The Yenikapı Project

CONTINUING RESEARCH ON TWO BYZANTINE SHIPWRECKS FROM CONSTANTINOPLE'S THEODOSIAN HARBOR

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Rebecca Ingram has been participating in archaeological research on ships and shipwrecks in Turkey since 2001 under the guidance of Dr. Cemal Pulak. She worked with the Institute of Nautical Archaeology team at the Theodosian Harbor excavations at Yenikapı in Istanbul between 2005 and 2008; she is writing her dissertation on the construction of ship YK11, a seventh-century merchantman found at the site.

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Michael Jones has participated in archaeological projects in Turkey, Spain, Portugal, and Massachusetts. In Turkey, he has worked under Cemal Pulak since 2003 on ships and shipwrecks dating from the Bronze Age to the Ottoman period. Between 2005 and 2008, Michael was part of Dr. Pulak's team at the Yenikapı excavations in Istanbul, assisting in the recovery of eight Byzantine shipwrecks. One of these ships, a merchantman dating to c. 900 C.E., is the topic of his dissertation.

The post-excavation documentation of two Byzantine merchantmen from the Theodosian Harbor excavations at Yenikapı continued throughout 2011 at the Institute of Nautical Archaeology (INA)'s Bodrum Research Center in Bodrum, Turkey. These two ships, YK 11 (c. seventh century C.E.) and YK 14 (c. 900 C.E.), were excavated and dismantled in 2008 and 2007, respectively, at the Yenikapı excavation in Istanbul, Turkey. They are part of a group of eight shipwrecks from the Yenikapı site being studied by a team of archaeologists under the directorship of Dr. Cemal Pulak, associate professor at Texas A&M University and Vice President of INA.[1]

The Theodosian Harbor, perhaps the largest harbor of the ancient city of Constantinople, was discovered near the district of Yenikapı in Istanbul during archaeological salvage excavations preceding the construction of a major transfer station between a new metro line and Istanbul's Marmaray Rail Tunnel, a submerged tunnel which will cross the Bosphorus Strait and connect the European and Asian sides of the city. Due to the sheer volume of archaeological finds, excavation by the Istanbul Archaeological Museums has continued non-stop since 2004, covering more than 58,000 m² of the urban center of Istanbul and yielding tens of thousands of artifacts dating from the Neolithic to late Ottoman periods. The largest collection of material is associated with the city's Theodosian Harbor, built on the southern shore of the Sea of Marmara (Propontis) in the late-fourth century C.E. In addition to harborworks built of stone, concrete, and wood, loose ship timbers, and ship's equipment, 36 Byzantine shipwrecks of fifth- to 11th-century date have been found. The eight shipwrecks being studied by Dr. Pulak and his team date from the seventh to early-11th centuries C.E.

The timbers of shipwrecks YK 11 and YK 14 were transported to INA's Bodrum Research Center in 2008, where the post-excavation documentation of the shipwrecks was begun in the summer of 2009. This detailed documentation of the component pieces of both shipwrecks has been ongoing since June 2010, thanks in part to generous funding from INA. The goal of the 2011 season was to continue this year-round effort to produce an exhaustive record of each timber for a reconstruction and study of the vessels' design and use in antiquity, which will be presented by the authors as Ph.D. dissertations. The dormitory, staff, and laboratory facilities at INA's Bodrum Research Center have been essential for completing a long-term, comprehensive study of these important ship timbers on a relatively modest budget.

The post-excavation documentation of YK 11 and YK 14 follows the methodology established by Fred van Doorninck and J. Richard Steffy in their groundbreaking studies of Byzantine shipwrecks, especially the 11th-century shipwreck found at Serçe Limanı.[2] The documentation includes a written catalog, measurements, photographs, sketches, and 1:1 scale drawings which will be used to create plans and scale models of the surviving sections of the ships' hulls. These data will also serve as the basis for reconstructing parts of the hull and rig which have not survived.[3] In 2011, many of the shipwrecks' several hundred timbers were fully documented; this process was finally completed in the summer of 2012.

Results of the 2011 Research Season

YK 11

Shipwreck YK 11 is a merchantman of seventh-century date (Fig. 1). The ship was found near the harbor's western extremity, the first area to suffer the effects of siltation from sediment deposited in the harbor by the Lycus River (Plate 6—p. 66). The shipwreck was found in a muddy layer full of debris and discarded objects such as broken pottery. Damage to timbers from woodboring shipworms (the *Teredo navalis* or teredo worm) suggests that the upper section of this ship was exposed for a period after sinking, although much of the lower hull was extremely well preserved by the anaerobic mud. Such exposure, combined with the significant repairs present on this hull, indicate that this ship was a worn-out vessel abandoned as a derelict, which slowly sank into a shallow, forgotten corner of the harbor. The ship was originally around 12 m in length and 4 m in beam. It was built primarily of Turkish pine (*Pinus brutia*) with a three-part keel of Turkey Oak (*Quercus cerris*).[4] YK 11 was constructed using a combination of traditional ancient techniques and newer methods developed during the later Roman Empire. The hull was built with thin planks edge-fastened with unpegged mortise-and-tenon joints, similar to the contemporary seventh-century Yassıada ship excavated by INA on the Turkish coast near Bodrum between 1961 and 1964. Also like the seventh-century Yassıada ship, YK 11 was built with mortise-and-tenon joints only to the waterline; above the waterline, pre-erected frames were used to determine the shape of the upper portion of the hull, a shipbuilding technique which had been developed in the Late Roman period.[5] The ship's framing followed an ancient pattern of alternating floors, which spanned the bottom of the hull, and paired half-frames, which curved upward to support the sides of the vessel; this framing pattern had been in use in Mediterranean ship construction for about 1,000 years by the time YK 11 sank.

