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# Underwater Cultural Heritage in the Arab States Region



Published in 2023 by the United Nations Educational, Scientific and Cultural Organization  
7, place de Fontenoy, 75352 Paris 07 SP, France and UNESCO  
Regional Bureau for Sciences in the Arab States - Cairo

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CLT/FU/CAI/2022/BRO/10

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## **Acknowledgments**

This information brochure would not have been realized without the support, encouragement, and assistance from the experts and officials engaged in Underwater Cultural Heritage protection in the Arab Region States. We would like to express our deepest appreciation to Dr Toufik Hamoum for reviewing this brochure. We are grateful to Mr Edouard Planche, Ms Chihiro Nishikawa, Ms Alison Faynot, and Ms Ulrike Guerin at the Culture Sector at the UNESCO Headquarters for their review. We would also like to acknowledge the assistance of the UNESCO Field Offices in the Arab States Region. Our special thanks go to Ms Gemma Tully, Ms Amal Gad, and Ms Basma Dajani for copy-editing work.

## Preface

I am pleased to present this information brochure on the Underwater Cultural Heritage in the Arab States Region. This brochure aims to introduce the UNESCO 2001 Convention on the Protection of Underwater Cultural Heritage, present the key Underwater Cultural Heritage (UCH) sites in the Region and highlight their contribution to the 2030 Agenda for Sustainable Development and the Implementation Plan of the UN Decade for Ocean Science for Sustainable Development.

The Region is home to rich heritage in all its dimensions – tangible and intangible, movable and immovable, and land-based and submerged. With the long coastline, the Region has a significant wealth of UCH covering some coastal World Heritage sites and biosphere reserves.

The UCH Convention was ratified by 70 countries, including 12 countries in the Arab States Region. The UCH Convention aims to strengthen the protection of UCH, which bears testimony to historical events, trade and exchange, climate change and also natural disasters, to reconstruct past cultures and advance climate knowledge.

Another important feature of the UCH Convention is its State Cooperation Mechanism. This Mechanism allows the international community to develop comprehensive protection of UCH including those in waters beyond the national jurisdiction, or the Area of High Seas, contributing to establishing effective Ocean Governance. The brochure presents the ongoing unique cooperation on the UCH in the Skerki Bank (Tunisia) and the Sicilian Channel (Italy) in this regard.

Besides its scientific and cultural significance, UCH makes economic contribution through coastal and marine tourism. It brings ocean-based new experience to the community and youth, providing an important basis of the Ocean-Based Blue Economy.

I would like to thank Prof Emad Khalil, Director of the Centre for Maritime Archaeology and Underwater Cultural Heritage (CMAUCH) at the Alexandria University, which hosts the UNESCO Chair for UCH, for invaluable contribution to make this brochure available. UNESCO hopes that government officials, policy makers, researchers and communities engaged in UCH and sustainable development will enjoy this brochure to have a better knowledge of our treasures and to enhance international cooperation in this area.

Dr Nuria Sanz, Officer-in-Charge, UNESCO Regional Bureau for Sciences in the Arab States

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# Introduction

Underwater Cultural Heritage (UCH) is defined by UNESCO as “all traces of human existence having a cultural, historical or archaeological character which have been partially or totally under water, periodically or continuously, for at least 100 years such as:

- i.** sites, structures, buildings, artefacts and human remains, together with their archaeological and natural context;
- ii.** vessels, aircraft, other vehicles or any part thereof, their cargo or other contents, together with their archaeological and natural context; and
- iii.** objects of prehistoric character”<sup>1</sup>.

This definition relates primarily to the age and environmental conditions of the deposit, i.e., the remains must have existed fully or partially “underwater” for at least 100 years, regardless of their type, nature, or the culture to which they belong. Once these core elements have been confirmed, the archaeological material can be defined further according to one or more specific criteria: - chronology – the time period the remains date from; - region – the geographical area where the remains were found; - typology – the physical categorisation of the remains, e.g., pottery, animal bone, stone etc.

