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Maritime Archaeology Periodical

TINA TURKISH UNDERWATER ARCHAEOLOGY FOUNDATION

FOUNDATION

Founded by a group of maritime-lover businessmen in 1999.

SCOPE

- To make the international society and scientists familiar with our abundant archaeological cultural heritage in Turkey and its seas. With this idea in mind, to make national and international publications, and organize conferences, panels, seminars, forums, symposiums, workshops, fairs, festivities, exhibitions, and artistic activities such as festivals, excursions and meetings.
- To support local and international scientific institutions, museums, and universities involved in activities of surveys, excavations, conservations and exhibitions under the approval and inspection of the Turkish Ministry of Culture and Tourism.
- To perform underwater surveys and excavations in our seas using scientific methods and current technological facilities under the approval and inspection of the Turkish Ministry of Culture and Tourism.
- To identify the archaeological artifacts lying underwater, reporting their whereabouts to relevant authorities for protection.
- To seek cooperation with the museums and institutions involved in the field and support their activities. To ensure enhancement of such museums and cultural activities, and take necessary steps to provide opportunities for new initiatives.
- To take necessary measures to prevent the pollution of our seas which becomes increasingly harder to fight back, ensure that such measures are taken, and cooperate with other institutions in this sense.
- To contribute to the educational and training institutions dealing with our scopes, and provide scholarships for dedicated students.

EXECUTIVE COMMITTEE

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TINA

Maritime Archaeology Periodical

PRESENTATION

UNRAVELING THE GLOBAL MARITIME HISTORY IS A SERVICE OF UTMOST SIGNIFICANCE FOR THE HISTORY OF HUMANITY

Being surrounded by sea on three sides, Turkey is one the countries that possesses the richest underwater archaeological cultural heritage. It has always been a focus of interest by its archaeological assets, particularly the cultural heritage in the field of underwater archaeology. The most tangible evidence on this interest is the history of underwater archaeological explorations exceeding more than fifty years, and variety and quality of revealed findings. The most ancient underwater archaeological findings, unparallelled artefacts exhibited in museums, and abundant maritime history prove that it is one of the most important centers in the world. Unquestionably, behind this archaeological wealth there are world-renown competent scientists.

TINA (Turkish Foundation for Underwater Archaeology), reaching almost 15 years from the date of its foundation, aims to elucidate the world's maritime history and publicize the scientific studies in this field by publishing the works of scientists from all over the world working in the field of "underwater archaeology".

We hope that continuity and effectiveness of our journal will contribute to the targeted service initiative.

Oğuz Aydemir

TINA Turkish Foundation for Underwater Archaeology
Chairman of the Board

EDITOR

Greetings to everyone from the first issue of TINA Maritime Archaeological Periodical.

An excavation performed at Cape Gelidonya on the southern coast of Turkey 54 years ago helped us better imagine the advancement of humankind throughout the history. Being aware of the fact that it is possible to perform an archaeological excavation under the water similar to the land archaeology, the team carried out excavation of the world's oldest known shipwreck at that time. As of now, archaeologists around the world keep exploring the maritime history both underwater and on land.

Archaeological excavations performed throughout the years revealed Turkey's significant role in the world's maritime history. And in 1999 TINA (Turkish Underwater Archaeological Foundation) was established. The objective is to inform the world society and scientists about the abundant archaeological cultural heritage in Turkey and its seas.

TINA Maritime Archaeological Periodical

TINA Maritime Archaeological Periodical is a periodical which aims to provide scientific contribution through presenting information on the "maritime archaeological activities" performed around the entire world.

Our goal is to create a magazine that discusses the works of maritime archaeologists working at every corner of the globe. Our pages will cover maritime archaeological excavations, scientific projects, news, conferences held in this line of work, university programmes and scientific education in the field as well as the new technologies. Of course, this will become true with you, our colleagues. We invite you to the magazine that will be enriched in coverage with your contributions.

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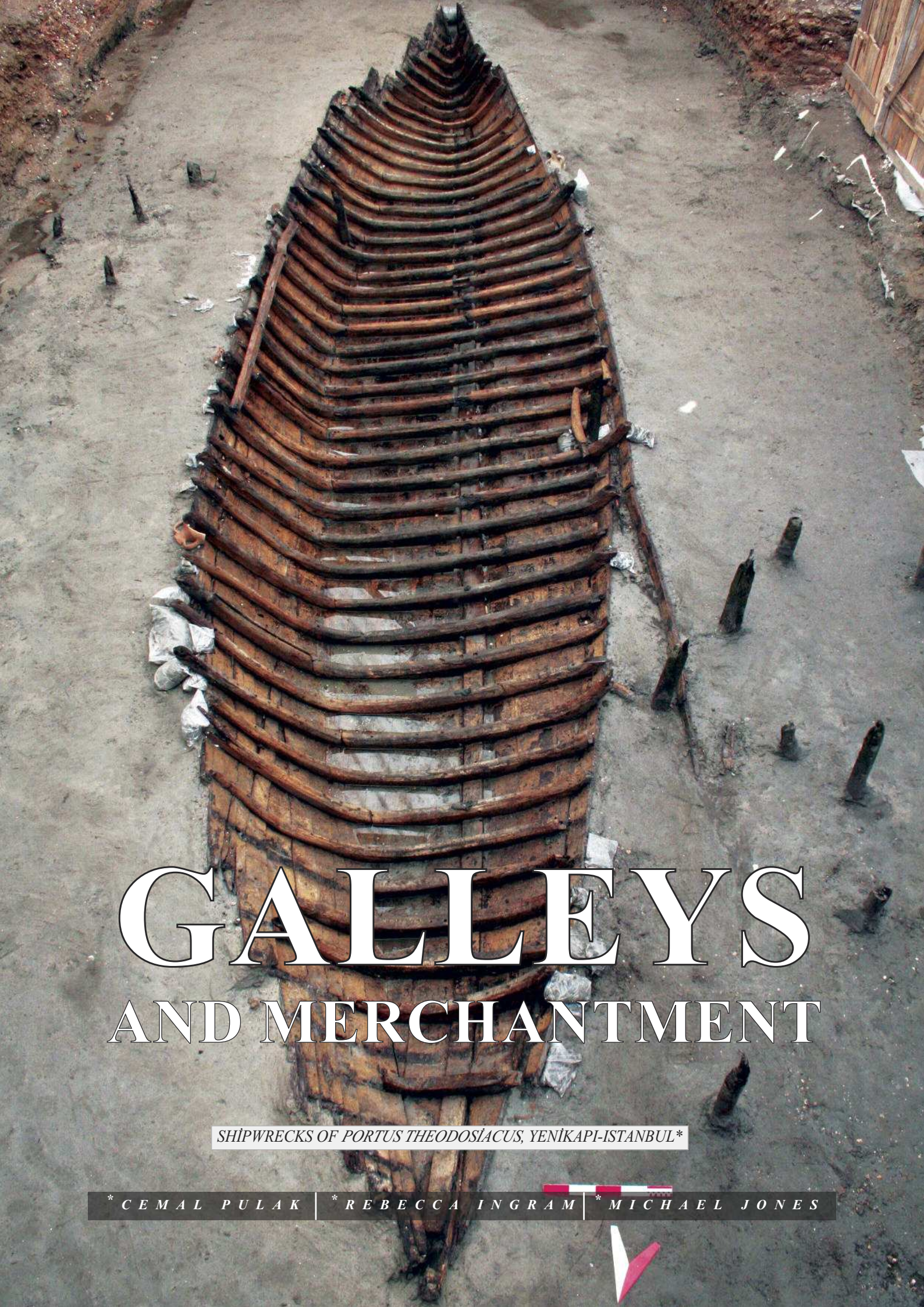
INDEX



GALLEYS AND MERCHANTMENT

*SHİPWRECKS OF PORTUS THEODOSİACUS, YENİKAPI-ISTANBUL**

* CEMAL PULAK | * REBECCA INGRAM | * MICHAEL JONES

Fig. 1: In situ documentation of shipwreck YK 1.

In 2004, construction work began on Istanbulís Marmaray Project, a major development of Turkeyís public transportation system that joins the Asian section of the city to the European part via an immersed-tube tunnel underneath the Bosporus Strait. The associated Metro Project will integrate this new segment of the railway with Istanbulís subway network. One of the primary interchange stations between the two systems will be located at Yenikapı, on the European portion of the new rail line. Istanbul Archaeological Museums initiated their preliminary archaeological excavations at Yenikapı in 2004 in preparation for construction at that site. In 2005, these excavations revealed the remains of a shipwreck (YK 1) ***(Fig. 1)****; thus, after more than 500 years, remains of Constantinopleís once-great harbor were again brought to light.*

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The Theodosian Harbor, *Portus Theodosiacus*, was the largest harbor in the Byzantine capital of Constantinople. This harbor was built during the reign of Theodosius I (A.D. 379-395), probably around A.D. 390, at the site of a natural bay in the cityís 12th district.[1] The Theodosian Harbor is mentioned in the *Notitia urbis Constantinopolitanae*, a list of the cityís monuments, in the 5th century A.D.[2] Over time, silt deposited by the Lykos River (Bayrampaşa Deresi), which flowed into the harbor, began accumulating at the harborís western end and gradually crept eastward, decreasing the usable portion of the harbor over its lifetime. By the 15th century, only a small part of the harbor remained in use, and the area seems to have been filled in completely by the 16th century.[3]

At the invitation of the Istanbul Archaeological Museums, Cemal Pulak, Vice-President of the Institute of Nautical Archaeology (INA) at Texas A&M University, identified shipwreck YK 1 as that of a late 10th- or early 11th-century Byzantine merchantman. Over the following years, excavations at the site uncovered the remains of 36 additional shipwrecks, dating from the 5th to the late 10th or possibly early 11th century A.D. These 37 shipwrecks are significant in that they represent the largest group of early medieval vessels revealed at a single archaeological site. These include small fishing boats, merchantmen of various sizes, and six 10th-century Byzantine galleys, the earliest medieval galleys ever discovered. Many of the ships appear to have sunk in a single catastrophic event around the end of the 10th or beginning of the 11th century, probably in a violent storm or series of storms.

Between July 2005 and December 2008, our team accomplished the in-situ recording, dismantling, and removal of eight of these shipwrecks (merchantmen YK 1, YK 5, YK 11, YK 14, YK 23, and YK 24 and galleys YK 2 and YK4). Post-excavation documentation and conservation on the shipwrecks is currently ongoing. The hull remains of YK 11, YK 14, YK 23, and YK 24 are being conserved in a water-soluble wax known as Polyethylene Glycol (PEG), at the conservation facility of INAís Bodrum Research Center.[4] Once their post-excavation study and conservation have been completed, the shipwrecks will be returned to the Istanbul Archaeological Museums.

*An expanded version of this article appeared in PULAK et al. 2013, 20-34.
[1] MANGO 1986, 121.
[2] MÜLLER - WIENER 1994, 4, 9.
[3] KUNIHOLM – GRIGGS – NEWTON 2007, 383; MÜLLER - WIENER 1994, 4; MAGDALINO 2000, 215.
[4] Four of the shipwrecks studied by Cemal Pulak and the INA team, YK 1, YK 2, YK 4, and YK 5, will be conserved by Ufuk Kocabaş and his team at Istanbul University.

Number	Date	Type	Estimated length	"Primary wood type(s)"	Date of excavation
YK 1	10th century	Merchantman	10 m	*Quercus cerris*	August 2005-January 2006
YK 2	10th century	Galley	30 m	*Pinus nigra, Platanus orientalis*	April-August 2006
YK 4	10th century	Galley	30 m	*Pinus nigra, Platanus orientalis*	September 2006-April 2007
YK 5	10th century	Merchantman	14,5 m	*Quercus cerris*	March-September 2006
YK 11	7th century	Merchantman	11 m	*Pinus brutia*	May 2008-November 2008
YK 14	9th century	Merchantman	14 m	*Quercus cerris*	April-September 2007
YK 23	9th century	Merchantman	15 m	*Quercus cerris*	December 2007-May 2008
YK 24	10th century	Merchantman	8 m	*Quercus cerris*	July-August 2007

Fig 2: Yenikapı shipwrecks studied by the Institute of Nautical Archaeology (INA).

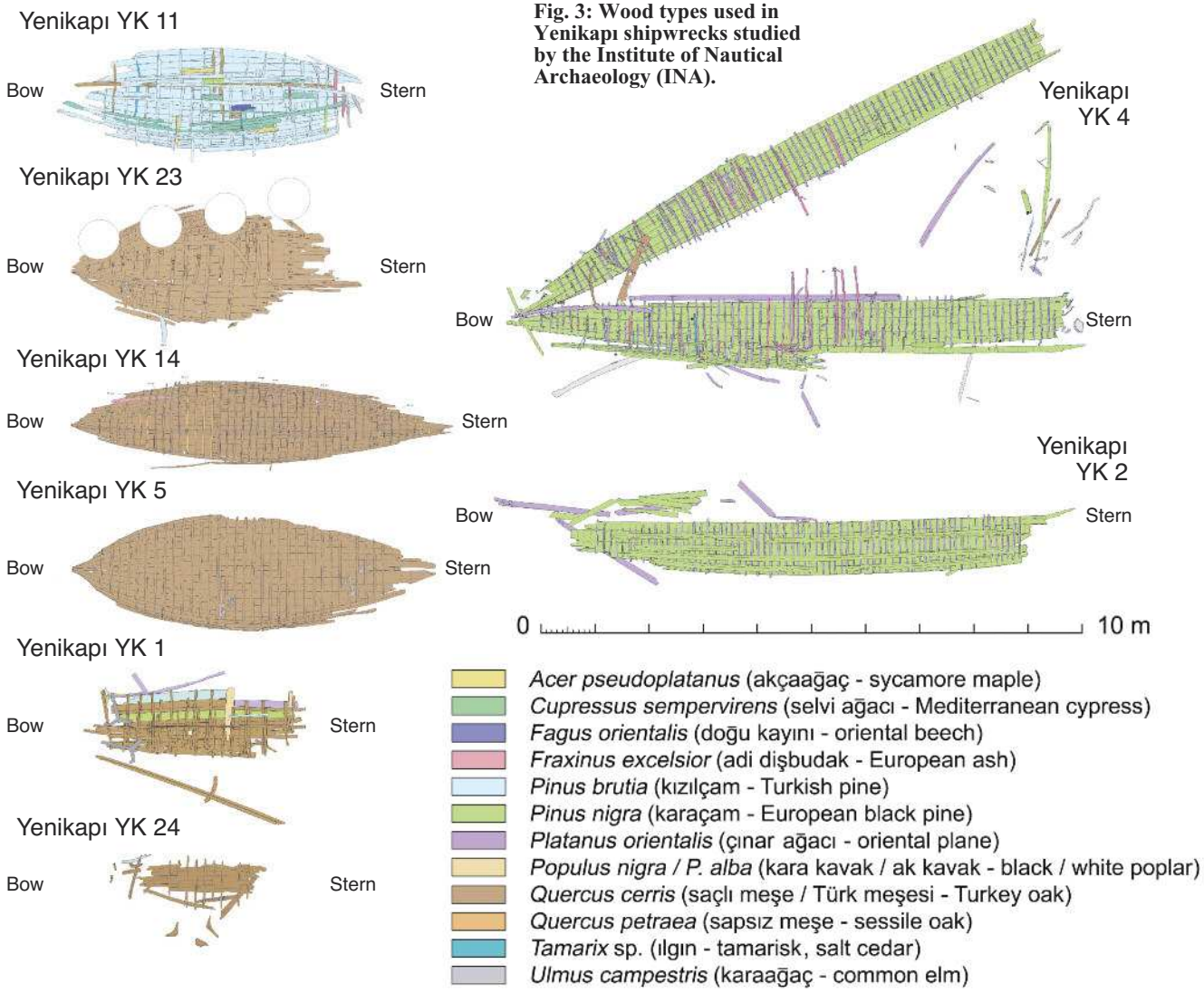

Fig. 3: Wood types used in Yenikapı shipwrecks studied by the Institute of Nautical Archaeology (INA).

THE GALLEYS

The INA team conducted the in-situ documentation, dismantling, and detailed study of two of the siteís six galleys (YK 2, YK 4). **(Fig. 2-3)** These long, slender vessels, the first shipwrecks of this kind from the Byzantine period to be excavated, were previously known only from textual and iconographic sources, both of which are often difficult to interpret. As such, well-preserved galleys such as those at Yenikapı are of fundamental importance and will likely form the basis for much of our understanding of Byzantine naval technology.

Fig. 4: Photomosaic of galley YK 2. Source: Image by R. Piercy.

Based on radiocarbon dating and their stratigraphic location relative to other artifacts uncovered at the site, YK 2 was probably built at the end of the 8th or early in the 9th century and YK 4 at the end of the 9th or early in the 10th century, and both ships sank in the 10th century.

These ships would originally have been approximately 30 m in length and 4 m in breadth. They were built with an emphasis on flexibility and speed, as would be expected of a naval galley. Based on their size, form, and construction, they were likely what the Byzantines referred to as *galeai*, which were light war galleys with a single bank of oars. Such sleek ships would have been used for scouting, speedy communication, and light naval warfare.

The lesser-preserved galley, YK 2, consisted of the port half of the shipís bottom, up to just beyond the turn of the bilge, for a length of 14.5 m. **(Fig. 4)** The study of the extant timbers showed that this ship, lacking any major repairs, was reasonably new when it sank in the 10th century, probably in a violent storm. Analysis by Nili Liphschitz of Tel Aviv University indicates that the outer shell of YK 2 was built of long, wide, flexible planks of European black pine (*Pinus nigra*).[5] Most (about 80%) of the shipís extant frames were of oriental plane (*Platanus orientalis*), a light wood; the remaining frames were of common elm (*Ulmus campestris*). The YK 2 frames were attached to the planking with a combination of treenails and iron nails. The planks were edge-fastened to one another with widely-spaced wooden dowels called coaks. Both the treenails and the coaks were of Turkey oak (*Quercus cerris*). Flat stringers of European black pine (*Pinus nigra*), placed over the frames, also provided some internal support to this galley.

[5] LIPHSCHITZ — PULAK 2009, 168-169.

Fig. 5: Sider strakes of galley YK 4, showing oarport strake.

YK 4 is the most extensively preserved galley at Yenikapı. It had split into two sides along its keel and was preserved for a length of 18 m, up to the turn of the bilge on the starboard side and up to the level of the oarport strake on the port side; much of the shipís bow was also preserved. Although only a relatively small portion of the oarport strake survived, it is significant in that it was the only *in-situ* oarport strake found on a galley at Yenikapı; this piece is thus of great significance, as it reveals the spacing of rowers (positioned 94.5 cm or approximately 3 Byzantine feet apart) relative to a specific location in the shipís hull. The location of the rowersí benches is also indicated by notches in the lowest wale of YK 4, thus revealing the vertical distance and offset between bench and oarport. **(Fig. 5)** In addition, staining and small fastener holes identified on the outer face of the oarport strake constitute the first archaeological evidence of the use of leather sleeves placed outboard of the oarports; these sleeves through which the oars were passed prevented water from entering the hull through the oarports. **(Fig. 6)** In addition to having rowers sitting along the full length of the ship, most likely 25 rowers per side, Byzantine texts indicate that such ships could also be sailed; YK 2 and YK 4 thus would have been equipped with a single mast fitted with a large lateen sail, although no direct evidence thereof was preserved.

