning. “We’ve discovered two ancient shipwrecks.”

Foley, a marine archaeologist at the Woods Hole Oceanographic Institution in Massachusetts, and his colleagues at Greece’s Ephorate of Underwater Antiquities in Athens have spent the day diving near the cliffs of the tiny island of Dia in the eastern Mediterranean. They have identified two clusters of pottery dating from the first century BC and fifth century AD. Together with other remains that the team has discovered on the island’s submerged slopes, the pots reveal that for centuries Greek, Roman and Byzantine traders used Dia as a refuge during storms, when they couldn’t safely reach Crete.

It is a nice archaeological discovery, but Foley was hoping for something much older. His four-week survey of the waters around Crete last October is part of a long-term effort to catalogue large numbers of ancient shipwrecks in the Aegean Sea. And the grand prize would be a wreck from one of the most influential and enigmatic cultures of the ancient world — the Minoans, who ruled these seas more than 3,000 years ago.

Some researchers believe that quest to be close to impossible. But Foley and a few competitors are using high-tech approaches such as autonomous robots and new search strategies that they say have a good chance of locating the most ancient of shipwrecks. If they succeed, they could transform archaeologists’ understanding of a crucial period in human history, when ancient mariners first ventured long distances across the sea.

Archaeologists have precious little information about the seagoing habits of the Minoan civilization, which erected the palace of Knossos on Crete — linked to the Greek myth of the Minotaur. Minoans far exceeded their neighbours in weaponry, literacy and art, and formed “part of the roots of what went on to become European civilization”, says Don Evely, an archaeologist at the British School at Athens, and curator of Knossos. Archaeologists are keen to understand what made the Minoans so successful and how they interacted with nearby cultures such as the Egyptians.

Although researchers have studied scores of Roman ships, finding a much older Minoan wreck “would add 100% new knowledge”, says Shelley Wachsmann, an expert in ancient seafaring at Texas A&M University in College Station.

UNDERWATER TREASURE

A Bronze Age wreck called Ulu Burun shows how the remains of a single ship can transform archaeologists’ understanding of an era. Discovered in 1982, it lies about 9 kilometres southeast of Kaş in southern Turkey, and dates from around 1300 BC, a century or two after the Minoans disappeared.

Christos Agourides, secretary-general of the Hellenic Institute of Marine Archaeology in Athens, describes it as “the dream of every marine archaeologist”. It took ten years to excavate, and researchers are still studying the nearly 17 tonnes of treasures recovered. The vast cargo includes ebony, ivory, ostrich eggs, resin, spices, weapons, jewellery and textiles as well as ingots of copper, tin and glass.

But what really stunned archaeologists was that the artefacts on this one vessel came from at least 11 different cultures¹ — from a gold scarab bearing the name of the Egyptian queen Nefertiti to copper from



A sixteenth-century-BC Minoan wall mural from the Greek island of Santorini depicts some of the ships used by the Bronze-Age seafarers.

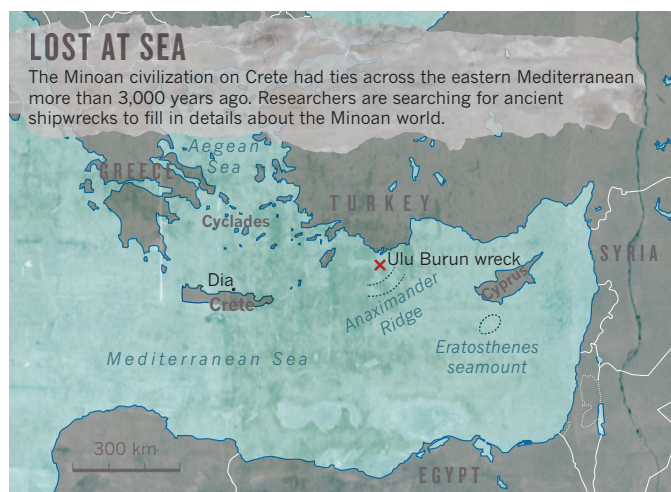
Cyprus and tin from central Asia.

The wreck provided tangible evidence of an astonishing array of contacts and trade between the different cultures of the Mediterranean and Near East in the late Bronze Age. The Ulu Burun ship sailed at around the time that Tutankhamun ruled Egypt, and “it is far more important than Tutankhamun’s tomb as a contribution to our understanding of the period”, according to Wachsmann. “This goes to the nitty gritty of the world. It’s Wall Street in a ship.”

The earlier Minoans set the stage for such a widespread trading network through their domination of the eastern Mediterranean. Their seafaring abilities were still celebrated 1,000 years later by Greek historian Thucydides, who credited the Minoans with building the world’s first navy and ridding the seas of pirates. Although other contemporary Mediterranean cultures were starting to travel across the sea, the Minoans ventured farther than others, reaching distant ports in Syria, Cyprus, the Cyclades and Egypt (see map). Wachsmann describes them as the “Christopher Columboes of the Bronze Age”.