It is important to recognise that while the above criteria will remain constant, the “underwater” nature of the archaeological remains is subject to change, as a result of either human or environmental intervention. For example, many sites where prehistoric activity took place on land, usually close to ancient shorelines, are

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• 1 - UNESCO. 2001. Convention on the Protection of the Underwater Cultural Heritage. Paris: Records of the General Conference, 31st session, Article.

now submerged due to rising sea levels. Similarly, items such as swords, deposited in lakes or rivers as part of past rituals, were made and used on land. These sites and artefacts have therefore come to meet the definition of “Underwater Cultural Heritage”. The opposite process is also possible: a shipwreck, for example, or other material remains lifted from the seabed and placed in a museum would lose its status as UCH.

This nuance tells us that UCH is not necessarily a constant scientific term. It relates to the underwater environment in which the material culture is located rather than any inherent archaeological or cultural attribute<sup>2</sup>. That is not to say that the material culture’s underwater location is not important: on the contrary, the underwater context reveals changes in use, condition and meaning over time (Fig.1). The physical changes that the underwater environment can cause, such as corrosion or decay, and the natural, social and ideological changes that underwater locations can reflect, therefore, are vital parts of a site or object’s life history.

The underwater location is also a key factor in determining which scientific techniques and methods to use when dealing with this type of material culture for purposes of exploration, research, documentation, excavation, conservation, presentation or public display. Thus, the study of UCH usually requires the use of tools and techniques that differ from those employed on terrestrial archaeological sites<sup>3</sup>. For this reason, UCH is frequently mentioned in association with underwater archaeology, i.e., archaeological work, such as excavation, recording and analysis, that takes place on partially or fully submerged sites. Underwater archaeology is governed by the same scientific principles and standards as archaeological work on land but is tailored to the specific challenges of underwater conditions<sup>4</sup>. The term “underwater archaeology” is not, therefore, a sub-discipline of archaeology. Instead, it is a technical term referring to a specific set of tools and techniques used in conducting archaeological work underwater, within the wider framework and principles of archaeological research<sup>5</sup>.

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- 2 - Bass, G. 1970. *Archaeology Underwater*. Harmondsworth: Penguin, p. 13.
  - 3 - Bowens, A. (ed.). 2008. *Underwater archaeology: The NAS guide to principles and practice*. Oxford: Blackwell Publishing.
  - 4 - Delgado, J. P. 1997. *Underwater Archaeology*. In J. P. Delgado (ed.), *Encyclopaedia of Underwater and Maritime Archaeology*. New Haven: Yale University Press, p. 436.
  - 5 - Bass, G. (ed.). 2005. *Beneath the Seven Seas*. London: Thames & Hudson.



• Fig. 1: The colossal statue of a Ptolemaic king found within the ruins of the Pharos Lighthouse of Alexandria, Egypt.  
© CMAUCH/Emad Khalil



## The Pharos Lighthouse (Egypt)



With a coastline that extends for more than 34,000 km and borders the Atlantic Ocean, Mediterranean Sea, Red Sea, Indian Ocean and the Arabian Gulf, the Arab Region has an enormous wealth and diversity of maritime and UCH sites, which include some of the most important sites from the ancient world.

Throughout its history, Alexandria has occupied a distinct position among the cities of the world. Since its foundation by Alexander the Great in 331 BC, and for almost a millennium thereafter, Alexandria was the capital city and cultural centre of Egypt. The creation of the port of Alexandria was one of Alexander's first projects at the site. The development involved the construction of a 1.2 km causeway, linking the offshore island of Pharos and the mainland. The outcome was the formation of the Eastern and Western Ports of Alexandria. The Eastern Port, also known as the Great Port, formed the main centre for maritime activity in the newly founded city. It included a number of internal basins which served as commercial, military and private harbours. The significance of the Great Port was further demonstrated by the presence of the Pharos Lighthouse, an architectural wonder, completed around 280 BC, which marked the entrance to the port. The total height of the lighthouse is believed to have been around 110 m. Over time, it was damaged by numerous natural disasters until an earthquake in the 14th century AD destroyed the final visible remains<sup>6</sup>. In fact, the various earthquakes suffered by Alexandria

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• 6 - Empereur, J. -Y. 2004. *Le Phare d'Alexandrie: La Merveille retrouvée*. Paris: Découvertes Gallimard.

• Fig. 2: Remains of the Pharos Lighthouse of Alexandria, Egypt.  
© CMAUCH/Emad Khalil

during its history have also resulted in subsidence of the coastline and led to the submergence of the ancient port's foundations to a depth between 6-8 m<sup>7</sup>.