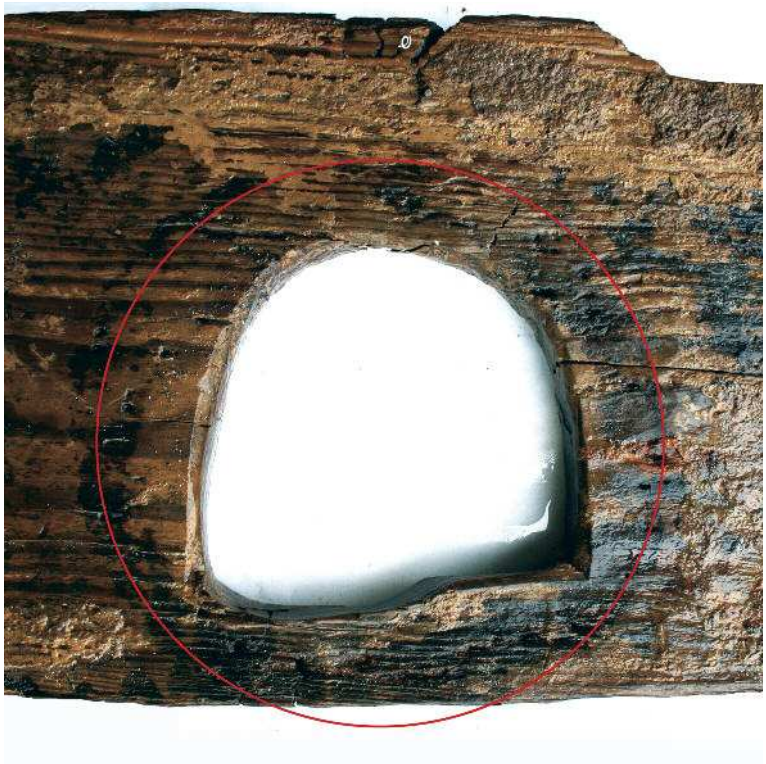

Fig. 6: Outer face of YK 4 oarport strake, showing staining and fastener holes from attachment of leather sleeves.

The hull of YK 4, like that of YK 2, was built of long, wide strakes of planking and wales of European black pine (*Pinus nigra*).[6] While most frames (about 85%) were of oriental plane (*Platanus orientalis*), several other wood types were represented, including common ash (*Fraxinus excelsior*), sycamore maple (*Acer pseudoplatanus*), Turkey oak (*Quercus cerris*), tamarisk (*Tamarix* [X5]), and European black pine (*Pinus nigra*). YK 4 was an aging hull when it sank, as evidenced by a number of frames added to the ship around amidships and toward the bow; these frames were inserted between existing frame locations, thereby doubling up the framing and providing essential reinforcement to these key areas. These later additions to the shipís framing are of woods other than oriental plane (*Platanus orientalis*). As on YK 2, the YK 4 framing was attached with a combination of treenails and iron nails, with planks edge-fastened to one another with widely-spaced coaks; both treenails and coaks were primarily of Turkey oak (*Quercus cerris*). The YK 4 keel and stemson were of oriental plane (*Platanus orientalis*), a lightweight hardwood.

In summary, both YK 2 and YK 4 were designed to be light and sleek, yet durable hulls. The use of long and wide planks that could be readily obtained from European black pine (*Pinus nigra*) minimized the number of joints or scarfs[7] in the planking, which would be a point of weakness in a long, narrow, flexible hull. The coaks and treenails used in fastening timbers together were furthermore made primarily of young and, therefore, flexible branches of Turkey oak (*Quercus cerris*). This provided additional flexibility to a hull that was designed to bend and flex in the water. Oriental plane (*Platanus orientalis*), not usually seen in the merchant vessels at Yenikapı, is a hardwood that is lighter than oak. Framing and other elements of the galleys fashioned from this wood thus contributed reasonable strength to the hull without excessive weight.

The INA team worked with merchantmen representing a chronological progression from the early 7th to the late 10th century.

THE MERCHANTMEN

In contrast to the light, sleek, flexible galleys, most of the merchantmen at Yenikapı were built primarily of large and heavy frames of solid oak, resulting in sturdy, broad vessels that could carry heavier loads (relative to their size) and withstand more regular and sustained use. Of the six merchant vessels studied by the INA group at Yenikapı, five were built primarily of Turkey oak (*Quercus cerris*): YK 1, YK 5, YK 14, YK 23, and YK 24. The sixth ship, YK 11, the earliest Yenikapı ship studied by the INA group, was instead built primarily of Turkish pine (*Pinus brutia*). The merchantmen found at Yenikapı date from the 5th to the 11th centuries A.D., a period during which a profound change was occurring in Mediterranean shipbuilding. Shipbuilding in the Mediterranean developed from a shell-based approach to a skeleton-based approach between the 4th and 11th centuries A.D., the approximate period represented by the finds at Yenikapı. This transition remains to be fully understood, however, and there is debate on the earliest date at which skeleton-based shipbuilding developed: Researchers in Israel contend that it may have emerged as early as the 6th century A.D., based on finds at Tantura Lagoon.[8] Due to the significance of this period in the study of shipbuilding in the Mediterranean, the finds from Yenikapı are particularly valuable: The opportunity to fully excavate, dismantle, record, and study these ships in detail has the potential to unlock vital clues to the nature and timing of this transition.

The INA team worked with merchantmen representing a chronological progression from the early 7th to the late 10th century. Based on its construction and the surrounding stratigraphy, as well as radiocarbon dating, the earliest ship, YK 11, dates to the early 7th century.

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[6] LIPHSCHITZ — PULAK 2009, 169.
[7] A scarf is an overlapping joint used to connect two timbers or planks without increasing their dimensions. STEFFY 1994, 279, figs. G-11a-11b on 291-92.
[8] KAHANOV – ROYAL – HALL 2004, 113-126; POMEY – KAHANOV – RIETH 2012, 237, 291-308.

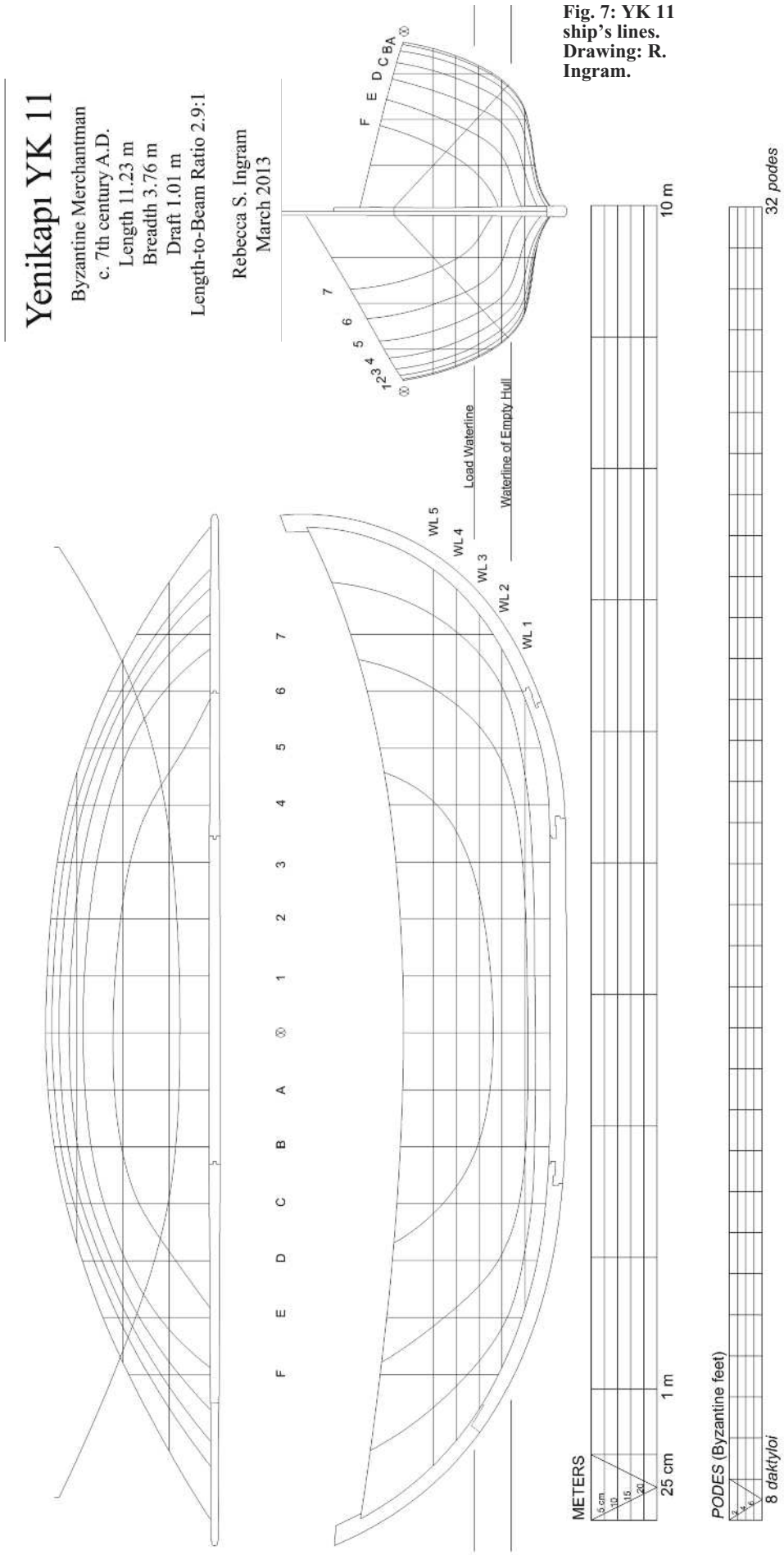

Fig. 7: YK 11 ship's lines. Drawing: R. Ingram.

YK 11 was excavated and dismantled in 2008, and documented in detail between 2009 and 2012.[9] Unlike most other later merchantmen at Yenikapı, YK 11 was built primarily of Turkish pine (*Pinus brutia*), with a keel of Turkey oak (*Quercus cerris*). The ship is approximately 11.25 m in length and 3.75 m in breadth, with a length-to-breadth ratio of 2.9:1. This is a typical ratio for such an efficient merchantmen. **(Fig. 7)** As on the 7th-century Yassıada ship, the planking of YK 11 was edge-joined with small, unpegged mortise-and-tenon joints below the waterline; above the waterline, the shipwright followed skeleton-first techniques, attaching planking directly to pre-erected frames. Detailed study has revealed that this ship had undergone several major overhauls during its lifetime, including the replacement of framing as well as planking.

[9] INGRAM - JONES 2011, 13-14.

Shipwreck YK 23, found near the center of the Yenikapı excavation site, was likely built early in the 9th-century, based on its construction details as well as coins found in association with the ship **(Fig. 8)**. YK 23 was probably 15 m in length and 5 m in breadth. Unlike YK 11, YK 23 was built primarily of Turkey oak (*Quercus cerris*), and planks of the ship were edge-joined with coaks rather than mortise-and-tenon joints. Although not as heavily repaired as YK 11, YK 23 had evidence of several repairs, revealing a long service life. YK 23 is noteworthy for its heavy construction; the massive frames, thick planks, and substantial keelóapproximately 30 cm in thicknessóindicate a strong, sturdy vessel.

YK 14, in contrast to YK 23, was a more lightly-built, sleek cargo vessel. **(Fig. 9)** Based on dendochronological and radiocarbon analyses, this ship can most likely be dated to the first half of the 9th century. After excavation and *in-situ* documentation in the spring and summer of 2007, detailed post-excavation recording of the hull timbers were carried out between 2009 and 2012.[10] Based on its excellent preservation and a near-absence of shipworm damage, it is likely that YK 14 sank and was buried quickly, probably the result of a storm. Built primarily of Turkey oak (*Quercus cerris*) and sessile oak (*Quercus petraea*), the ship was originally approximately 14.65 m in length and 3.4 m in breadth, with a length-to-breadth ratio of 4.2:1.[11] Unlike most other merchantmen at Yenikapı, YK 14 boasts a slender, graceful design; the reason for this design is unclear, but perhaps this hull was constructed for speed as well as for use in shallow coastal waters and rivers.

[10] JONES (in press), INGRAM —JONES 2011, 13-14.
[11] LIPHSCHITZ — PULAK 2009, 168.

Fig. 8: Concrete pillars through side of shipwreck YK 23.

The presence of multiple repairs suggests it had been in use for an extended period when it sank. YK 14, like YK 23, was built with oak planks that were edge-joined to one another with closely-spaced coaks below the waterline. However, the framing pattern reflects an innovation: instead of alternating floors and paired half-frames, YK 14 was built with flat, L-shaped floor timbers whose long arm alternated in orientation with each successive frame. This configuration allowed the positioning of floor-futtock joints to alternate between the frames, thereby avoiding potential points of weakness in the hull. This framing pattern,[12] similar to that used in the late 9th-century Bozburun ship and 11th-century Serçe Limanı ship, also allowed for more standardized and easily fabricated frames.

The least preserved of the Yenikapı merchantmen built during the 10th century and studied by INA, YK 24, was also the smallest, only 8 m in length and 2.5 m in breadth. Based on its size, this was probably a small cargo vessel or fishing boat intended for local use. **(Fig. 10)** This ship was built of Turkey oak (*Quercus cerris*), with flat, L-shaped floor timbers and planks edge-joined with coaks. Numerous repairs to the planking and keel of this ship indicate a somewhat dilapidated, aging hull that had seen many years of service.

[12] HARPSTER 2009, 301-310; BASS vd. 2004, 93.

Fig. 9: Measuring YK 14 with Total Station.

Fig. 10: Shipwreck YK 24 during *in situ* documentation.

Much better preserved, YK 5 comprises the bottom and much of the port side of the ship, and is approximately 14.5 m in length and 5 m in breadth, with a length-to-breadth ratio of 2.9:1. This 10th-century merchantman was built entirely of Turkey oak (*Quercus cerris*). Based on its near-pristine condition and a lack of repairs, YK 5 was probably new when it collided with galley YK 4 and sank, probably during a violent storm; the hull of YK 5 was found resting atop galley YK 4 toward the eastern end of the excavation site. **(Fig. 11)** YK 5 was built with flat, L-shaped floors. This was preferred for producing a wider and more flat-bottomed hull shape, likely in an effort to maximize cargo capacity. YK 5 planks were edge-joined with widely-spaced coaks below the waterline.

Of the 31 merchant vessels recovered at Yenikapı, only three were found with much of their cargo still present. One of these, YK 1, was the first shipwreck discovered at the site. The area above and around the wreck was covered with dozens of Ganos-class wine amphoras, many of which survived intact. The remains indicate that the ship engaged in regional trade in the Sea of Marmara in the late 10th and early 11th centuries[13]. The presence of cargo as well as two iron, Y-shaped anchors at the shipís bow strongly suggest that the ship sank during a storm and was quickly covered with a thick layer of sand, thus protecting the valuable iron anchors from the notice of salvors. **(Fig. 12)** The intact YK 1 anchors are one of the only three sets of anchors found in association with any of the shipwrecks excavated at the site.

[13] GÜNSENİN 2009, 147.

Fig. 11: Shipwreck YK 5 during in situ documentation.

Of the 31 merchant vessels recovered at Yenikapı, only three were found with much of their cargo still present. One of these, YK 1, was the first shipwreck discovered at the site. The area above and around the wreck was covered with dozens of Ganos-class wine amphoras, many of which survived intact. The remains indicate that the ship engaged in regional trade in the Sea of Marmara in the late 10th and early 11th centuries[13].

Fig. 12: One of two iron anchors found on shipwreck YK 1.

A noteworthy aspect of YK 1 is that the starboard side of the ship was preserved, from the turn of the bilge up to, and including, the shipís caprail. **(Fig. 1)** The ship was built of Turkey oak (*Quercus cerris*). It would have been approximately 10 m in length and 3.5 m in breadth, resulting in a length-to-breadth ratio of 2.9:1[14]. It was initially built with techniques identical to those used in the construction of YK 14, YK 24, and YK 5, although the keel of YK 1 was slightly curved or ìrockeredî, which would have resulted in a more rounded hull. **(Fig. 13)** Similar to the planking of many of the other merchantmen, the YK 1 planking was edge-joined with closely-spaced coaks below the waterline. Above the waterline, the side of the ship was strengthened longitudinally with four, half-log wales. At some point during its lifetime, the ship was subjected to a major overhaul, in which the sides were raised by about 60 cm to increase the vesselís freeboard. During the overhaul, 12 secondary futtocks were inserted between the shipís 16 existing futtocks, providing a framework supporting the newly-added strakes and caprail[15].

In overview, these six Yenikapı merchantmen reflect a gradual progression in the transition from shell-based to skeleton-based shipbuilding that occurred in the second half of the first millennium. All of these merchantmen were built with edge-fastened planking below the waterline, primarily with shell-based techniques, while the ship was built primarily according to skeleton-first techniques above the waterline, with planking attached to pre-assembled framing. This mix of shell-based and skeleton-first techniques is typical of transitional shipbuilding of this period.

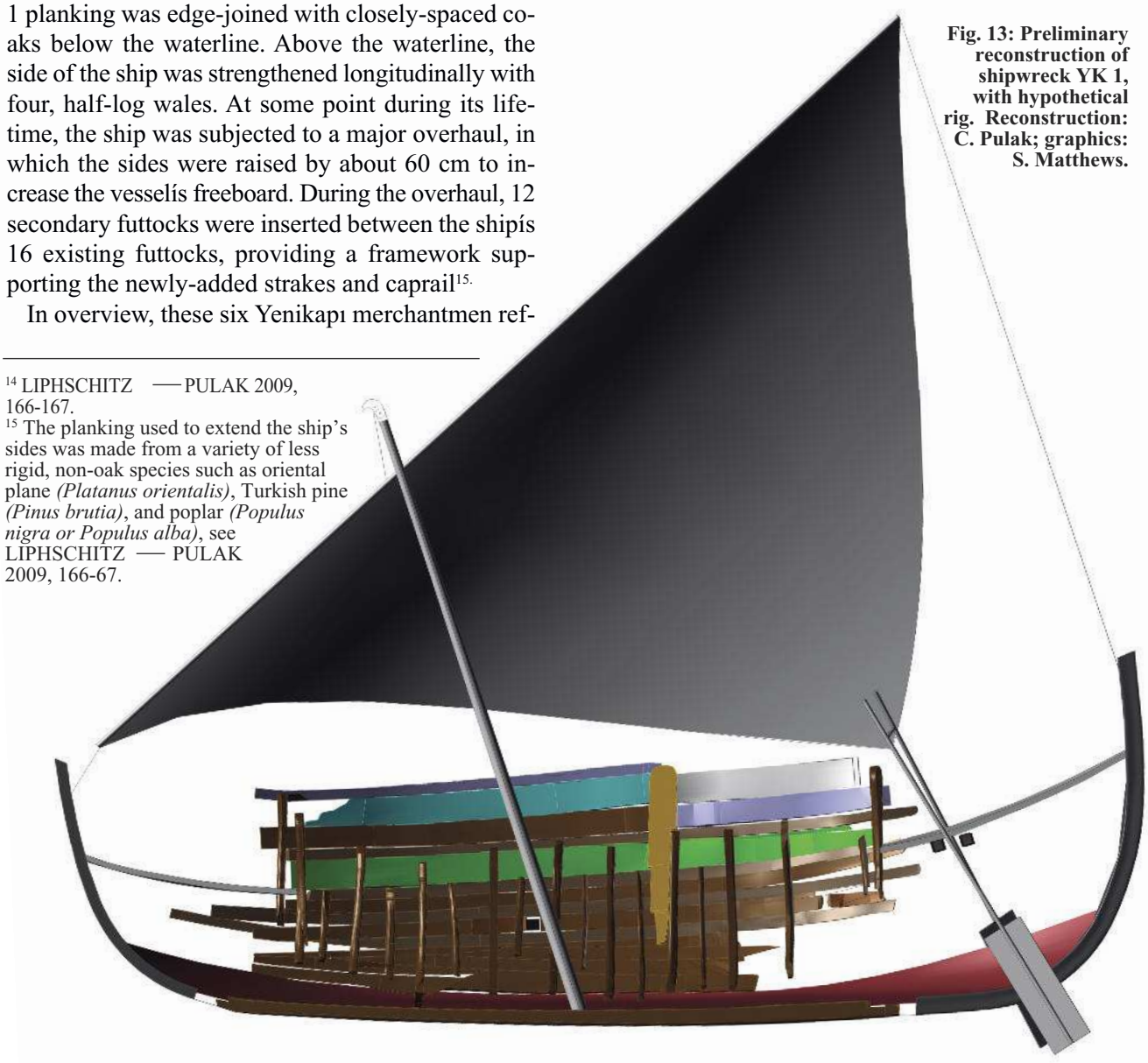

Fig. 13: Preliminary reconstruction of shipwreck YK 1, with hypothetical rig. Reconstruction: C. Pulak; graphics: S. Matthews.