Researchers have already found one potential Minoan wreck site by the island of Pseira, off the northeast coast of Crete. In 2003, archaeologist Elpida Hatzidaki of the Ephorate of Underwater Antiquities discovered a large collection of underwater pottery dating to around 1800 BC.

But at this site and a few even older ones, no portion of the ship itself survives, and it is hard to determine whether the pottery came from a wreck, was simply thrown overboard, or washed into the sea from the nearby coast. Even those who believe the Pseira site does represent a Minoan wreck admit that the pottery itself — everyday ware of local origin — doesn’t reveal much new information. What archaeologists crave is an equivalent of Ulu Burun, a long-distance trading ship packed with valuable cargo that would reveal how different cultures interacted.



“Ships were the way that people communicated and moved about the ancient world,” says Foley. “So if we can find these ancient wrecks, we get a much clearer view of the very dim past.”

That dream lured Foley and his team to Crete last year, and they brought a new tool that they hope will significantly raise the chances of finding an ancient shipwreck. In the past, archaeologists have explored the sea floor using divers and, more recently, remotely operated vehicles (ROVs) that are controlled by pilots on ship. Foley’s team tested an autonomous diving robot that could search the ocean bottom for hours under its own command. The REMUS 100 vehicle (for Remote Environmental Monitoring Underwater System) is equipped with Global Positioning System technology, side-scan sonar and a video camera. The Woods Hole researchers worked on the project with Greek archaeologists led by Theotokis Theodoulou of the Ephorate of Underwater Antiquities.

ROBOT ROVERS

The torpedo-shaped robot, nicknamed Gudgeon after a Second World War submarine, spent the first month of the field campaign surveying the entire sea floor north of Crete’s main harbour, Heraklion, for any lumps and bumps that might signal an ancient wreck.

Foley had high hopes for the area because it had been a port for millennia and had never been surveyed by archaeologists. But the search came up empty handed. Close to shore, there was no hope of finding ancient wrecks because the sea floor was covered in a thick pile of sediments that had washed off the island. Farther out, the researchers found furrows left by trawl fishermen, who had scraped the sea floor clean, even in areas where trawling is supposedly forbidden.

So Foley’s team moved its search to Dia, which lies just north of Heraklion. In 1976, the ocean explorer Jacques Cousteau found some ancient remains there, and Foley suspected that Dia might be a fertile site for shipwrecks because its steep cliffs could be lethal to vessels caught in a storm.

The team took a two-pronged approach to exploring around Dia. The Gudgeon crew prowled Dia’s bays, where the ocean bottom is smooth and artefacts are more likely to show up in sonar images. Near shore, where the bottom is too rocky for Gudgeon, Foley and his team of divers made a circuit of the bays at about 40 metres depth.

Almost immediately, the divers located five ancient wrecks, ranging from around the second century BC to the ninth century AD. The discoveries confirmed Cousteau’s impression that now-deserted Dia was used for centuries as an anchorage. And Foley was convinced that the Minoans must have been here too, with the evidence perhaps on the deeper floor of Dia’s bays. But Gudgeon’s sonar images from those sites kept coming back disappointingly clear.

On the penultimate day of the field season, Greg Packard and Mark Dennett of Woods Hole stood on the stern of their small research vessel, and swung Gudgeon overboard. The miniature explorer descended to the bottom and spent the morning cruising back and forth along

preprogrammed gridlines. Later that evening, when Packard examined the sonar data, he spied a potential target — a patch of bright speckles amid the smooth dark image. The team debated whether it could be a heap of pottery on the sand.

The next day, Foley took his crew of divers out to the suspect site. Some 15 minutes later, they came back with disheartening news: the sonar signal was a collection of plastic water bottles that must have been dumped overboard from a modern boat. And footage from Gudgeon's video camera explained the absence of archaeological remains — furrows in the sand showed that trawlers had cleaned out even these tiny bays. If a Minoan ship ever sank here, it has long since been destroyed. "It's such a waste," says Foley, clearly disappointed. "I bet they're not even trawling for fish. I bet they're trawling for antiquities."

DIVING DEEPER

Wachsmann says that he isn't surprised by what Foley saw. From 2007 to 2009, he led the Danaos project, using sonar-equipped ROVs to survey hundreds of square kilometres of sea floor on a suspected ancient trading route between Crete and Egypt. In three seasons, he didn't find a single ancient wreck from any period, and only a scattering of artefacts.