During 2011, post-excavation documentation of YK 11 focused on the framing of the ship, a task which required eight months to complete. Understanding the YK 11 framing proved to be particularly challenging due to the extensive repairs which had been made over the course of the vessel's lifetime. In addition to the documentation of framing, a large portion of the ship's keel, several stringers, and numerous UM (Unidentified Members, or loose ship timbers found on the wreck site) were documented during the 2011 season (Fig. 2). While some UM timbers are impossible to identify beyond a certain type of timber, the original positions on the ship of some UM timbers—particularly elements of framing—have been identified after thorough study and analysis of fastener patterns and have contributed important details regarding the construction of poorly preserved sections of the vessel.

FIG 1
Seventh-century shipwreck YK 11 prior to dismantling. July 2008 (O. Köyağasıoğlu).

YK 14

YK 14, a medium-sized cargo ship, was uncovered in the central area of the Yenikapı excavation in a stratigraphic layer of gray sand with shell and ceramic inclusions very different from the deposits in the western end of the harbor (Fig. 3, Plate 7—p. 66). The absence of damage from marine borers to nearly all of the surviving hull timbers indicates that it was buried quickly, probably in a storm which deposited a thick layer of sand onto the ship. Although the ship was found without a cargo (which may have been salvaged soon after its sinking), ceramic finds in the same stratigraphic layer as the shipwreck date the loss of the vessel to around 900 C.E. Almost 12 m of the ship was preserved; originally, the vessel was approximately 14 m in length and 4 m in beam. The ship was built primarily of Turkey Oak and Sessile Oak (*Quercus petraea*).[6] Like YK 11, YK 14's lower hull planking was edge-joined, but with regularly-spaced wooden pegs called coaks rather than mortise-and-tenon joints, reflecting a change in Byzantine shipbuilding technology that occurred after the seventh century. The upper part of the hull was built around pre-erected frames to which planks (without coaks) were fastened. Both ships are examples of some of the last stages of the ancient Mediterranean method of planking-first ship construction. By the 11th century, if not earlier, this tradition was supplanted by 'skeleton-first' shipbuilding methods, which have been used in wooden shipbuilding into modern times.

In 2011, the cataloging of the hull planking and keel timbers of YK 14 was completed. Many of the largest planking and keel timbers, which are up to 7 m in length, were removed intact from the wreck site. The documentation of these timbers, which was begun in 2009, was completed at INA's Bodrum Research Center between June and November of 2011 (Fig. 4). YK 14's large timbers are stored in a pair of 27-metric tonne (30-ton) capacity freshwater-filled timber storage tanks, with each large timber in a foam-lined crate. Detachable wooden molds were built to support curved pieces, which can be raised out of the water in the storage tanks for the drawing, photographing, and cataloging of the timbers. The documentation of planking and keel timbers has provided important new details on the construction methods and repair of the ships, as well as the positions of frame timbers which were not preserved. In the colder winter months, the scale drawing and cataloging of the ship's 62 frames was begun in the Hethea Nye Wood Conservation Laboratory. The drawings of these timbers are particularly important for the reconstruction of the hull because the curvature of each frame provides the shape of the ship's hull in a specific area of the ship. Due to the excellent preservation of the ship's frames, these records can be used to produce a highly accurate reconstruction of much of the ship's hull.

Future Plans for the Yenikapı Ships

The cataloging phase of the study of YK 11 and 14 was completed in the summer of 2012; data collected during this phase will form the basis for the authors' dissertations on the analysis and reconstruction of

these well-preserved and historically significant vessels. Results from the study of shipwrecks YK 11 and YK 14, combined with those of other shipwrecks and artifacts from the Yenikapı site, promise to revolutionize our understanding of Byzantine seafaring technology and the role of maritime trade between the imperial capital of Constantinople and other areas of the Mediterranean in the early Middle Ages. Once our study of the shipwrecks is completed, the timbers of YK 11 and 14 will be conserved at INA's Bodrum Research Center in Polyethylene Glycol (PEG), a water-soluble wax used to conserve waterlogged archaeological wood, in a process that will take several years. After conservation, the timbers will be returned to Istanbul, where a planned archaeological museum will be devoted entirely to exhibiting the shipwrecks and artifacts from the Yenikapı site. A museum dedicated mainly to shipwreck finds in Turkey's largest city promises to showcase the wealth of Turkey's incredibly rich maritime heritage and expose the wider public to the methods and results of research in nautical archaeology, a mission begun by George Bass and continued by many other INA researchers over the past 50 years.

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FIG 2
Rebecca Ingram preparing to photograph a UM timber from YK 11 outside the Hethea Nye Wood Conservation Laboratory at INA's Bodrum Research Center. Column drums from the Kızılburun shipwreck are visible in the background. March 2012 (M. Jones).

FIG 3
Late ninth- or early tenth-century shipwreck YK 14 during excavation. April 2007 (M. Jones).

FIG 4
Michael Jones cataloging the main keel timber of YK 14 in the freshwater storage tanks at INA's Bodrum Research Center. September 2011 (R. Ingram).

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Notes

[1] Pulak 2007; Ingram and Jones 2011.

[2] Bass et al. 2004, 73–169.

[3] A more detailed overview of the post-excavation documentation may be found in Ingram and Jones 2011, 11–3.

[4] Wood identification was carried out by Nili Liphschitz of the Institute of Archaeology, The Botanical Laboratories, Tel Aviv University.

[5] Bass and van Doorninck 1982, 55–6.

[6] Liphschitz and Pulak 2009, 168.