[14] LIPHSCHITZ — PULAK 2009, 166-167.

[15] The planking used to extend the ship's sides was made from a variety of less rigid, non-oak species such as oriental plane *(Platanus orientalis)*, Turkish pine *(Pinus brutia)*, and poplar *(Populus nigra or Populus alba)*, see LIPHSCHITZ — PULAK 2009, 166-67.

CONCLUSIONS

The Yenikapı shipwrecks are the first direct archaeological evidence for ships associated with the trade, economy, and defense of the Byzantine capital. Although Byzantine-period ships have been excavated elsewhere in the Mediterranean, no other site has provided so many well-preserved vessels from this period. Understanding the transition from shell-based to skeleton-based shipbuilding has been particularly problematic due to the relative lack of well-preserved, fully excavated shipwrecks available for study and comparison. The Yenikapı shipwrecks promise to add a significant body of new information toward elucidating this complex process, due both to the large number and varied types of ships discovered at the site and to their exceptional state of preservation. Preliminary research indicates that the long, sleek galleys, built primarily of wide and long planks of flexible pine, were specifically designed to result in flexible, fast and highly maneuverable vessels. The merchantmen at Yenikapı, in contrast, were usually built of oak; based on their design, shipwrights strove to create a strong, sturdy vessel that maximized cargo capacity. Altogether, these ships show that the development of Mediterranean shipbuilding in late antiquity was a more complex process than previously thought. Byzantine shipwrights seem to have been adapting to the often harsh economic circumstances and political conditions of their times by retaining some aspects of older technology and traditions while experimenting with or modifying others. As post-excavation research continues on these vessels from Yenikapı, nautical archaeologists will be better able to understand how and why these changes took place.

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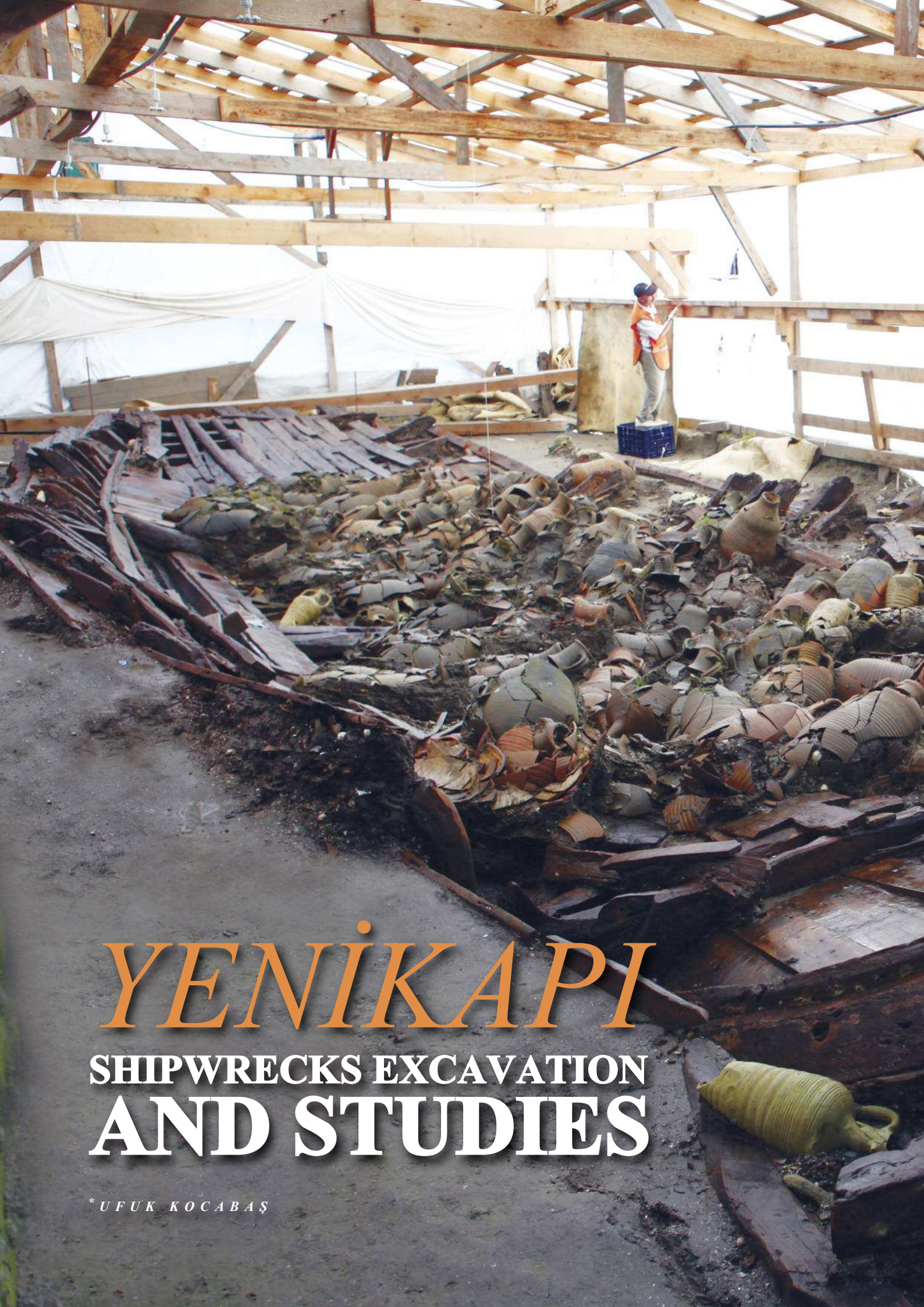

YENİKAPI

SHIPWRECKS EXCAVATION AND STUDIES

*UFUK KOCABAŞ

SUMMARY

Thirty seven shipwrecks dated to Byzantine Period have been discovered in the district of Yenikapı, Istanbul. They were found by the Istanbul Archaeological Museums during a rescue excavation that started in 2004. Considered the largest medieval shipwreck collection in the world, these wrecks have survived due to the sedimentation of the Theodosian Harbour caused by the Lykos Stream. The wrecks provide us with invaluable information on Byzantine period ship typology, shipbuilding technologies, and their constructional evolution.

THEODOSIAN HARBOUR: DISCOVERY, EXCAVATION AND HISTORY

Considered one of the most important cities of the Mediterranean world since its re-foundation as the capital of the Roman Empire in the fourth century AD, Istanbul has been the capital city of three great world empires, and the grandest city of the Republic of Turkey. Istanbul has been the stage for the coexistence and clashes of the occidental and oriental civilisations and different cultures. In the long course of its history, Istanbul has grown beyond the Theodosian walls into a cosmopolitan and gigantic city of 15 million inhabitants. As the old city transformed into a metropolis, one of the biggest problems became transportation. Before the start of construction at ‹sk¸dar, Sirkeci, Sultanahmet and Yenikapı for the Metro and Marmaray projects, designed to resolve many transportation problems, the Directorate of Istanbul Archaeological Museums launched archaeological excavations at these sites .

In the course of these excavations, the most extensive archaeological excavations in the history of Istanbul, the largest medieval harbour of the city has been uncovered at Yenikapı, where a central station will be built **(Fig. 1)**. Known as Portus Theodosiacus (i.e. the Theodosian Harbour) in the written sources, the site has presented us with discoveries deserving of a capital cityís harbour and beyond, with priceless artifacts related with seafaring, trade, and ships of the Byzantine period.

Fig. 1. A view from excavation; one of the stone docks on the front, a shipwreck tent at the back.

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The excavations confirmed that the harbour was established in this former cove, and then silted in by the *Lykos* (Bayrampaşa) stream transposing the site to about 300 m from todayís shoreline. Approximately 50 archaeologists and 600 workers had been working on the archaeological salvage excavations at Yenikapı covering a construction area of 58.000 m^2. Istanbul Archaeology Museum has also been collaborating with several national and international universities and institutes which provide scientific support through various disciplines such as nautical archaeology, conservation, osteo-archaeology, archaeo-botany, geology, philology, dendrochronology, prehistory, and anthropology.

As expected. the excavations first revealed Ottoman remains. The area between todayís Mustafa Kemal and Namık Kemal Avenues has been known as *Langa Bostanı* (*Langa* vegetable and fruit gardens) since Ottoman period **(Fig. 2)**. *The Langa or Vlanga* was a neighbourhood where the non-Muslim Ottoman population, mostly made up of Jewish families, lived[1]. As the excavations progressed archaeologists uncovered profound Byzantine material beneath the Ottoman remains. Soon after, the site was understood to be the Theodosius Harbour previously known from the literary sources. Named after Byzantine emperor Theodosius I, the harbour was established at the mouth of Lykos stream which includes Zone XII of the city **(Fig. 3).** Although there are doubts regarding the harboursí precise location due to an earlier harbour at the same area, it is commonly accepted that the earlier Eleutherios Harbour, which dates to Konstantin I period (272-337) the precursor to the Theodosius harbour. Petrus Gyllius agrees that the Theodosian Harbour was established at the same location that the Eleutherios Harbour was previously located[2]. Excavations by Istanbul Archaeology Museum supports this idea on the basis of earlier remains and artefacts uncovered at the west end of the site[3].

[1] KÖMÜRCİYAN 1988, 3; İNCİCYAN 1976, 4-5.
[2] GYLLIUS, IV.
[3] ASAL 2007.

Fig. 2. Map of Constantinople and The Harbour of Theodosius that was drawn by a geographer from Florence; Christopher Buondelmonte 14th-15th century.

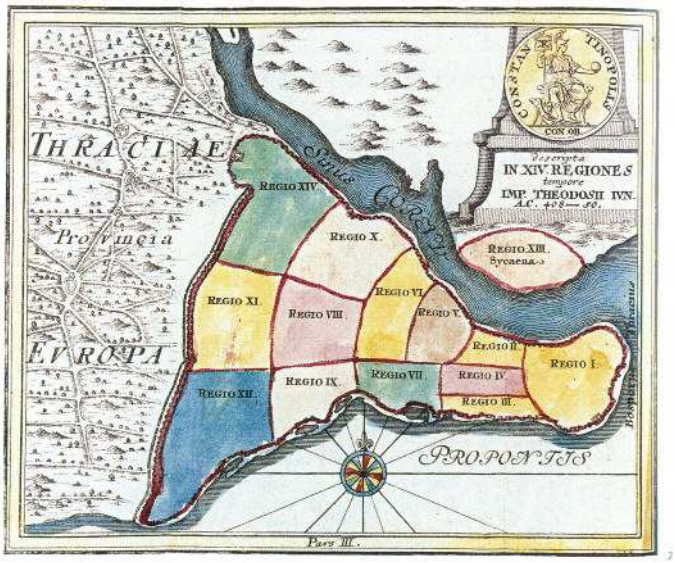


Fig. 3. Map of Constantinople in the era of Theodosius the first that is separated to 14 regions.

Fig. 4. Cleaning and documentation work on largest cargo ship of the excavation site; YK22.

The most telling remain here is a 51 m-long and 4.20 m-wide wall built with ashlar blocks and khurasan mortar. Another diagnostic feature is an exposed 11 m long vaulted structure. Furthermore, breakwater and quay stones exist with two parallel rows of wooden pilings extending 43 m in front of the quay belonged to a pier[4].

According to the textual evidence; the presence of two granaries on the east of harbour; *Horrea Alexandrina and Horrea Theodosiana* indicate this was a commercial harbour, receiving ships loaded with mass cargoes of grain from Alexandria. It is known that the grain trade was active until the Arabic conquest of Egypt on AD 641. Grain ships from Egypt were sailing directly to Constantinople until the reign of ?ustinianos. Due to strong seasonal wind and currents in the Dardanelles strait, the ships had to wait for the safer weather conditions. In order to avoid such delays, granaries were built at Tenedos Island by the emperor ?ustinianos. Thus bigger ships unloaded their cargoes without waiting in the Dardanelles strait while smaller ships were shuttling between Tenedos and the capital. In addition to the grain trade, construction materials such as marble from Proconnesos, tiles, bricks, timbers, and other food supplies were brought to the Theodosian harbour to meet the growing demands of Constantinople[5].

YENİKAPI SHIPWRECKS

37 shipwreck have been uncovered at Yenikapı site. These represent the largest medieval shipwreck collection ever found in a single site. Besides the Yenikapı shipwrecks have survived well as they were buried in the silt brought by the Lycus Stream. The Istanbul Archaeological Museums turned to Istanbul Universityís Department of Conservation of Marine Archaeological Objects to handle the conservation and fieldwork of most of the shipwrecks[6]. Departmentís director Dr. Ufuk Kocabaş and his team of departmentís staff, full time specialists and Istanbul Universityís graduate students have been working for more than seven years at the Yenikapı excavation site to document and raise the shipwrecks **(Fig. 4-5)**.

[4] KIZLTAN 2010; GÖKÇAY 2007.
[5] MÜLLER-WIENER 1998, 18.
[6] The fieldwork of the eight of the Yenikapı shipwrecks were carried out by a team of Texas A&M University led by Dr. Cemal Pulak.

The information on the origins of the shipwrecks is limited. With a goal of ascertaining the geographical regions in which the ships were built, approximately 2800 samples were taken from the ship timbers and analysed at Istanbul Universityís Forestry Faculty by Prof. Dr. Ünal Akkemik[7]. Akkemik reports that most of the ship timbers are of oak, pine, chestnut, and ash trees, all of which are common in the western and northern Anatolian region. The wide distribution of these species throughout the Mediterranean region prevents more precise suggestions for the home ports of the Yenikapı ships.

For the accurate dating of the ships ^{14}C analyses were performed by Oxford Universityís Radiocarbon Acceleration Unit (ORAU). In addition dendrochronological analyses have also been planned for greater dating precision.

[7] AKKEMİK 2008, 201-212.

Fig. 5. Cargo of YK12 shipwreck that consist of amphorae and personal belongings.

Fig. 6. A detail from Total Station work that provides 3D field drawings.

Fig. 7. Parts of the shipwrecks were dismantled and placed in special wooden cases, meanwhile hand drawings in progress.

EXCAVATION, IN SITU DOCUMENTATİON AND LIFTING

The excavation of a shipwreck at the Yenikapı site began with setting up a temporary tent over the wreckage in order to protect waterlogged ship timbers from the drying and damaging effects of direct sunlight. A secondary measure taken for to avoid drying of the waterlogged wood was to install a sprinkler system for round-the-clock misting of the timbers. After carefully removing any sediment from fragile timbers with water and hand-tools, a standard procedure consisting of *in situ* documentation, plan and section drawings, 3d modelling, 1:1 scale acetate drawings, photomosaic micro-site construction, video recording and cataloguing are applied[8] **(Fig. 6)**

After detailed documentation labelled timbers forming the hull structure such as frames, planks, keel, stem or sternposts are gently disassembled **(Fig. 7)**.

[8] ÖZSAİT-KOCABAŞ 2010a; ÖZSAİT-KOCABAŞ 2008, 37-72.

Fig. 8. Planks were placed on the "L" shaped carriers to avoid loss of any part of woods and original curved shape.

Fig. 9. Istanbul University Yenikapı Shipwrecks Project Laboratory near excavation site and preservation pools for the shipwrecks.

Fig. 10. Locating of nails and labelling.

Specially designed mould-like carriers are used to dismantle plank strakes in order to maintain the original angle of hull curvature **(Fig. 8)** Disassembled timbers are placed in separate wooden boxes and transferred to fresh water tanks for the desalination process.

Conservation and reconstruction procedures of the shipwrecks have been carried out at Istanbul Universityís Ship Conservation and Reconstruction Laboratory and the on-site ìIU Yenikapı Shipwrecks Research Centreî **(Fig. 9)** founded with the support of ìIstanbul Metropolitan Municipalityî and ìIstanbul Universityís Scientific Research Projects Unitî[9].

POST EXCAVATION DOCUMENTATION

The first stage of reconstruction work aims to gain a better understanding of the construction techniques of each ship. It is unfortunate that neither detailed description regarding the medieval shipbuilding nor any sketch or plan of a medieval ship exists among the historical sources.

The present information on nautical life of the period is limited to a small number of iconographic examples and literary sources vaguely referring to some of the ship types. The lack of sufficient historical evidence dictates a need for detailed examination of each shipwreck.

Therefore digital reconstructions showing the possible original hull and rigging have been made on the basis of the careful examination of surviving remains **(Fig. 10)**. Using digital reconstructions, the original dimensions of a shipwreck, such as draught, overall length, length at the waterline, breadth, depth, etc. may be estimated with some certainty.

[9] KOCABAŞ — ÖZSAİT-KOCABAŞ — KILIÇ 2012.

Fig. 11. A digitizer called Faro Arm provides 3D drawings of the shipwrecks.

Detailed recording of the surviving ship timbers are made with a 3-D digitizer called, *FaroArm* are made. This technology has been used in the field of archaeology for the first time in Turkey by Istanbul Universityís Project team **(Fig. 11)**. Ascertainable details of each timber, such as fastenings, joints, angles, tool marks, corrosion stains, etc. are all recorded using the laser scanner. Each digitized timber can then be used to create 3-D images of ship timbers[10].

GENERAL CHARACTERİSTİCS OF THE YENİKAPI SHİPWRECKS

The Yenikapı shipwrecks provide us with invaluable information on shipbuilding technologies and shipbuilding evolution over time. The ongoing research of shipbuilding experts from Istanbul University reveal a broad range of shipbuilding techniques from traditional shell-based approaches to skeleton-based approaches as well as a mixed construction technique of the transitional period combining both approaches. Research has shown that the planks of some shipís hulls were edge-joined with coaks, while planks of other ships show characteristics of the transitional period, locked in place with wooden pegs. In a third group of ships, probably of skeleton-based construction, no evidence of edge-fasteners were found in the joining of the planking. Use of diverse construction techniques in some ships dating from the same period suggests the presence of local differences and a non-linear progression of approaches[11]. Progress in scientific research on the Yenikapı shipwrecks will certainly contribute to discussions of shipbuilding processes, revealing many technical details that have been previously unknown.

[10] ÖZSAİT-KOCABAŞ 2011a.
[11] ÖZSAİT-KOCABAŞ 2011a.

Fig. 12. In situ position of YK12 with her cargo which is exceptional.

According to the initial results, in shipwrecks YK 34 and YK 35 the planks of the hull were fastened with wooden dowels using locking pins whereas in YK 22 the planks were fastened without using any locking pins.

In the excavation area of Yenikapı, a majority of the shipwrecks are those which were edge-fastened using dowels. Shipwrecks YK 3, YK 6, YK 7, YK 8, YK 9, YK 12, YK 13, YK 15, YK 16, YK 18 and YK 20 are considered to have been built using mixed construction techniques of the transitional period.

The excavations have also yielded three shipwrecks without any edge fastenings between planks. There is evidence that shipwrecks YK 17, YK 27 and YK 29 were built using the skeleton-based construction techniques.

CARGO SHIPS

According to the preliminary evaluations, Yenikapı shipwrecks can be divided in two groups. The first group is represented by cargo ships in various dimensions dating from the fifth to the tenth centuries. These ships have flat bottom sections and rounded hulls and likely carried one sail, probably a lateen rig, placed near the bow. On the basis of their relatively small sizes most of the ships would have been used over short distances. It is possible that some ships would have functioned as fishing vessels

Fig. 13. Cleaning work on YK34. Remaining pillars of a pier has been paled on the shipwreck.

At least four of the cargo ships were found with the cargoes intact **(Fig. 12-13)**. The reason for the sinking of these four ships remains unclear. The rest of the ships were found without cargoes, anchors, or rigging equipment and were probably abandoned in the harbour after a long period of service[12].