Wachsmann found that sedimentation was a problem even far from shore — up to a metre per millennium in some areas. This means that although some Greek and Roman remains might still be visible, a Minoan ship would be buried under 3 or 4 metres of sand. And even at 500–600 metres depth, he saw clear evidence of trawling. "It was almost like somebody had swept the sea in front of me," he says. On the basis of his experiences, Wachsmann now believes that the chance of finding a Minoan equivalent of Ulu Burun "approaches zero".

The effect of bottom trawling is "devastating" for archaeologists, agrees Robert Ballard, an oceanographer based at the University of Rhode Island in Narragansett, who has pioneered deep-sea exploration and discovered the wreck of the *Titanic* in 1985. "Most of the Aegean has been destroyed," he says.

Ballard has spent years searching for ancient wrecks and says that he has learned the importance of finding areas beyond the reach of fishermen — below about 600 metres, say, or close to undersea cables, which trawlers avoid. He has also opened up his search area. Historians once assumed that the number of wrecks in the deep sea was negligible because ancient ships must have hugged the coastlines, but in the 1990s Ballard found eight ancient wrecks far from shore between the islands of Sicily and Sardinia² (Foley was Ballard's graduate student at the time). "The ancient mariner was not afraid of going out to sea," says Ballard.

Since 2008, Ballard has been exploring the eastern Mediterranean, the Aegean and the Black Sea with a suite of ROVs. Although he is finding large numbers of ancient wrecks, he hasn't yet uncovered anything from the Bronze Age. But, like Foley, he believes Minoan ships are waiting to be discovered. The key to finding the oldest wrecks, he says, is locating "relic surfaces" that have escaped being buried by sediment, which flows downhill and covers the deep sea floor³. "What you want is a shipwreck that came down on a mountain," he says, because sediment can't accumulate on a steep slope.

Last year, Ballard investigated the Eratosthenes seamount, a 700-metre-deep tabletop south of

Cyprus, and says it does indeed seem to represent a relic surface. He is now applying for permits to return to Eratosthenes to search for shipwrecks next year. Another area he would like to investigate is the submerged Anaximander mountains south of Turkey. It would be difficult to distinguish a wreck site from such rocky terrain using sonar, so he plans to use video cameras to conduct a painstaking visual search over smaller areas. "It's very hard hunting," he says.

Foley is also now looking to the deep sea, but has a different strategy. Instead of targeting particular sweet spots, he wants to cover as large an area as possible. He has raised more than US\$1 million towards the \$1.8 million that he needs to return to the Mediterranean next year, this time with two of Gudgeon's more powerful cousins, REMUS 6000s owned by the Waitt Institute in La Jolla, California.

To maximize the chances of finding ancient wrecks, the team will hunt on open, flat areas in the lowest reaches of the sea, up to 6,000 metres deep. Foley estimates that the two REMUS vehicles can cover up to 5,000 square kilometres in one month, equivalent to 1% of the entire Aegean Sea. The recent field trial around Dia encouraged Foley because

it should be easier for the sonar surveys to pick out vases than it was to find plastic water bottles, which are poor sonar reflectors, he says.

Both Ballard and Foley are ultimately hoping to use their surveys to catalogue large numbers of wrecks of all ages across great swathes of the Mediterranean and the Black Sea. Through a combination of sonar and high-resolution digital photography, they can compile detailed three-dimensional maps of a wreck site and answer questions about the date, origin and cargo of a ship without bringing up a single artefact.

Foley estimates that hundreds of thousands of ships must have sunk in ancient times — including thousands in the Bronze Age alone — and that a significant proportion of those are still sitting at the bottom of the deep sea. If he's right, then perhaps researchers will eventually have not just one Minoan ship, but hundreds. With enough wrecks, says Foley, "it ought to allow us to draw new conclusions about this absolutely formative period in human experience."

That could shift marine archaeologists into an era in which they can use statistical data gathered from hundreds or thousands of wrecks to build up a bigger picture of trade routes, migration and warfare throughout history. "We'd rather find 500 ships than excavate one," says Ballard.

Such a dream seems a long way off as Foley's team packs up its gear at the end of its campaign. Packard and Dennett carefully lower Gudgeon into a crate for its long trip back to Woods Hole, while Foley eyes one of the artefacts he retrieved from Dia's waters — a bulbous Byzantine amphora covered in deposits left by worms.

It's not the find Foley hoped for, but he is undaunted — this is just the beginning of what he knows could be a long search. "I'd like to be doing this every year for the next 20 or 30 years," he says. "Until I'm too old to go to sea." ■

Jo Marchant is author of *Decoding the Heavens: Solving the Mystery of the World's First Computer* (William Heinemann, 2008).

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Divers investigate a first-century-AD wreck near the Greek island of Dia.

B. FOLEY

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