GALLEYS

Six galleys or oared vessels constitute the second group of Yenikapı shipwrecks. There were no original examples of this type prior to the Yenikapı excavations and the information on this type of Medieval vessel was limited to scanty literary evidence. These first archaeological examples of medieval galleys exhibit quite different hull forms than the cargo ships.

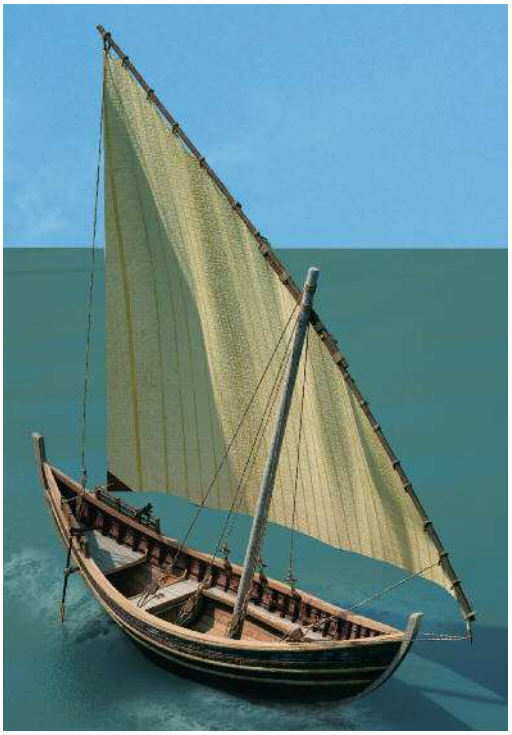
They are approximately 28 meters long and narrow. These hull designs must have provided greater speed and manoeuvrability[13]. The Yenikapı galley type vessels can be associated with the ìgaleaî mentioned in Byzantine texts and these would have served the Byzantine navy as scout vessels escorting ìdromonsî, the main type of warship of the empire[14]. **(Fig. 14).**

Fig. 14. YK16; a combat vessel that called Galley (Galea)

[12] ÖZSAİT-KOCABAŞ 2010b; ÖZSAİT-KOCABAŞ 2011b, 137–148; KOCABAŞ 2012, 1-5.
[13] ÖZSAİT-KOCABAŞ - KOCABAŞ 2008, 97-186.
[14] SAKELLIADES 1997, 47-54; PRYOR - JEFFREYS 2006; PULAK 2007, 128-141.

CONSERVATION

Due to a thick layer of muddy sediment, the Yenikapı shipwrecks were found in a relatively good state of preservation in comparison with other wrecks found underwater in Mediterranean region. However, regardless of their fair condition, it is unwise to store or display any waterlogged ship timber without conservation and restoration procedures as natural drying will result in irreparable damage to the ships. Biological and taphonomic activity has resulted in differing levels of degradation on the cell structure of the timbers during the course of many centuries and must be counteracted through conservation processes.



The conservation procedure begins immediately as the wrecks are brought to day light. In order to avoid cracks and shrinkage on waterlogged timbers due to drying out, a temporary tent with a sprinkler system is set on the wreck site to maintain high relative humidity at site during the fieldwork. The ship timbers removed from the site are kept in fresh water tanks and thereby desalination procedure is started.The levels of degradation, the causes of degradation, and maximum water contents are identified via ESEM (Environmental Scanning Electron Microscope), XRF (X-ray Fluorescence), XRD (X-ray diffraction), ICP-MS (Inductive Kapling Plasma) analyses. After this stage the iron compounds on timbers are removed by chemical and mechanical methods **(Fig. 15)**. The most crucial stage of the conservation procedure is the impregnation of chemicals into the cell structure of the wood to replace water in the cell structure and provides mechanical strength. A synthetic resin, Polyethylene Glycol (PEG) and Kauramin (melamin formaldehid) solution are chosen as the impregnation chemical for Yenikapı wrecks in accordance with industry standards **(Fig.16-17)**. Following this lengthy procedure, drying techniques will be applied and reassembly of ship timbers for the future public exhibitions will be possible[15].

[15] KOCABAŞ 2010, 23-33.

Fig. 15. Chemical and mechanical cleaning on keel before conservation.

Fig. 16. Woods are being conservated by using Kauramin method.

Fig. 17. PEG solution is being poured into the conservation tank.

CONCLUSION

Thirty-seven shipwrecks uncovered during the Yenikapı archaeological excavations, dating from 5th to 10th centuries, constitute the largest medieval shipwreck collection ever found in a single site. The temporal differences exhibited by the shipwrecks provide a unique opportunity to understand the development of shipbuilding traditions and technologies in the Mediterranean region. Although the results are preliminary, there are many construction details which do not exist in the present literature. Widely discussed and debated subjects in the field of nautical archaeology; transition from shell-based to skeleton-based shipbuilding techniques and possible reasons behind this transition, are being reviewed based on the new evidence from the Yenikapı excavations.

Our ultimate goal is to make Istanbul own the largest ancient shipwreck collection in the world. No doubt, this collection will attract numerous Turkish and foreign visitors and will contribute to the national economy when displayed in a museum to be founded in the future, adding new value to the cultural heritage of Turkey.

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LİMAN TEPE

KLAZOMENAE HARBOR EXCAVATIONS

*HAYAT ERKANAL - VASIF ŞAHOĞLU - İRFAN TUĞCU

"İzmir Region Excavations and Research Project[1]" was begun in 1992 with Urla/Liman Tepe Excavations led by Hayat Erkanal. Excavations have been ongoing since 2006 by Ankara University Research Center for Maritime Archaeology (ANKÜSAM)[2] that has now completed its institutionalization process. The project consists of four excavations on land, of which two were completed, two ongoing, and an underwater excavation.

The most extensive of these excavations takes place at Liman Tepe, İskele Quarter in the Urla District of the İzmir Province. Excavations at this site have revealed eight cultural layers to date. The site was inhabited continuously from the Chalcolithic Period[3] through the Roman Period[4] without interruption. The strong fortification system revealed at Liman Tepe dates to the 3rd Millenium BCE. The architectural structures reflect a presence of a central administrative authority, and the archaeological finds reflect relations with central Anatolian cultures, as well as with cultures from overseas countries, and suggests the center was one of the most important Aegean ports in pre-history[5].

[1] İzmir Region Excavations and Research Project (IRERP) is coordinated and executed by Ankara University Research Center for Maritime Archaeology (ANKÜSAM). All the work performed within this scope is supported by the Ministry of Culture and Tourism of the Republic of Turkey, Ankara University Rectorate, Faculty Of Languages, History And Geography of the Ankara University, Turkish Historical Society, The Turkish Institute of Nautical Archaeology (TINA), Institute for Aegean Prehistory (INSTAP), INSTAP-SCEC, and Urla Municipality.

[2] http://ankusam.ankara.edu.tr

[3] A stratified sequence is observed dating from the 5th Millenium BC to the Roman Period without interruption. Please see ERKANAL 1999 326.

[4] For Liman Tepe stratigraphic sequence, please see ERKANAL - GÜNEL 1996 310; ERKANAL 1999, 326 vd.; G‹NEL 1999, 43, Tab 1; ŞAHOĞLU 2005, Fig 2

[5] ERKANAL – ŞAHOĞLU 2012.

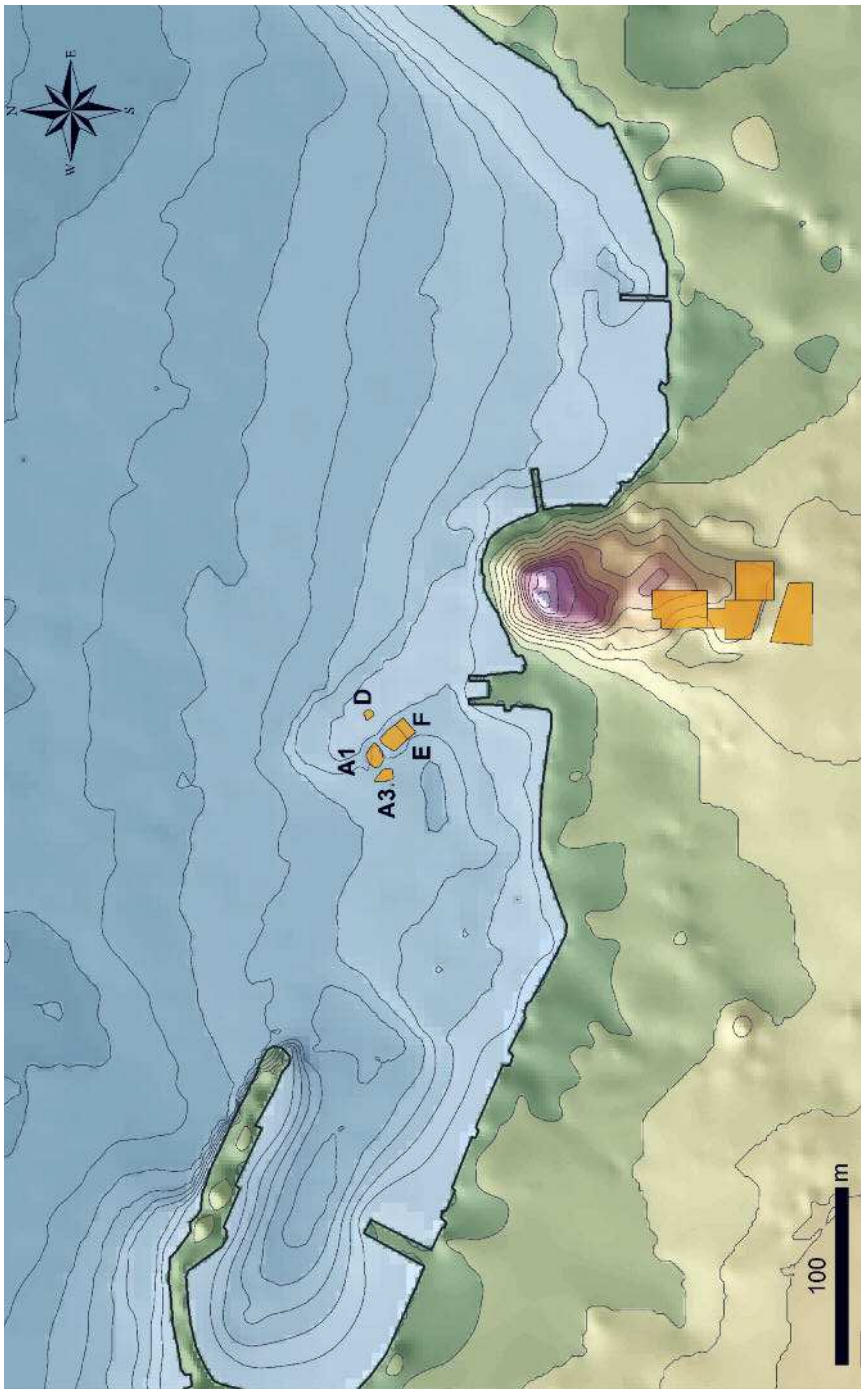

Fig. 1 – Topographical map of Liman Tepe showing the excavation areas.

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Fig. 2 – Aerial photo of Liman Tepe / Klazomenai showing the submerged breakwaters. (Photo: Hakan Çetinkaya)

Liman Tepe survived as Klazomenai throughout the Classical Era.

Upon discovery of various submerged architectural features just north of Liman Tepe in 1995 using aerial photographs, documentation of the remains were immediately initiated. Parts of the Bronze Age settlement were thought to have sunk due to tectonic subsidence[6], but further research suggested that the architectural remains belonged to the facilities of an archaic harbor of Klazomenai. The joint underwater archaeological excavations of Ankara and Haifa Universities of the remains were carried out between 2000 and 2006. The underwater excavations and research has been continuing as an ANKÜSAM project since 2007.

The initial excavations focused mainly on the breakwater that encompassed the harbor. The breakwater structure is approximately 100 m long, and it has a width of up to 35 m. The advantages of using the breakwater were justified to a degree after the excavations performed between 2000-2006 **(fig. 1-2)**.

A trench of 10 x 10m was dug in area E, south of the breakwater, and within the limits of the harbor in 2007 for identifying the first construction and use phases of the harbor facilities encompassed by the breakwater. In 2012, a new trench immediately adjacent to the former was dug (area F) to expand the excavation area. These excavations were aimed at revealing the harbors stratigraphic sequence and continued through 2013, with more excavation plan for upcoming years[7] **(fig. 1-2)**.

The earliest construction date of the harbour facility may go back as early as late 7th century BCE. The harbour was intensively used during the Archaic Period **(fig 3-6)**, then it may have been abandoned during the 5th century BCE, only to be intensively used again during the 4th century BCE **(fig. 7)**.

[6] ERKANAL – GÜNEL 1997, 248.
[7] ERKANAL vd. 2010; ERKANAL vd. 2012; ŞAHOĞLU 2010.

Fig. 3 – Painted pottery dating to Archaic Period (Liman Tepe underwater excavations)

Both 6th century and 4th century harbour floors have yielded particularly unique archaeological assemblages.

Considering the floor where Roman Period sherds that belong to large pithoi are revealed, three different periods of use were identified for the harbor. These pithoi sherds found, at Area A1, Area E, and Area F, were documented and temporarily replaced underwater for preservation.

All sherds were later brought to Area A1, enumerated, and reburied. After completion of the well- equipped restoration laboratory building on the new campus of ANKÜSAM (supported by TINA, the Koç Foundation and Urla Municipality), the sherds will be gradually taken out of the sea for necessary preservation and restoration work.

Due to the coastline formation, we focused on the possibility of a parallel construction breakwater. The potential area for a second breakwater was approximately 300 m west to the currently excavated breakwater of the Classical Period, in the area where the modern Urla breakwater lies. Following evaluation of several aerial photographs, we identified the presence of a second breakwater with a large section left underneath the modern breakwater, and with similar features to the Classical period breakwater **(fig. 2)**. The second breakwater is important for understanding the size of the ancient harbor. The coastline length encompassed by the two breakwaters is approximately 500 m. A harbor structure this size clearly reveals the maritime power of the ancient city of Liman Tepe / Klazomenai **(fig. 2)**.

The harbour floors at Areas E and F date to the 4th and 6th Century BCE respectively and have yielded artifacts that were much better preserved compared to any site on land across Turkey. Although restoration and conservation of metal, wooden components and pottery take a considerable amount of time, they are all being performed in the laboratory of ANKÜSAM. Once the conservation and restoration processes are completed, we anticipate the artifacts to be displayed at the Archaeology Museum of İzmir.

Fig. 4 – "Wild goat style" pottery fragment dating to Archaic Period (Liman Tepe underwater excavations)

Fig. 5 - Painted pottery dating to Archaic Period (Liman Tepe underwater excavations)

Fig. 6 – Parfume bottle in the shape of a warrior head with a helmet dating to Archaic Period (Liman Tepe underwater excavations)

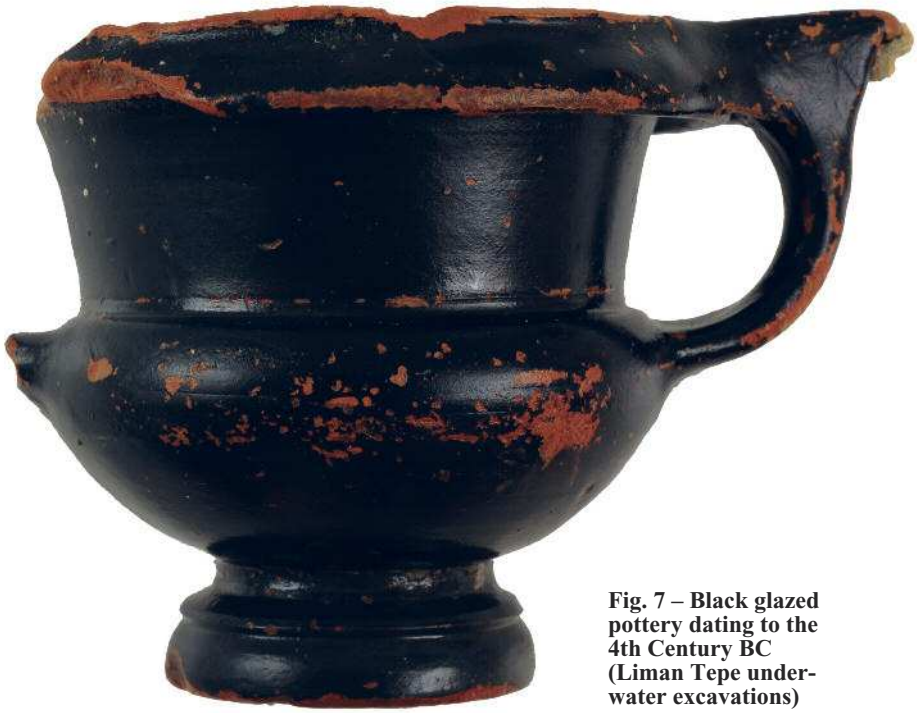

Fig. 7 – Black glazed pottery dating to the 4th Century BC (Liman Tepe underwater excavations)

Following completion of the construction for ANKÜSAM's Urla campus in 2014, the underwater research projects of Erythrai and Teos will be accelerated and continued under the auspices of the research center. We are currently planning to perform an excavation in one of the Ottoman Period shipwrecks recently identified as a result of the surveys in the area, and we are also planning on completing documentation of anchorage sites which were also found during underwater surveys. Geomorphological work performed in co-operation with McMaster University will continue in 2014 both on land and underwater, particularly in the area where the second breakwater was identified.

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MARMARİS BOZBURUN PENINSULA SHIPWRECKS

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ABSTRACT

Over a period of five years, hundreds of dives were performed in the Aegean, and Western Mediterranean regions, within the scope of the ìTurkeyís Shipwreck Inventory Projectî conducted by the Institute of Marine Sciences and Technology at Dokuz Eylül University, and supported by TÜBİTAK, the Ministry of Culture and Tourism, and additionally by TINA (Turkish Underwater Archaeology Foundation). The project was carried out on the *Koca Piri Reis* Research Vessel of the Institute of Marine Sciences and Technology, *Virazon*, the research vessel of the Institute of Nautical Archaeology (INA), and other locally rented boats.

Based on our surveys, over 100 shipwrecks located between the Dardanelles Strait (Çanakkale Boğazı) in the north, and Bozyazı of Mersin in the south, were recorded in the "National Geographical Information System" developed by our institute. This paper reports on some of these shipwrecks.

1. HELLENISTIC SHIPWRECK IN MARMARIS BOZBURUN PENINSULA

Over the course of this project we have surveyed many sites for the first time, and also explored other sites based on information obtained from sponge divers, fishermen, and local authorities. The Bozburun peninsula, near Marmaris, is among the regionís most intensively surveyed areas. The waters around the peninsula and surrounding areas were investigated by scientific teams performing using recent deep sea search technologies. As a result of these surveys, shipwrecks were found at depths between 70 and 90 m,[1] beyond normal SCUBA diving limits.

[1] ROYAL 2006, 195-217; ROYAL 2008, 88-97; ROYAL – McMANAMON 2010, 327–344.

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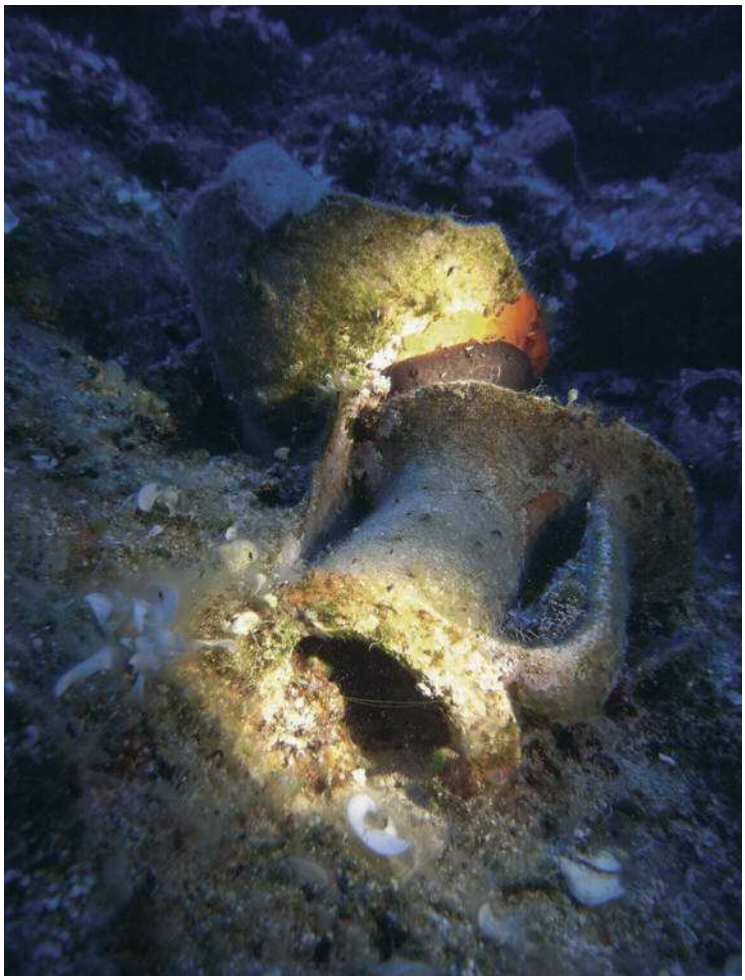

Fig. 1 Amphora neck piece

Fig. 2 Amphora bottom piece

We detected broken amphora pieces dated to various centuries during our shallower dives to scuba limits whereupon we decided to perform a more detailed search of the surrounding area. We found a large number of mushroom-rim amphorae on the sandy and rocky sea floor at a depth of 40 m with an adjacent ascending slope **(Fig. 1-2)**. The amphora pieces were first identified at a depth of 25 m on the slope, and they continued down to the deep sandy section.

Scattered amphorae were identified in two groups. A small amount of kitchen wares were also found among the finds, presumably belonging to a ship that had been looted over the years. It appears that a large portion of the shipís cargo was made up of mushroom-rim amphorae as well as kitchen wares concreted to the rocks. In the area of the shipwreck that we dated to late 4th century BC (Hellenistic Period), approximately 30 broken amphorae was observed. These amphorae, known as "Solokha I"[2] were produced on the island of Kos. Numerous ballast stones were also observed in the shipwreck area.

The remains related to the shipwreck were scattered over an area approximately 150 m^2 in size. A majority of the amphorae on the slope were concreted to the rocks. A similar type of amphora have been found on shipwrecks located near Çeşme and Gökova, suggesting this type of amphora was commonly traded in the region. Accordingly, we identified a shipwreck that will provide important data about the trade routes of the region. We suspect that intact samples may lie at deeper depths, we were unable to perform deeper dives due to weather conditions. However, we can say that our survey of the immediate area was adequate. Our efforts to find any anchors associated with the shipwreck were fruitless.

2. BYZANTINE SHIPWRECK IN MARMARIS BOZBURUN PENINSULA

We focused our research on the southern section of the survey area based on the initial discoveries. Traces of a second shipwreck were identified which are better preserved than the aforementioned Hellenistic shipwreck. This shipwreck was located approximately 100 m off the shore and lies on the steep slope, between 15 m and 35 m. We discovered several widely scattered LR1 type amphora[3] pieces on the rocky seafloor at 15 m depth **(Fig 3-5).** As we followed the trail of amphora pieces downslope, we identified approximately 30 broken amphorae scattered and concreted to the rocks.

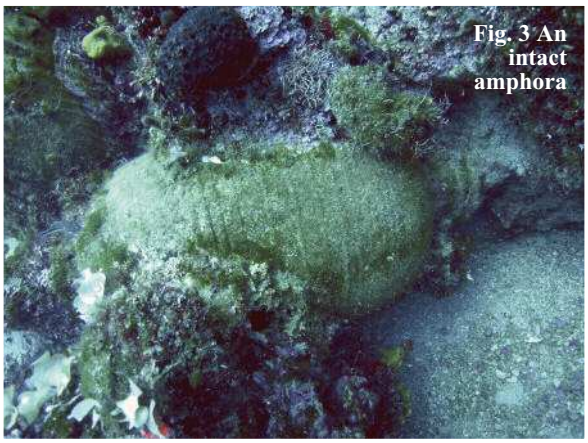
Fig. 3 An intact amphora


Fig. 4 Kitchen pot

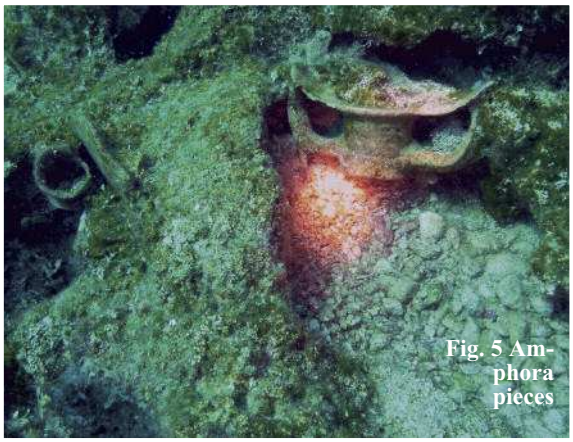
Fig. 5 Amphora pieces

[2] LAWALL 2000, 66-67; NØRSKOV – LUND 2002, 56-68; LAWALL 2004, 451-453; GEORGOPOULOU – NODAROU – KİLİKOGLOU 2008, 1049-1061.
[3] BASS – VAN DOORNINCK 1982, 155-157; ALPÖZEN – ÖZDAŞ – BERKAYA 1995, 113.

Approximately 40-50 amphorae of the same type were discovered immediately ahead of the same spot, in the cracks and crevices between the rocks, at a depth of approximately 35-40 m, along with a few kitchen pots and a large number of ballast stones of various sizes.

The ceramics were scattered over an area of approximately of 200 m^2. Based on these data, it is assumed that the remains belonged to a small trade ship carrying the ceramic cargo and possibly contained perishable organic products as well. The shipwreck was dated to the 6th or 7th century AD based on the cylindrical amphorae with parallels used during the early Byzantine period.[4]

When no further archaeological finds were uncovered during surveys performed to the immediate north or south of the shipwreck site, we decided to relocate the survey to farther north, and focus our search on the coasts closer to the Marmaris Gulf.

3. LATE HELLENISTIC SHIPWRECK IN MARMARIS BOZBURUN PENINSULA

Once again we found the remains of a shipwreck on a steep slope during the survey performed in this region. We detected hundreds of amphorae concreted to each other and scattered over a large area. Amongst the searches we performed during this survey, the most intense assemblage was located at this shipwreck site.

The amphorae and other finds of the shipwreck are located on a sloping, rocky sea floor at a depth of 15-27 m **(Fig. 6-10)**. The remains of the shipwreck continue in a long straight line at the bottom of the slope and are scattered over an area of approximately 150 m^2. Most of the visible remains on the surface of the substrate were concreted to each other, and the scatter continued on the sandy seafloor at the base of the slope. This gave us the impression that intact artifacts may be lying under the sand, but this remains unconfirmed.

[4] LEIDWANGER 2013, 183-186; LEIDWANGER 2007, 308–316; ŞENOL 2003, 85; ARTHUR – ÖREN 1998, 193-212; BASS – VAN DOORNINCK 1982, 155; VAN DOORNINCK 1989, 247-257; VAN ALFEN 1996, 192.

Fig. 6 General view of the Hellenistic shipwreck

Fig. 7 Piece of Kos amphorae

Fig. 8 Pile of Rhodian and others amphorae

Fig. 9 An intact Rhodesian amphora

Fig. 10 An overall view of the shipwreck site

Two different types of amphorae were identified in the pile Kosian and Rhodian[5]. The Kosian amphorae date to the 2nd century BC[6] and the Rhodian examples date to the late 2nd or early 1st century BC[7], which is the Late Hellenistic Period. Although there are many ballast stones as well as various types of dishes, bowls, and other kitchen wares around the shipwreck, the shipís anchor(s) could not be located during the survey.

4 ARCHAIC CYPRUS SHIPWRECK IN MARMARIS BOZBURUN PENINSULA

We encountered one more significant find as we expanded our survey site further north, a Cypriot shipwreck dated to Archaic Period. Thus, we have found the third presently known Cypriot shipwreck from the Archaic Period along the Anatolian coast. The previous two Cypriot shipwrecks were identified by INA[8].

At least 60 pieces of basket-handle amphorae, approximately 30 mortar-type pottery pieces were identified in addition to many broken amphora pieces **(Fig. 11-13)**. Given the rarity of the Cypriot shipwreck, samples were taken from the basket-handled amphorae for petrographic analysis. The basket-handle amphorae in the shipwreck have been dated between the late 7th century BC and the early 6th century BC[9]. The shipwreck remains lie between 3 m and 15 m depth and are scattered over an area of approximately 120 m^2. The ship probably sailed from Cyprus, and then was caught by a storm and struggled to shelter at this bay, but hit the rocks and sunk.

We also found Kosian amphorae piles and stacks from the Hellenistic period in addition to Cypriot artifacts during our survey of this shipwreck. There are clearly two distinct shipwrecks at the same site, one belonging to Archaic period and the other to the Hellenistic period.

Fig. 11 Basket-handle amphora pieces

Fig. 12 Mortar-ceramic pot

[5] MONACHOV 2005, 69-95.
[6] ŞENOL 2003, 42.
[7] ALPÖZEN – ÖZDAŞ – BERKAYA 1995, 93; ARIEL 1988, 31-35.

Fig. 13 General view of shipwreck

Fig. 14 A grapnel anchor

5 ANCHORAGE SITE IN MARMARIS BOZBURUN PENINSULA

Many anchors were detected in addition to the shipwrecks during the surveys executed around Marmaris **(Fig. 14)**. One of the seven anchors discovered is a large three-hole stone form **(Fig. 15)**. This anchor was made of sandstone and its dimensions are 150 x 50 x 20 cm. In addition to the one three-hole stone anchor[10], three Y-form anchors[11], and two grapnel anchors[12] were discovered. The anchors identified in this region were included in our anchorage location database. We were unable to perform a detailed exploration for more anchors, but assume that the region contains many more awaiting discovery and study.

Fig. 15 A three hole stone anchor

[8] BASS 1974, 335; ROSLOFF 1981, 279; PULAK 1997, 313-314; HENTSCHEL 2004, 12-13.
[9] GREENE – LEIDWANGER – ÖZDAŞ 2011, 60-61; GREENE – LEIDWANGER – ÖZDAŞ 2013, 22-34; MASTER 2003, 57, Fig. 7.
[10] EVRIM – ÖKE – TÜRKMENOGLU – DEMIRCI 2002, 254-267.
[11] VAN DOORNINCK 2005, 191-224.
[12] RAY 2001, 167.

CONCLUSION

Four shipwrecks dated from the 6th century BC to the 6th century AD were discovered during this survey carried out in the Marmaris/Bozburun region. Institutions such as the Institute of Nautical Archaeology (INA), and RPM Nautical Foundation (RPMNF) have also performed surveys earlier in the same region, and identified shipwrecks of various centuries (4th century BC ñ 17th century AD). The total number of these shipwreck sites does not exceed 15 and represent ships that sank on important sea-trade routes presumably used for hundreds of years. We may assume that thousands of vessels sailed on this trade route based on the number of shipwrecks discovered- representing a small fraction of total sea traffic. It is generally assumed that one ship sank each year. As a result of surveys performed by three different scientific teams at depths between 90 m and 10 m, it appears that this assumption does not hold true for this area.

Shipwrecks and the other archaeological finds suggest that this region was an important commercial route for maritime trade. Considering the individual finds and anchors, we conclude that this route was frequently used by trade ships that traveled during a time span from the Archaic Period through present day.

Other finds that we detected in the region suggest a trade activity through Cyprus, Syria (Eastern Mediterranean), Carthage (Northwest Africa), and Italy, in addition to the regional commercial activity.

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THE BREAKWATER OF THE ANCIENT HARBOR OF SİDE

* H A K A N Ö N İ Z

The ancient harbor of Side has been examined as part of the Archaeological Underwater Research on the Coast of Antalya project launched in 2009, and resumed in 2012 with contributions from the Turkish Underwater Archaeology Foundation, the support by G¸ner Kozdere, the director of Side Museum, and Professor Hüseyin Sabri Alanyalı˝, director of Side excavations. During the project, we identified 28 sarcophagi dating to the 3rd or 4th AD, and three stelae dating between the 4th to 3rd century BC, about 50 m off the western breakwater of the Harbor of Side. The land excavations at Side yielded sections of fortifications and wall constructions dating to the mid-4th century AD. Breakwaters appear to have been repaired during these construction works of walls re-using sarcophagi and stelae from the necropolis area as embankment material.

SİDE AND THE SEA:

A variety of coins, minted in Side, may indicate how the sea was embraced. Dolphins were depicted on many coins with a pomegranate, a symbol which gave its name to the city. For instance, one particular mint dating to the 5th or 4th century BC has a depiction of a dolphin facing left with a pomegranate resting upon it on the reverse side of the coin **(Fig. 1).** Another coin has a pomegranate on the obverse side and a dolphin on the reverse side**,** while another coin depicts a pomegranate on the obverse side, and a dolphin and a human eye on the reverse side. The use of dolphins and sea motifs on coins minted at Side began during the 5th century BC and appearss to have continued until 4th century AD. Another example dating to a period between 211 and 217 AD has the depiction of a sailing vessel on the reverse side **(Fig. 2)**, and another one dating to the Period of Constantine (330 to 337 AD) has a depiction of the Emperor and Victoria, the oarswoman on a ship on reverse side**.** Themes related to the sea and the seamanship are not limited with these specimens[1]. Possibly the best representation of a local sea theme can be seen on a coin with a depiction of the Side harbor dating to the Roman period **(Fig. 3)**. The harbor on this coin is in the form of a circle enclosed by buildings similar to the mosaic with a depiction of the Kelenderis harbor[2]. Based on the iconography of the coin, the harbor has a single entrance at the center from seaward.

[1] Assemblage from the excavations at Side currently conducted under the direction of Professor Hüseyin Sabri Alanyalı contributes to the research. Associate Professor Ahmet Tolga Tek and Side Museum Directorate are currently conducting invaluable work on coins.
[2] The mosaic found during excavations conducted under the direction of Professor Levent Zoroğlu in 1989, in the ancient city of Kelenderis situated at Mersin-Aydıncık was dated to early Byzantine period. Excavations continue at Kelenderis in the area where the mosaic was found and other areas. (ZOROĞLU 2006, 17.)

Fig.1: Coin of Side dated to between the 5th and 4th centuries BC (ATLAN 1967: 64, Lev. X)

Fig.2: Coin of Side dated to the 3rd century AD (ATLAN 1976:Fig. 178)

Fig.3: Coin of Side dated to Roman Period (MANSEL 1967, Fig. 32)

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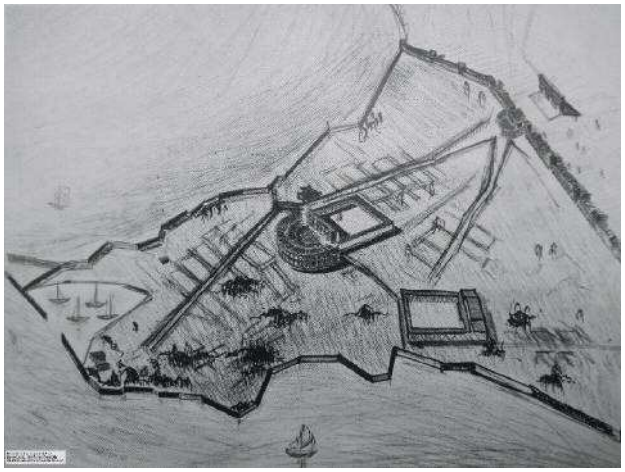

Fig.4: Animation of the Ancient City of Side (MANSEL 1963: 1)

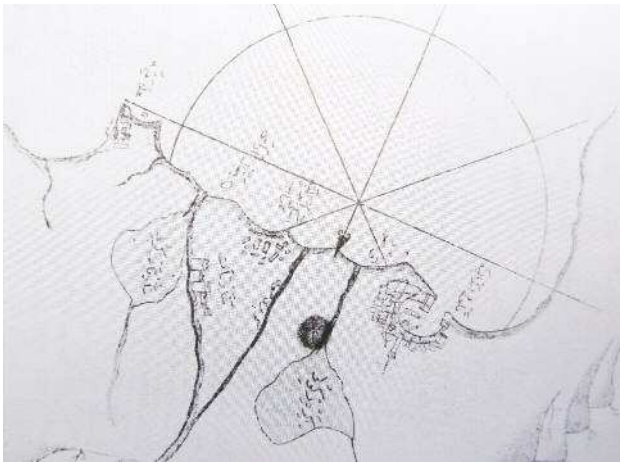

Fig.5: Harbor of Side, by Piri Reis

THE HARBOR AND BREAKWATERS OF SİDE:

Founded on a peninsula, Side is protected from winds coming from the east. From the west the harbor only suffers winds that blow in counter direction. Thus, unlike many cities built on peninsulas or tombolos, this city is not in the form of a natural harbor. Therefore, a port for wharfing in winter, and additionally a quay were built to the northeast of the city during the ancient period. The harbor was built on a natural form by creating a breakwater embankment. Since the natural form to the south end of the peninsula itself alone did not provide a safe haven harbor, the breakwater was probably built together with the city. The two breakwaters to the east and west together composed the main harbor. There is also a small shed built as an extension of the east breakwater located to the east of the main harbor. A passage between the main harbor and the shed was apparently available during several periods. Arif Müfit Mansel described the harbor in 1963 as ìtriangularî[3], and his depictions of the city have an almost triangular form **(Fig. 4).** However, the above mentioned coin depicts the harbor as circular, as does the 16th century map of Evliya Çelebi[4] **(Fig. 5)**. On Beaufortís map[5] from 1811-1812, the harbor has a deformed circular shape.

[3] MANSEL 1967, 24.
[4] Piri Reis map does not include the Side peninsula, therefore the drawing depicting the form of the harbor maybe misleading.
[5] Francis Beaufort (1774-1857) was an admiral in Britain's Royal Navy, he is the creator of wind force scale known as "Beaufort Scale". He has been assigned the duty of performing the survey and measurements of Karaman Province, - which used to be the the southern coastline back then, between 1811 - 1812 , in the mean time he had the chance to make the drawings of some ancient settlements. (PULTAR 2013, web.)

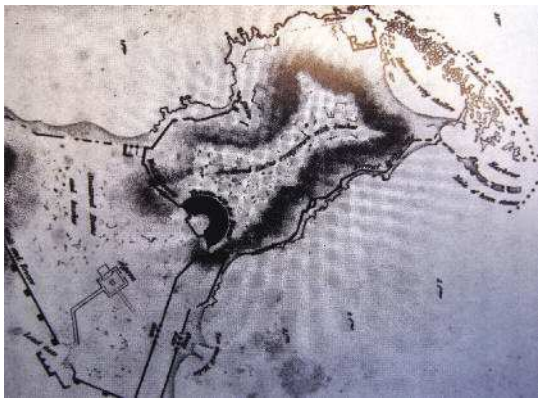

Fig.6: Map of Side, by Beaufort (MANSEL 1963: 41)

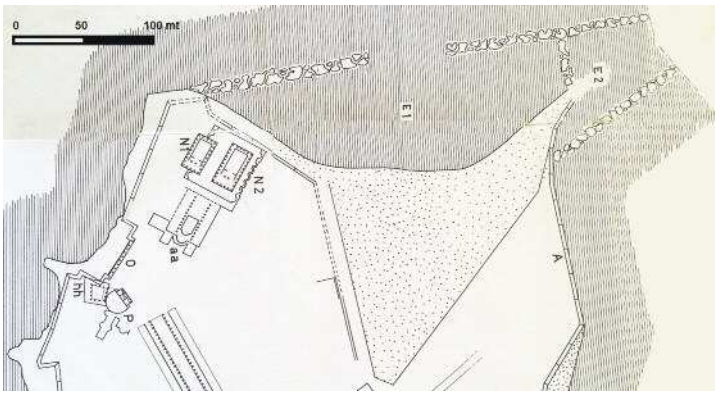

Fig.7: Plan of the Harbor of Side ordered by Mansel (MANSEL 1963: Plan)

Fig.8: Photograph of the Harbor of Side, 1963 (MANSEL 1963)

Breakwaters on this drawing appear nearly rectangular with rounded corner **(Fig. 6)**. Both the plan drawn by Mansel **(Fig. 7)** and the photograph taken the same year **(Fig. 8)** indicate that the breakwater has almost flattened. The Harbor drawings by Paul Knoblauch in his book published in 1977[6] look similar to Mansel's plan[7]. Both the flattened form of the structure on the surface and partly circular form of the breakwater's embankment under the water are visible in the aerial photographs taken before construction of the modern breakwater. It is likely that the harbor of Side was fortified with construction of new walls, probably around the mid-4th century AD. More sonstruction occurred during the 5th century. Among the additions was a basilica adjacent to the Temples of Apollo and Athena[8].

[6] A very nice book about the Harbor of Side was prepared by Paul Knoblauch. The book documents the condition of the harbor particularly before the recent reconstruction in 2007. There are also detailed records in the archives of the Museum of Side. The inspiring drawings of the harbor in the book (Fig.5, 54) suggests multiple reconstruction works on the breakwaters over the centuries. However, our research revealed some differences – probably due to the tides –between the present breakwaters and the harbor drawing #5.

[7] KNOBLAUCH 1977: Fig. 82, 83, 85.

[8] ALANYALI 2011, 111

Fig.9: Sarcophagi examples outside the Breakwater of Side (Photography: Hakan Öniz)

Excavations have also revealed renovations from the 6th and 7th century in the city. The most recent reconstruction in the harbor of Side was completed in January 2007, with fill from the harbor being removed and dumped to the open sea during the reconstruction process.

The underwater excavations yielded 28 sarcophagi **(Fig. 9, 10)** and three stelae **(Fig. 11)** dispersed parallel to the ancient breakwater, approximately 50 m off the modern breakwater. Some of the sarcophagi have been broken and all are filled with large stones and rocks. Several shipwrecks have been found with cargo of sarcophagi from different regions of the Mediterranean Sea, mainly from Croatia. Although the submerged sarcophagi at Side were initially thought to be part of a shipwreck, their dispersion in a straight line of approximately 130 meters parallel to the western breakwater suggests that they were parts of embankments. The stelae that belong to the 4th to 3rd centuries BC uncovered within the same fill with these sarcophagi dating to the 3rd and 4th centuries have eliminated the possibility of a cargo shipwreck for now. We believe that under the sand and embankment, there should be more sarcophagi lying dispersed in an area of approximately 3 to 6 m and stelae uncovered at a depth of 4 meters.It is very likely that the above mentioned sarcophagi and stelae were carried from the necropolis near and outside of the city walls or from another location in the city.

Fig.10: Funerary stele outside the Breakwater of Side (Photography: Hakan Öniz)

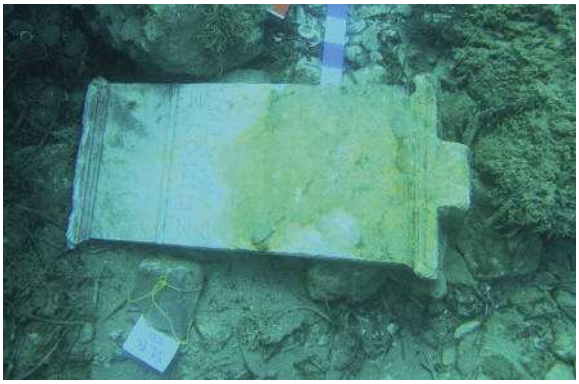

Fig.11: One of the Grave Stelae

Available pictures, maps, drawings, photographs and underwater excavations suggest that the breakwater has undergone multiple restorations over the past two thousand years. The main reason for these restorations is damage caused by wave action. In winter, the height of waves reaches to 8 m, resulting in strong forces acting on the breakwater structure from the open sea. The pressure might have caused sliding and collapse of the eastern and western breakwaters of the circular harbor towards northeast into the harbor during the Roman period. The second reason is the sinking of the heavy breakwater embankment made of irregular and large blocks of stones into the sand dune in the course of time. Certainly, earthquake is also another important factor. The embankment which collapsed into the harbor within centuries probably caused the harbor to have become smaller. The sliding appears to be 50 meters in average. In this case, the harbor of Side probably had a size of approximately 26000 m^2 during the Roman period, which means that the area lost due to sliding. should be around 9000 m^2. The exact number of stelae and sarcophagi uncovered during the survey can only be confirmed by an underwater excavation. Their original location will only be understood in coming years during the excavations at Side.

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A NEW DISCOVERY IN THE MYNDOS HARBOR SURVEY:

THE WEST HARBOR

Fig. 1: Aerial photographs of Myndos Ports

* MUSTAFA ŞAHİN

Myndos, one of the important Carian ports, is among the cities with a single harbor according to ancient authors such as Herodotos[1], Polybius[2], and Strabo[3]. Based on underwater survey performed in 2012 the city appears to have had a second harbor. This paper is about the newly discovered harbor.

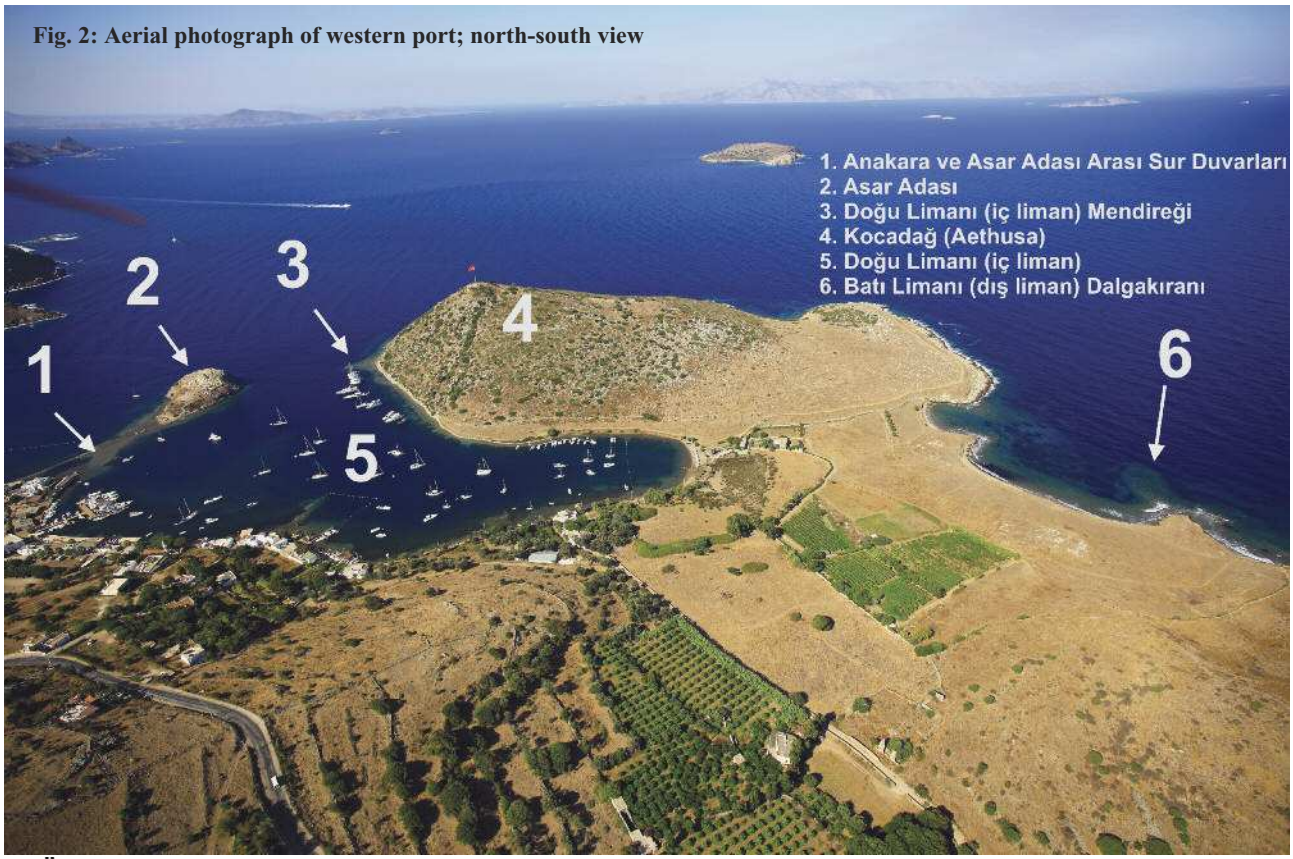
Most ancient coastal cities were built directly on natural harbors[4]. Myndos was founded on a coastline which geographically has the shape of a mound, called a tombolo **(fig. 1)**. Pliny lists Myndos among the ancient cities with a tombolo connected to the mainland[5].

The known harbor of Myndos is encompassed by Kocadağ-Aethusa, a 484 m high mountain to the southwest, and a tiny island (Tavsan) to the southeast **(fig. 2)**. The two pieces of land that form the strait leading into the harbor also provided a natural defense system for the ancient harbor by narrowing the harbor's entrance.

Herodotos writes about Admiral Scylax, from Myndos and his support of Megabates, a cousin of Darius I, with a trireme or triremes during his campaign in 500 BCE to Naxos[6].

[1] HERODOTOS, V, 33.
[2] POLYBIUS, XVI, 15.
[3] STRABON, XIV, 656.
[4] CEYLAN 2010, 352 vd.
[5] PLINIUS NH, III, 8, 89-92.
[6] The navy of Megabates during Naxos Campaign consisted of 200 triremes. We found out that triremes from Myndos were also involved in the battle (HERODOTOS V, 33). Herodotos rather refers to the punishment of the Myndos trireme's captain Scylax. No detailed information is available about the number of Myndos ships involved in the naval battle.

Fig. 2: Aerial photograph of western port; north-south view



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Polybius reports that during the naval battle of Lade in 494 BC, ships from Rhodes had to anchor at Myndos harbor overnight before traveling further to their final destination, the island of Kos[7]. Myndos was a member of the Delian League from 453/52 to 421/20 BC[8]. These data suggest that Myndos was among the city-states with significant naval forces. However, the location of the naval harbor of Myndos is still unknown.

In his book of Classical Age geography, Strabo also provides a description of the harbors of the cities. For example, while he described Knidos; "*Then to Cnidus, with two harbors, one of which can be closed, can receive triremes, and is a naval station for twenty ships."* He clearly mentioned that Knidos had two harbors[9]. But then describing Myndos, he wrote: "*Then forthwith one comes to Myndus, which has a harbor; and after Myndus to Bargylia, which is also a city; between the two is Caryanda, a harbour, and also an island bearing the same name, where the Caryandians lived"*[10]. Here he uses the singular form of the term "harbour" when describing Myndos and Caryanda, and for Bargylia the term he used is "city". We are unsure whether with the term "harbour" he actually wanted to emphasize Myndos and Caryanda were both port cities. But Bargylia is also a coast settlement, therefore a port city. Whether Strabo, when he mentioned the term harbor, wanted to emphasize that the city had only a single harbor, is debatable. Considering the descriptive detail that he gave for Knidos, apparently Myndos did not have a naval harbor. In other words, it would not be a far-fetched assumption to say that Myndos had a single harbor during the years when Strabo was alive (64 BC –24 AD).

Within the scope of the postdoctorate research of Dumankaya in 2012, a stacked rubble stone breakwater was found during the underwater survey performed at 2-3 m depth in the bay at the western shores of the city **(fig. 3)**[11].

[7] POLYBIUS XVI, 15.
[8] VARİNLİOĞLU 1992, 18.
[9] STRABON XIV, 2, 15.
[10] STRABON XIV, 2, 20.
[11] DUMANKAYA 2013, Levha 55.

Fig. 3: Western port breakwater remains

Fig. 4: Shipwreck remains on breakwater, general view

Fig. 5: Shipwreck remains on breakwater, detail

Fig. 6: Shipwreck remains on breakwater, detail

The new discovery exposed the presence of a second harbor in the city.

The harbor we referred to as the "Western Harbor" is to the northwest of Kocadağ, and in the bay called Dönmezler Cape **(fig. 2)**[12]. The coastline of the bay where the harbor lies is 200 m long. There are many building remains and walls extending from the south end of the coast toward northwest[13]. The concave shaped harbor breakwater is entirely submerged **(fig. 4)**. It is 76.56 m long, and 34.15 m wide. The breakwater was entirely built with stacked rubble stones. The upppermost height of the breakwater above the seabed is 6.67 m, which is 2.20 m below the surface. It is commonly believed that a height of at least 2 meters is required for a breakwater to offer effective protection from waves. Therefore, it appears likely that the breakwater has sunk, in relation to the ancient landscape, by approximately 4 m. The cause of sinking may be attributed to a number of possible events, including tectonic activity, sesmic activity, a rise in the sea level due to climate change, or some combination of one of more of these events.

Currently, there are two shipwrecks on the breakwater **(fig. 5)**[14]. Preservation of the wrecks is poorr. One of the shipwrecks is located on one end of the breakwater, and the other one is at breakwater's nearest point to the shore. We identified Egyptian and DR 2-4 amphorae that were used between 1st century BCE and 3rd century CE during the surveys **(fig. 6)**[15]. The presence of these sherds, and lack of any information about the presence of the west harbor in the records of Strabo, who lived between 64 BC and 24 CE, suggest that the harbor could have been built, at earliest, during mid-1st century CE[16]. Presuming this dating effort to be accurate, It seems very unlikely that it was a naval harbor based on current evidence of its construction date. If it were used for commercial purposes, it may be fair to claim that Myndos had a growing trade volume in the Mediterranean region from the 1st century CE.

[12] DUMANKAYA 2013, Levha 57.2.
[13] DUMANKAYA 2013, Levha 56.1.
[14] DUMANKAYA 2013, Levha 58.3.
[15] DUMANKAYA 2013, 92.
[16] STRABON XIV, 2, 20.

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THE MOST PRIMITIVE ANCIENT "REED BOATS"

People living near the sea or water have been always attracted to anything that can swim or float on the water. No matter how far the location of their settlements were from each other, communities all around the world took to the water using naturally formed bundles of weeds in still water and mounted them as if riding their horses for hunting and small scale farming. This method probably originated from the fact that reeds were, and are still, an abundantly available bouyant material.

* O S M A N E R K U R T

Bundles of reeds lashed together were used to form a primitive type of water transport in many historical periods and cultures as indicated by the iconograohy of Sumerian, Babylonian, and Egyptian sources. The same iconographic information also provides details on each of these stages including how these vessels were constructed and used[1] **(Fig. 1-4)**. Reed boats remain a widely used technology by small societies living in secluded or remote areas (e.g., Easter Island, Lake Titicaca, Mexico, Chad, Ethiopia, Sardinia).

Reeds are readily available on the banks of the Nile River where the water is stagnant, and trees are scarce. The same is true of the Mesopotamian swamps around the Tigris and Euphrates Rivers. Regardless of its geographic location, the construction, form, and area of utilization for reed boats are all similar. With some geographical variation, in Egypt reed boats were made mostly of papyrus plants, whereas the plant used in Mesopotamia for reed boat construction was bamboo.

The typology of the boats, the relationship of each civilization with water throughout the history, and the available information on this historical process form the backbone for this study. As time went by, people became aware of the limitations of reed boats as they turned their eyes to the open sea rather than protected waters. Reed boats are the typological ancestors of more advanced type of ships capable of sailing on open seas. Thus, these raft-style boats, made primarily of reeds, represent the oldest vessels in ship typology.

O B J E C T İ V E

One objective of our research is to elucidate the typological aspect of Mesopotamian archaeology, with a primary objective to attempt reconstruction of these reed boats according to the same production techniques and usage circumstances under the discipline of experimental archaeology.
More importantly, we want to try this type of transport, which is in fact, not a vessel, under the conditions of the open sea and waterways with currents, and share our data .

M E T H O D

This boat type which has fair maneuverability in estuaries, lakes, and still waters The reed fibers are uniform, and thanks to the air tubes inside, they can be turned into a solid and floating object after being lashed together to produce the shape of a hull.

[1] Bkz. Wilkinson, G.,The Manners and Customs of the Ancient Egyptians,Vol II, New York, 1878, 208, Fig 408.

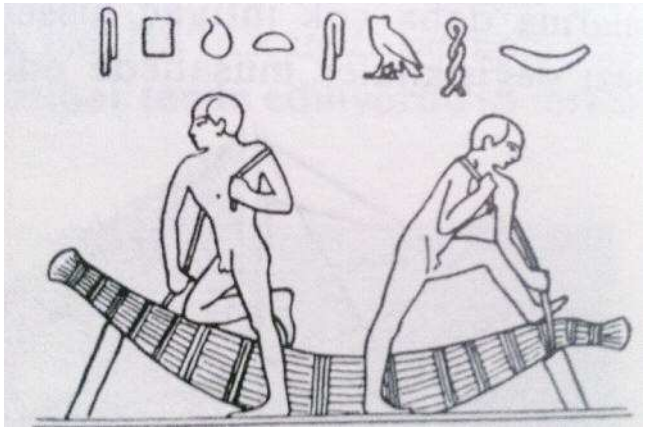

Fig.1: The Making of a Reed Boat. (İnan, A., Mısır Tarih ve Medeniyeti, Ankara, 1992, 211, Fig. 69)

Fig.2: Egyptian Grave Embossment. (Heyerdal, T., "RA's Research Expedition", Maritime Research Foundation, İstanbul , 2006, 414)

* *360 Degree Research Group, www.360derece.info*

Fig. 3: Egyptian Grave Embossment. (Heyerdal, T., "RA's Research Expedition", Maritime Research Foundation, İstanbul , 2006, 413)

Fig. 4: Relief from the palace of Sennacherib, 704-681 BC. British Museum, (Casson, L., Antik Çağda Denizcilik ve Gemiler, İstanbul 2002, 2)

Fig. 5: Canoe paddle, Easter Island. (Heyerdal, T., "RA's Research Expedition", Maritime Research Foundation, İstanbul , 2006, 409)

Despite being lashed tightly together using ropes made of vegetation, it does not have a rigid structure. That is why it can navigate only in still waters, primarily due to lack of a homogenous distribution of force on the boat as a unit, which may lead to detachments and ruptures. The best solution would be to create a mass as thick as possible using the reeds that actually are not larger than 1 cm in diameter rather than lashing them lengthwise and side by side to benefit from the longitudinal forces. It is the only way of preventing the boat, which has no keel, from breaking into two pieces.

Vegetation fibers are used for lashing the reeds together to make bundles. Similar to reeds, these fibers also reflect the characteristics of the region they grew in. They have to be both sturdy and elastic. Reeds may absorb large amounts of water for a short while after they come into contact with it, without leading to any significant change in the stability of the boat. On the contrary, it may actually increase the stability of the boat. This is one claim we will be able to evaluate during the course of the project.

Fig. 6: Reed boat prototype. (Photo: Mualla Erkurt, November 2013, Urla).
Length: 4.50m
Beam: 1.10m
Draft: 20 cm
Sail surface: 4.5 m2

CONCLUSION

Propulsion of a reed boat is by its paddling crew. While paddling is efficient on smaller boats, it is not so on larger boats. Paddles (as in canoeing) are preferred for propelling these boats **(Fig. 5)**. Yet, paddling can be difficult and exhausting. Oars are used for long range travels for better performance, while in canals or streams with high flow rates, paddles are more functional.

On all ancient boats propelled by wind, propulsion becomes difficult to impossible against a headwind of 3 or more on the Beaufort Scale, and against the waves. Reed boaters were, of course, aware of the propelling force of the winds. No information is available on the use of sail on reed boats from iconographic resources. Still, we did our best to obtain the results using the most primitive rigging.

We believe our results will contribute much to the information on reed boat typology. We have already built a 4.5 m prototype of a reed boat to further understand its characteristics, which was followed by the construction of a main hull for a 15.4 m vessel within the scope of the project,which includes ongoing sea-trials **(Fig. 6-7)**.

Fig. 7: Large reed boat. (Photo: Mualla Erkurt, November 2013, Urla).
Length: 14.5m
Beam: 2.60m
Draft: 35cm
Sail surface: 40 m2

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VISUALIZATION IN NAUTICAL ARCHAEOLOGY

* GÜZDEN VARİNLİOĞLU

Digital Humanities[1] is a new academic field for the creation, implementation, and interpretation of computer technologies. The University of California Los Angeles (UCLA), established the *Center of Digital Humanities* and the *Experiential Technologies Center,* launching multiple projects in social sciences, design, architecture and archaeology[2]. Their objective is to construct digital models of historical and archaeological artifacts to explore them in the digital space. With the project of Underwater Cultural Heritage, digital modeling methods on land are implemented in underwater environment, contributing to the visualization of nautical archaeology.

With the prologue of information technologies into archaeology, 3D documentation techniques, laser scanning, photogrammetry, and computer aided design/drafting (CAD) tools have been extensively used. Even if 3D visualization and presentation models are becoming widespread, the methodology of conventional 2D orthographic drawing maintained its importance in the academy. The initial examples of 3D models were giving limited clues about the texture and material of the artifact -abstract models-, but development of algorithms led to more realistic visualizations. *Structure from motion* (SfM)[3] algorithms made possible the generation of digital models out of the methodically taken photographs. We conducted fieldwork for the Project of Underwater Cultural Heritage in November 2013 to apply these SfM tools in an underwater setting.

UNDERWATER CULTURAL HERITAGE PROJECT

With the permission of the Ministry of Culture and Tourism, we conducted archaeological surveys along the Lycian coast of Turkey. Our aim was to document archaeological and historical finds to provide data for the information systems.

[1] BURDICK vd. 2012
[2] PRESNER – JOHANSON 2009
[3] VERHOEVEN 2011, 67-73.

Fig. 1 A panoramic view of underwater

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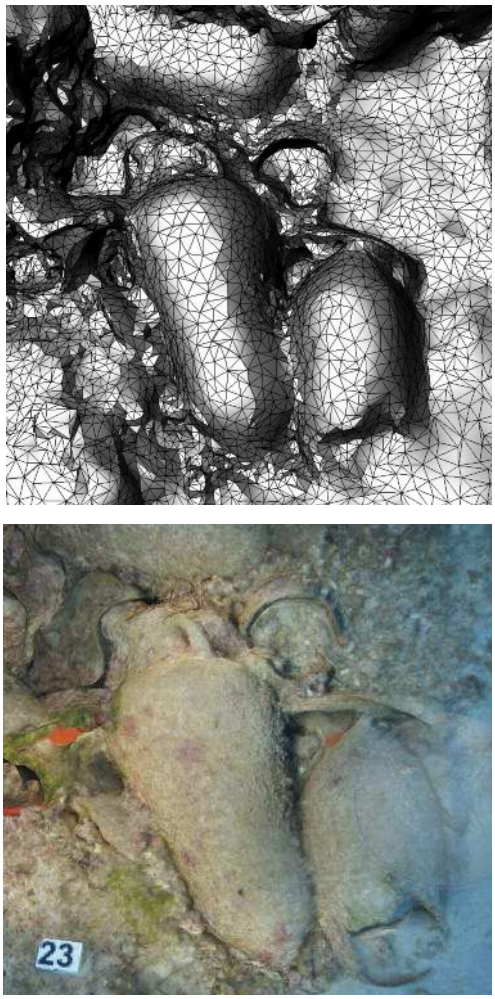

Fig. 2 Phases of modeling process of a find

The main objective was to retrieve the data from the artifact without decontextualizition, as the in-situ preservation is the first option listed in the "Convention on the Protection of the Underwater Cultural Heritage 2001" by UNESCO. Following this preservation methodology, a systematic archaeological survey was conducted by divers. Discovered artifacts were locally georeferenced and data was entered into a database system.

In addition to general mapping documentation, studies included taking sets of photographs for photomosaic and recording video (Fig. 1). However, these techniques provided only 2D representation of 3D cargo sites and finds.

In 2013 campaign, we used Structure from Motion (SfM) software to process sets of photographs for generating 3D models. Even though sites and artifacts differ in size and in depth, the main technique was to take sets of sequential photographs covering all sides and angles. This technique may be briefly summarized as 3D scanning of the object by taking photographs. In case of standing objects such as amphorae, pithoi, ceramic pieces, architectural objects and anchors, photographs were taken following a spiral pattern.

Since the lighting conditions vary according to topography and depth, a variety of light sources and lenses are used. Later, the photographic sets are processed by the modeling software without photo editing.

In the 2013 campaign, models of 100 finds and four archaeological cargo sites were generated from site photographs. Even with this low-budget technology, we achieved accurate 3D models easily. The efficiency of this technique brought the idea of shifting the design of the online virtual museum from conventional 2D display of the artifacts to 3D photorealistic models.

CONCLUSION

At the early stages of the project we developed a data collection methodology following an in-situ preservation guideline. Without decontextualization of the artifacts, we retrieved the data to create an online inventory. Photo-realistic models of the artifacts brought the challenge of an immersive virtual museum project with an emphasis of 3D virtual environments to fruition. We are currently at the stage of exploring methods of display and dissemination of the models online.

ACKNOWLEDGMENTS

My thanks to the Turkish Academy of Sciences (TÜBA) for supporting this post-doctoral research; to the Chamber of Maritime Trade, Antalya Division for their financial support; to my advisors, Professor Gülen Çağdaş of Istanbul Technical University (İTÜ) and to Professor Diane Favro and Christopher Johanson of University of California Los Angeles (UCLA); and the Project team of Underwater Research Society (SAD).,Burak Özkırlı, Çağatay Arıcan, Cantekin Çimen, F. Emrah Köşgeroğlu, Gani Uğur Bozel, Gökçe Durusoy, Gökhan Türe, Gürel Dimez, Mehmet Ayberk Çatar, Mert Gökalp, Murat Draman, Okan Halaçoğlu, Ömer Akman, Özcan Keçeli, Serdar Gülsöken, Serkan Durusoy, Serpil Kozludere, Sevil Gürel Peker.

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8th INTERNATIONAL SYMPOSIUM ON UNDERWATER RESEARCH (26-29 MARCH 2014) PROCIDA (NAPOLI) - ITALY

The Symposium is scheduled to be held on March 26-29, 2014 in the fascinating island of Procida (Gulf of Naples-Italy). It aims to foster interaction among all concerned academicians, practitioners and researchers from different disciplines working on underwater sciences and research. Furthermore, it is anticipated to provide a platform for exchange of scientific and technical information and experiences among participants. 57 papers and 120 scientists on underwater archaeology, marine biology, underwater medicine and similar disciplines took part during the symposium. The University of Naples "L'Orientale", with GAMA - General Association on Mediterranean Archaeology and DAN - Divers Alert Network organizes and promotes the 8th International Symposium on Underwater Research

2013 AUSTRALIAN INSTITUTE OF MARITIME ARCHAEOLOGY WORKSHOP AND CONFERENCE TOWARDS RATIFICATION: AUSTRALIA'S UNDERWATER CULTURAL HERITAGE

CANBERRA, AUSTRALIA 3-6 OCTOBER 2013.

JANE MİTCHELL - CHELSEA COLWELL-PASCH

The conference room was dark and focused, the discussions broad in range, and the debate, at times, robust. Delegates from UNESCO, Europe, and across Australia and the Pacific had come to Canberra to share their research and discuss the effects, benefits and work required to ratify the UNESCO 2001 Convention on the Underwater Cultural Heritage.

Organised by the Australasian Institute of Maritime Archaeology (AIMA), the conference was held on the picturesque grounds of the Australian National University. The location of Canberra was selected in an effort to bring the leading advocates for ratification of the UNESCO convention to Australia's capital city, home of the Federal government. The proceedings were broken into two separate parts, the pre-conference workshop and the conference proper.

Fig. 3: The official 2013 AIMA Conference poster [Courtesy of AIMA]

The UNESCO 2001 Convention on the Protection of the Underwater Cultural Heritage Workshop

The workshop was held with hopes to review progress made overseas and throughout Australia towards the ratification of the 2001 Convention, to construct a strategy for Australian ratification based on this progress, and to better manage Australia's underwater cultural heritage and surrounding legislation. The official welcome to the workshop was given by Graeme Henderson, Research Associate at the Western Australia Museum and integral proponent to the formation of the 2001 Convention. The workshop ran over the course of one day and consisted of an expert panel meeting, three chaired sessions and a roundtable discussion.

The first session, titled The UNESCO Convention on the Protection of the Underwater Cultural Heritage, was chaired by Dr. Lyndel Prott Director of UNESCO's Division of Cultural Heritage and mediator for the drafting of the 2001 Convention. During this session, Dr. Patrick O'Keefe, touched on the reasons for the Convention's drafting.

Dr. O'Keefe was the foundation Chairman of the International Law Association's Committee on Cultural Heritage Law, he was directly involved in the preparation of the draft instrument which formed the basis of the 2001 Convention. This topic was then expanded upon by Henderson as he afforded a maritime archaeologist's perspective to the 2001 Convention's drafting. It was truly a rare and unique experience to have the three major Australian contributions to the formation and drafting of the 2001 Convention explain, in their own words, the complexities of the process. The last topic of the section considered the need for Australia to ratify the convention and was presented by Associate Professor Craig Forrest from the University of Queensland.

The second session of the workshop, chaired by Dr. Bill Jeffery (Flinders University), looked into the extent of progress towards ratification and the strategies employed. Presenters in this session discussed ratification progress of Australia, India, and the Netherlands, as well as Tanzania. The third session discussed how ratification was achieved in Spain and Belgium but also included an update on the status and development of ratification by Ulrike Guérin, Secretariat of the 2001 Convention for UNESCO.

The second session of the workshop, chaired by Dr. Bill Jeffery (Flinders University), looked into the extent of progress towards ratification and the strategies employed

The final session of the pre-conference workshop was a roundtable discussion regarding ratification in Australia. The public, attending scholars, specialists, and experts in the fields of archaeology, history, cultural heritage, and international law, along with members of other disciplines, were all encouraged to participate in the workshop. It was quite a sight to have industry leaders, UNESCO representatives and those who drafted the 2001 Convention all present to discuss approval of the Convention. The excitement was palpable as discussions and discourse surrounding the future of Australia's underwater cultural heritage flew around the room. The implications discussed will be used by AIMA and the Department of Sustainability, Environment, Water, Population and Communities (Canberra, ACT) to work towards ratification. The workshop was concluded with both spirits and hopes high for ratification by Australia.

THE AIMA CONFERENCE

The conference began with an official welcome to Ngunnawal Country by the traditional owners of the land, before Professor Howard Morphy, Director of the Research School of Humanities and the Arts at the Australian National University, opened the conference.

Dr. Mariano J. Aznar-Gómez delivered the morning's keynote address. Dr. Azna-Gómez took the delegates on a discourse titled Treasure hunters, sunken state vessels and the 2001 UNESCO convention. The difficulties surrounding the legal status of sunken vessels in foreign waters have been a deterrent for some countries to ratify the UNESCO convention. Azna-Gómez discussed the cases of two Spanish state vessels, Juno and La Galga de Andalucía wrecked in US territorial waters in the late eighteenth and early nineteenth centuries respectively. These vessels became the target of treasure hunters who argued the ships were abandoned and therefore could be salvaged. The extended court cases that travelled through to the highest court in the US determined the vessels were in fact state vessels and as such were still legally owned by the flag nation.

In the first conference session participants discussed Australia's Indigenous underwater cultural heritage, which is a developing area of study in Australia. Professor Ian McNiven talked about the indigenous population's relationship with the land. Speaking in relation to Northern Australia and the Torres Strait, he described the notion of land ownership as a spiritual idea and one that is central to their identity.

Abhirada Komoot, from Silpakorn University in Thailand, bought to the table the idea of incorporating indigenous laws, both tangible and intangible, into heritage laws that often have a European-centric focus.

Contributors in the second session of the day revisited many of the themes discussed during the ratification workshop. Ulrike Guérin provided a broad overview of the UNESCO 2001 Convention, and some of the issues faced.

The third session was devoted to aircraft archaeology. As noted by Dr. Silvano Jung, this session on aircraft as underwater cultural heritage was a first for an AIMA conference. This is particularly relevant as there is little current legislation in Australia protecting aircraft, despite the fact that in Australia, there have been some significant archaeological studies of aircraft over the past twenty years.

It was a useful introduction for those delegates who had been unable to attend the workshop. Dr. Aznar-Gómez's second paper of the day discussed the legal content of the 2001 Convention and how the convention fits in with, and attempts to fill the gaps of the UNESCO Law of the Sea.

The next few papers dealt with particular states' efforts to ratify the 2001 Convention. Forrest presented a paper outlining the legal ramifications for Australia of ratifying the 2001 convention and how changing the laws can be positive.

Martijn Manders from the Dutch Cultural Heritage Agency then discussed the status of the Netherlands Government in ratifying the 2001 Convention. The Government originally declined to vote in 2001 and is slowly coming around to the possibility of ratifying. Robert Yorke, Chair of the Joint Nautical Archaeology Policy Committee in the UK, outlined the results of a recent review set up to determine the extent of compliance of the British Government with the rules of the 2001 convention.

The third session was devoted to aircraft archaeology. As noted by Dr. Silvano Jung, this session on aircraft as underwater cultural heritage was a first for an AIMA conference. This is particularly relevant as there is little current legislation in Australia protecting aircraft, despite the fact that in Australia, there have been some significant archaeological studies of aircraft over the past twenty years. Ratification of the 2001 convention would provide better protection for aircraft than is currently the case. Danielle Wilkinson presented a broad overview of the history of the aircraft, including technical developments and an insight into some significant aviation archaeology work. This included the major work conducted on the Catalina flying boat wrecks in Darwin Harbour, NT and Broome, WA. Dr. Jung's paper discussed how his studies have helped determine that there are three more Catalina flying boats still to be found lying in Roebuck Bay, Broome. Jung made the point that some aircraft sites such as those at Broome have current significance for the Dutch who commemorate the air raid that killed Dutch refugees escaping from Java, Indonesia. But the Australian nation does not recognise the significance of the air raids nor are they listed on the Commonwealth Heritage list.

Heritage Victoria's maritime archaeologist, Peter Harvey, discussed the work completed so far on aircraft in Victoria, a regionthat is better than many other states in Australia as the Heritage Act (1995) protects aircraft relics older than 50 years. However, not much work other than a desktop study has been completed to date. Law Ph.D. candidate from the University of Canberra, Kim Browne, took the conference delegates on a virtual tour of Chu'uk's abandoned World War II airfields and aviation sites. Browne discussed the effects of the war on the tiny lagoon and surrounding islands and the devastation wrought by "Operation Hailstorm', the bombing raid on the Japanese fleet by Allied forces in 1944. Browne argues that the relics remaining on Chu'uk are valuable cultural heritage and should be protected as such.

The local Chu'ukese people, however, see no value in the World War II wrecks except as sources of shelter or ammunition for fishing. Grahame Anderson reported on his expeditions to Tasmania in anattempt to find the flukes of one of Abel Tasman's anchors, lost in North Bay in 1642.

The conference's first day ended with a public lecture by Turkey's Assistant Professor A. Harun Özdas. The audience numbers swelled as members of the public joined the conference delegates to hear about Dr. Özdas' work coordinating the Shipwreck Inventory Project of Turkey. Illustrated by beautiful images of wrecked ships and stacks of amphorae resting along the Turkish coastline, Dr. Özdas took the audience on a journey through maritime history.

The next session was centered on in-situ preservation and conservation of underwater cultural heritage; a particularly important topic in relation to the conference theme. Martijn Manders introduced the European research project designed to survey, assess, stabilize, monitor and preserve underwater archaeological sites (SASMAP).

The project aims to develop new techniques and establish best practice in underwater preservation techniques. Agni Mochtar from the Centre of Archaeological Research in Indonesia discussed the importance of Indonesian underwater cultural heritage on a local, national and international level. She also outlined the difficulties faced by Indonesia including the development of methodologies, a lack of resources and limited equipment.

Vicki Richards, from the Western Australian Museum, presented a paper prepared by Jon Carpenter on the excavations of 12 whaling ships located in reclaimed foreshore at Bunbury, WA. Due to proposed site development works, the ships were excavated and extensive in-situ conservation surveys were conducted to determine extent of deterioration of the site once uncovered. The project aims to develop informed management strategies and long-term preservation of the site.

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The second day of the conference was opened with a keynote address by Tim Smith. Smith has been coordinating fieldwork on the Australian World War I submarine AEII that rests in the Sea of Marmara off the Turkish coast.

The submarine played a key, but often understated role in the Battle of Gallipoli beach landings. Smith discussed the next stage of this joint Australian/Turkish project scheduled for 2014, in which a camera will be inserted into the conning tower of the submarine in order to get still photographs and video footage of the internal spaces. This requires interference to the hatch of the conning tower, which needs careful design and planning and importantly, Smith noted, intensive negotiation to obtain permits.

Mike McCarthy presented the next paper prepared by Adam Wolfe on the history and fate of SS Papanui. Lost off the island of St. Helena in the South Atlantic, this Australian vessel represents the challenges facing the management of Australian underwater cultural heritage located in isolated and foreign waters.

Andrew Viduka, Australia's Commonwealth maritime archaeologist, then presented on Australia's sovereign shipwrecks and P.O.W. transport ships located in overseas waters. In the paper he also discussed the possibility of partnerships that Australia could develop with other countries to manage these wrecks.

Vicki Richards opened the next session with a paper discussing the Australian Historic Shipwreck Preservation Project, incorporating studies of two shipwrecks Clarence in Victoria and James Matthews in Western Australia. Richards outlined the two very different plans to preserve the wrecks that will provide a comparative analysis of in-situ preservation protocols that will help to establish best practice. Dr. James Hunter from the South Australian Maritime Museum, fresh from fieldwork in Queensland, discussed a project to archaeologically record HMCS Protector using structured-light scanning technology. HMCS Protector now serves as a breakwater off Heron Island on the Great Barrier Reef after a long career of public service. Hunter discussed the project's aim to bring the ship 'virtually' to South Australia for a museum exhibit by constructing 3D models of the vessel.

Disseminating information is becoming more of an issue as the industry moves towards in-situ protection of underwater cultural heritage. Cassandra Philippou, as part of her role as Project Manager for the Australian Historic Shipwreck Preservation Project, introduced conference delegates to 'Biblioboard', an online library system established in 2011. While the platform is still in its infancy and relatively unproven, Philippou discussed the potential of the technology to reach a wide audience.

Debra Shefi's paper questioned the adequacy of the definition of in-situ preservation in the context of the 2001 convention. She discussed the idea that the definition may not be robust enough and may cause confusion for future legislators and practitioners. Then Flinders University Ph.D. candidate, Madeline Fowler, discussed her research of South Australian missions. Fowler's research incorporates archaeological recording with the collection of oral histories and historical data at missions with the aim of increasing the presence of indigenous people in Australia's maritime cultural heritage. The session on commercial exploitation of underwater cultural heritage was perhaps the most controversial. Robert Yorke's paper outlined his concerns regarding the future of HMS Victory and the possibility that the 2001 convention could be exploited for treasure-hunting gains. Elena Perez-Alvaroi, a Ph.D. candidate from the University of Birmingham, discussed the use and destruction of ancient Roman lead artifacts found on shipwrecks, in particle physics experiments. Patrick O'Keefe then discussed the definition of 'commercial exploitation' in relation to Rule 2 of the 2001 convention and argued that Rule 2 is one of the most important provisions in the convention.

Capacity in underwater cultural heritage management is an important issue for countries looking to ratify the 2001 convention but without the economic means to protect their heritage or educate the public. Martijn Manders discussed the UNESCO Foundation Courses held at a venue in Chanthaburi, Thailand between 2009-2011. Over three years these courses have been offered to more than 70 students coming from 17 countries across Asia and the Pacific in all aspects of underwater cultural heritage management. Ama Dayananda, from the Central Cultural Fund in Sri Lanka, outlined the Underwater Cultural Heritage Tourism Project (UCHTP), a project run in Galle, which aims to use trained maritime archaeologists to educate tourists about Sri Lankan cultural heritage. Elia Nakoro, from the Fiji Museum, then presented a paper on the state of protection on Fiji's underwater cultural heritage, which consists of at least 500 shipwrecks. The Fijian government is preparing to discuss ratification of the convention and Nakoro outlined the difficulties the few qualified practitioners will have in ongoing protection of these sites.

Overall, the conference was a success in allowing a forum for discussion of the benefits and drawbacks for ratifying the 2001 UNESCO Convention for the Protection of the Underwater Cultural Heritage. Conference delegates were able to see the effort going into ensuring the convention is robust and suitable as a management tool for the world's collective underwater cultural heritage.

The first archaeological excavation of an ancient shipwreck in the Mediterranean was carried out in Turkey by Dr. George Bass at Cape Gelidonya in 1960. Until that time underwater excavations were directed by non-diving archaeologists who simply instructed commercial divers to raise samples of whatever they found on the shipwreck site. While this did help in establishing the chronology of artifacts of the period most of the archaeological potential of these excavations was lost.

At Cape Gelidonya Dr. Bass decided that the excavation should be carried out exactly like it would be on land. This meant excavating the site it down to bedrock and measuring the location of every artifact recovered in order to make a precise archaeological site plan.

In 1994 I returned to Cape Gelidonya with Dr. Bass on an INA survey of the shipwreck site and the surrounding seabed. The large Mycenaean jar I found was certainly one of the most exciting discoveries of my career.

The photograph: Donald Frey (INA Archive)

MASTER PROGRAM IN UNDERWATER ARCHAEOLOGY AT ARCHAEOLOGY DEPARTMENT OF EGE UNIVERSITY:

As a subdiscipline of archaeology, underwater archaeology explores the maritime activities which had a significant role in the expansion of cultures, the maritime culture that developed in relation to these activities, and the cultural evidence that remains underwater due to various preservation environments and variable. Nautical or underwater archaeology requires expertise from other disciplines to uncover traces of diverse activities that were involved in the development of relevant intercultural relations.

Although many shipwrecks and submerged settlements have been identified in our territorial waterse, relatively few have been surveyed or excavated, inpart or completely. The fact that Turkish scientists have conducted only a small proportion of these archaeological excavations indicates a lack of qualified Tuirkish personnel in this field. It is critical to take measures to increase our activities, both survey and excavation, conducted underwater. The Master's Program in Underwater Archaeology that was announced in 2013 by the Archaeology Department of Ege University is one such contribution to the activities initiated by our universities toward this goal. Thus far, our university has qualified students for requirements of many otheruniversities. The program has been recently enveloped under the umbrella of the Social Sciences Institute of Ege University, and applied courses are carried out with technical support of the Faculty of Fisheries and Research and Application Center of Underwater. The program is a result of the collaborative work of Social and Physical Sciences and became was further enhanced when two professors from the Institute of Marine Sciences at Dokuz Eylül University joined our program. The main objective of the Master's Program in Underwater Archaeology is to train qualified scientists who will increase the quantity of scientific research in the field of archaeological sciences. Theoretical courses will be provided by the instructors of the Archaeology Department at the Faculty of Letters, Ege University, while practical trainings and other underwater courses will take place at the facilities and aboard research ships of the Faculty of Fisheries and Research and Application Center of Underwater of Ege University. The Master's Program in Underwater Archaeology has an archeaology based curriculum within a multi-disciplinary program started in the Academic Year 2013/14. It is based on the technical infrastructure of Research and Application Center of Underwaterof Ege University with contributions of the professors from the Institute of Marine Sciencesof Dokuz Eylül University. Below is a list of lectures and lecturers of the program:

❖ *FALL SEMESTER:* Introduction to Maritime Archaeology, (Compulsory) (Theoretical) (Assoc. Prof. Dr. Ahmet Kaan ŞENOL); Commercial Vessels of Antiquity, (Compulsory) (Theoretical) (Assoc. Prof. Dr. Gonca ŞENOL); Ancient Shipbuilding Technology and Typology (Elective) (Theoretical) (Ass. Prof. Dr. Harun ÖZDAŞ); Scuba Diving I (Elective) (Applied) (Prof. Dr. Cengiz METİN); Underwater Imaging Technology (Elective) (Applied) (Prof. Dr. Altan LÖK); Geophysical Survey to Locate Shipwrecks (Elective) (Theoretical) (Dr. Nilhan Kızıldağ, instructor)

❖ *SPRING SEMESTER:* Trade Relations in the Mediterranean, (Compulsory) (Theoretical) (Assoc. Prof. Dr. Ahmet Kaan ŞENOL); Mediterranean Harbor Structures (Compulsory) (Theoretical) (Ass. Prof. Dr. Aytekin ERDOĞAN); Underwater Research and Excavation Techniques (Elective) (Theoretical) (Ass. Prof. Dr. Harun ÖZDAŞ); Scuba Diving II (Elective) (Applied) (Prof. Dr. Cengiz METİN); Advanced Diving Techniques (Elective) (Applied) (Prof. Dr. Altan LÖK) Seminar, (Compulsory) (Theoretical) (Assoc. Prof. Dr. Gonca ŞENOL)

THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) OFFICE OF NATIONAL MARINE SANCTUARIES WISHES TO ANNOUNCE THE 2ND ASIA-PACIFIC REGIONAL CONFERENCE ON UNDERWATER CULTURAL HERITAGE WHICH WILL BE HELD IN HONOLULU, HAWAII, 12-16 MAY 2014.

BRIAN FAHY

Recent decades have witnessed an expansion of activity directed at underwater cultural heritage which has raised awareness of the potential and importance of this heritage. There has also been a realisation of the threats to this material from human activities and natural action, sea-level rise and erosion, increased development, industrial extraction, exploitation of marine resources and SCUBA diving activities, which are all contributing to damage and loss. This period of relatively rapid change has increased pressure on governments, heritage groups and agencies, coastal zone managers, diving groups, and other users to formulate an approach to managing the underwater cultural heritage.

Management agencies are increasingly aware of their responsibilities for stewardship of our special ocean areas, and those responsibilities include historical, archaeological, and cultural resources. These properties beneath the sea comprise a unique archaeological and cultural record of our national and international seafaring past. The ocean is a highway, and sea voyaging is transnational and multicultural in nature. Therefore, the broader context for understanding and preserving the underwater cultural heritage in specific locations (like Hawaii) is the Asia Pacific region.

Preservation of the underwater cultural heritage provides tangible values beyond just archaeological data. Projects often directly engage the public in scientific research and marine stewardship. Nautical archaeology classes provide preservation training for sport divers. Models of responsible heritage tourism have proven economically successful in several other locations.

The 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage provides a basis for international cooperation in underwater cultural heritage. The Convention's Annex, a template for management practices in this field, provides a set of operational rules. This guidance and capacity is needed in the Pacific, where islands often face the combined challenges of lack of funding, visitor impacts, climate change, exploitation of marine resources, looting, and more. Understanding heritage resources is a way of preserving cultural identity in times of change.

Preservation of the underwater cultural heritage provides tangible values beyond just archaeological data. Projects often directly engage the public in scientific research and marine stewardship. Nautical archaeology classes provide preservation training for sport divers. Models of responsible heritage tourism have proven economically successful in several other locations. The heritage field, particularly in Pacific Island nations, has measurable socioeconomic benefits.

The 2nd Asia-Pacific Regional Conference on Underwater Cultural Heritage, hosted by the National Marine Sanctuary Foundation and University of Hawaii, aims to:

❖ Address management and protection strategies of underwater cultural heritage in Asia and the countries of the Indian and Pacific Oceans in the 21st Century

❖ Facilitate regional cooperation through the development of academic and governmental networks in the Asia-Pacific region

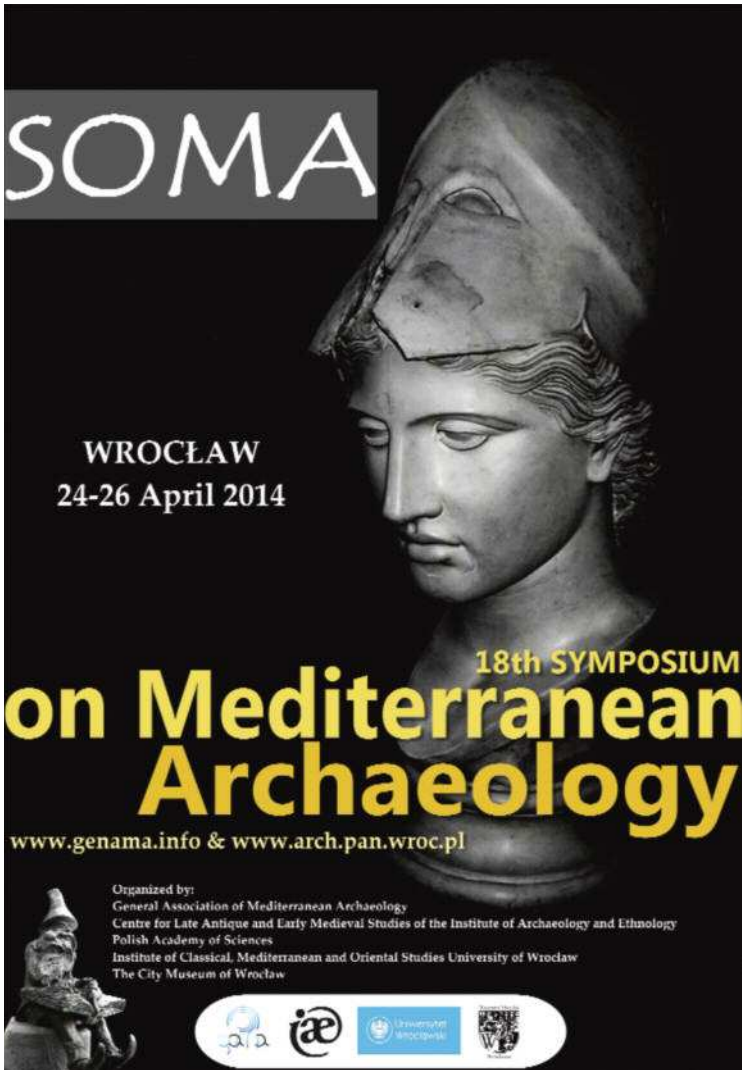
❖ Provide a forum for discussion of technical and ethical issues related to underwater cultural heritage and underwater archaeology

A wide range of people involved with underwater cultural heritage are encouraged to attend, including those from universities, government agencies, museums, NGOs, IGOs, the private sector, and the local community. This conference follows the inaugural Asian Academy for Heritage Management (AAHM) Asia-Pacific Regional Conference hosted by the National Museum of the Philippines, held on November 8-12, 2011. It brought together 290 participants from nearly 50 countries and succeeded in capacity building within the region with many delegates creating collaborative projects. The proceedings were published in hard copy as well as online, free to download (http://www.themua.org/collections/items/browse?collection=2).

Currently, keynote speakers for this event include Dr. James Delgado, Director of the Maritime Heritage Program for the U.S. National Oceanic and Atmospheric Administration (NOAA) and Dr. Sayan Praicharnjit from the Centre for Community Archaeology Research and Development in Thailand.

If you have an interest in underwater cultural heritage or underwater archaeology in the Asia-pacific region we encourage you to attend. Stipends may be available to those who qualify. For further information visit our website, www.apconf.org.

18TH SYMPOSIUM ON MEDITERRANEAN ARCHAEOLOGY (SOMA 2014) WROCLAW – POLAND / 24-26 APRIL, 2014



The eighteenth annual meeting of the Symposium on Mediterranean Archaeology (SOMA) will be held in Wrocław-Poland on 24-26 April 2014. As it has been in the past, this symposium will continue to provide an important opportunity for scholars and researchers to come together and discuss their works in a friendly and supportive atmosphere. Spectrum of the symposium is growing wider due to the increased importance and knowledge of interdisciplinary works in today's scientific era.

Since prehistoric times the Mediterranean has been acting as a locale for interaction between groups inhabiting regions that are now studied mainly within the different sub-fields of ancient studies. In recent years, however, the development of research techniques and analytical models of archaeological evidence have identified similar historical paths that are similar if not, in some cases, common to these different areas of the ancient world from the West (Iberian peninsula) to the East (Anatolia and Levant) from the North (Europe, Black Sea Coast) to the South (Maghreb and Egypt).

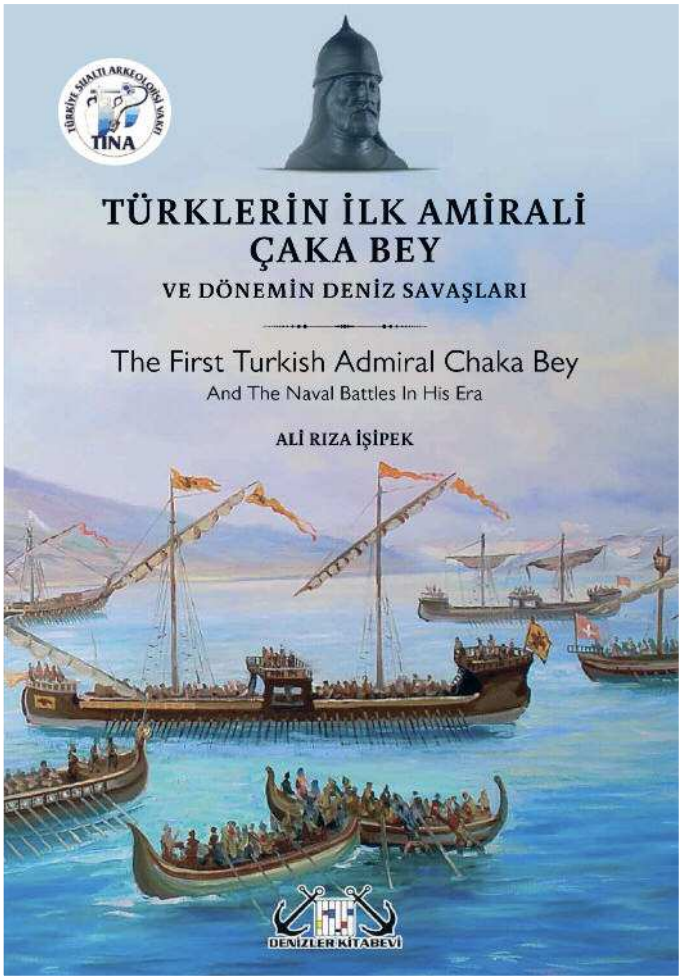
The 18th SOMA meeting welcomes presentations related to the above-mentioned topics and also arguments like sea, trade, colonization and piracy using archaeological data collected within contexts located within the Mediterranean basin and the Ancient Near Eastern area, chronologically ranging from Prehistoric to Medieval periods.

ORGANIZED BY:

Centre for Late Antique and Early Medieval Studies of the Institute of Archaeology and Ethnology Polish Academy of Sciences

General Association of Mediterranean Archaeology

Institute of Classical, Mediterranean and Oriental Studies University of Wrocław. The City Museum of Wrocław



Approximately fifteen years after its founding, the TURKISH FOUNDATION FOR UNDERWATER ARCHAEOLOGY (TINA) is contributing to the recorded history of our seas with a new publication, sharing with readers the jusitifiable pride of the only commemorative work on the first Turkish Admiral Chaka Bey.

Information and records about Emir Chaka Bey are very limited, therefore, this publication aims to pass his legacy to the next generations beyond fidelity and rememberance for such a legendary character.

It is known that the Turcoman Chaka Bey conquered Smyrna and subsequently founded the first Turkish independent state there (1081-1092). He also started the maritime chapter of Turkish history and shook the Byzantine Empire, whose members described Chake Bey as an energetirc leader. He was also known as Chavuldur Chaka Bey from the Danishmend Bey's retinue, a member of left branch tribes of Oghuzes. He was a well-read Turcoman Bey who had full command of Greek and read Homer's poem "The Night is Falling" aloud during a conversation with Byzantine Commander Dalassenos.

I would like to express my thanks to those who gave their efforts and to the Board of Trustees of TINA, for providing full support for the publication of this book about Chaka Bey.

Oğuz Aydemir

TINA Turkish Foundation for Underwater Archaeology Chairman of the Board

TINA MARITIME ARCHAEOLOGY PERIODICAL

PERIODICAL OF TURKISH UNDERWATER ARCHAEOLOGY FOUNDATION

TINA periodical is published twice a year, in May and in November. The articles you wish to publish must be sent in 3 months prior the printing date. TINA will publish maritime archaeology work from all over the world, mainly on the Anatolian and Mediterranean shores.

Publication guidelines

Articles should be presented as Word files.

Font size is 11 for texts and figures; and 9 for abstracts, footnotes, catalog and bibliography, and font type is Times New Roman overall.

Footnotes should be numbered in the order in which they appear in the text and be placed at the bottom of each page and numerical continuity followed throughout the article.

Titles within the text must begin with bold miniscules.

Use of punctuation:

Abbreviation of figure “fig.” inscriptions within text should be cited in parentheses as (fig. 1); a space should be placed between the inscription “fig.” and the number to follow; if consecutive figures are mentioned, then a dash should be placed between the two numbers without space before or after the dash, (e.g., fig. 3-5). If the figures are not consecutive, then a comma and a space should be placed after each number except the last one (e.g., fig. 5, 8, 14).

In the bibliography and abbreviations section, if the author has two last names, a dash should be placed between the two names without spaces (e.g., ÖZSOY-SADIK); if an article has multiple authors, a space, a dash, then a space again should be placed after each name, and then the other name should follow (e.g., ALTAN – ERCAN).

“Bibliography and Abbreviations” section should be placed at the end of the article and the abbreviations used in footnotes should be explained here. References used in footnotes should be written in unabbreviated form for the first time, and then abbreviated if multiple. The order of author’s name, date of publication, page (and plate or picture if any) should be followed in abbreviations.

Bibliography order should follow last names as listed in alphabetical order.

Words originating from extinct languages should be written in italic form.

Bibliography (for books):

Green, J., *A Technical Handbook*, London 2004

Bibliography (for articles):

Bass, G., Van Doorninck, F. H., "A Fourth-Century Shipwreck at Yassı Ada", *AJA*, Vol. 75, No. 1, January 1971, 27-37.

Footnote (for books):

GREEN 2004, 19.

Footnote (for articles):

BASS – VAN DOORNICK 1971, 32, Pl. 2, Fig. 8.

The abbreviation "fig." should be used for the description of all pictures, drawings, and maps and should be numbered in the order in which they appear in the text (Descriptions such as Plate, Picture, Drawing, Figure, Map or any other type of description or their abbreviations should not be used under no circumstance).

Figures should contain 300 dpi of resolution; format should be in raw, tif or jpeg.

Photograph size for the tablet version of the magazine should be 1024x768, and the video should be in mp4 form. The photographs and video material that do not conform to above mentioned criteria shall be converted into the required format by the journal. The author (-s) shall be deemed to have accepted such a conversion.

Articles and figures placed in different folders are to be uploaded to e-mail or written to CDs, and sent via courier service. A printed version of the article should be sent via the courier service as well.

The author is responsible for figures from sources other than his/her own. Therefore, the source should be referred.

Articles should contain a list of figures following the main text.

Text should conform to above mentioned criteria and not exceed 15 pages except for special issues.

Articles should be written in Turkish or English.

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