Since 1994, the Centre d'Études Alexandrines (CEAlex) has been carrying out a large-scale project to survey, excavate and document the submerged remains of the Pharos Lighthouse. The aim of the project is to determine the size and nature of the archaeological site and accurately record its contents<sup>8</sup>. The submerged remains extend over an area of more than 25,000 m square, making the site one of the largest in terms of the global study of submerged architecture. The site contains more than 3,000 objects, including colossal statues, sphinxes, Greek and Egyptian-style columns, parts of obelisks and huge building blocks (Fig. 2)<sup>9</sup>. 36 pieces, excavated from the site in 1995 and 1996, are on display in locations across Alexandria's city centre, including in the open-air museum of the Roman Theatre and outside the Bibliotheca Alexandrina. The majority of items from this unique site, however, remain submerged and can only be visited by divers.

Since 2012, the CEAlex has expanded its research and recording programme at the Pharos Lighthouse to include a digitization project. The project is using

photogrammetry to produce a detailed 3D model of the underwater site and its contents. As of January 2022, more than 70% of the site has been digitized and virtual reconstructions of architectural elements are currently underway. Digital models of the site will be used to raise public awareness and to share information about the history of the Pharos Lighthouse and its surroundings (Fig. 3).



• Fig. 3: Digital modelling of the ruins of the Pharos sites, Egypt. © Archives CEAlex (Cnrs/lfao)

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- 7 - La Riche, W. 1996. Alexandria: The sunken city. London: Weidenfeld & Nicolson.
  - 8 - See: <https://www.cealex.org/recherches/operations-en-cours/phare/>
  - 9 - Hairy, I. 2006. Le Phare d'Alexandrie, concentré de géométrie. *La Recherche*, 394, pp. 44–50.

## The Ancient Port of Alexandria (Egypt)



• Fig. 4: The Eastern Harbour of Alexandria had been in use since its creation in the 4th century BC, until the present day. The underwater survey of the harbour revealed a wealth of evidence for its structure and development during the Ptolemaic and Roman periods. ©AlexMed

In addition to the excavation of the Pharos Lighthouse site, another important underwater archaeology project is taking place inside the ancient Port of Alexandria led by the Institut Européen d'Archéologie Sous-Marine (IEASM)<sup>10</sup>. Since 1992 the IEASM has been conducting a comprehensive underwater survey of the submerged remains of the Eastern Port of Alexandria (Fig. 4). The project has resulted in the discovery of the sunken docks that were in use during the Ptolemaic and Roman eras. It has also revealed the presence of a number of internal harbours which overlooked the city's royal quarter in the Ptolemaic period. The research has enabled specialists to form an accurate picture of the Port of Alexandria during the height of the city's prosperity under Ptolemaic and Roman rule<sup>11</sup>. The work of the IEASM has also recorded hundreds of submerged remains and artefacts, including – amongst others – columns, statues, inscriptions, and parts of obelisks. A number of these objects have been recovered and restored, and have featured in several international exhibitions.

About 30 km east of the ancient port of Alexandria, the IEASM are working on another unique underwater archaeological site in the Bay of Canopus. The bay contains the submerged remains of the ancient towns of Canopus and Thônis-Héracléion. These harbour towns flourished at the end of the ancient Egyptian era. They remained in use until the end of the Byzantine period, providing vital links between the Mediterranean Sea and the Nile valley and controlling maritime traffic entering or leaving Egypt<sup>12</sup>. Since 1996, the IEASM has conducted detailed geophysical, geological and archaeological surveys of the area, locating the submerged remains of both ancient towns at a depth of 4-7 m and a distance of 2-6 km from the current coastline. The expedition also discovered the ancient estuary of the Canopic branch of the Nile, around which these cities were established. The annual Nile flood and the silt and sediments it carried, together with the gradual rise in sea level and the earthquakes and accompanying tsunamis that struck Egypt during the 4th and 8th centuries AD, resulted in the submergence of these ancient towns. The IEASM archaeological project has recorded a wide range of artefacts at the sites, including columns, statues and docks, as well as many architectural elements linked to the buildings that once shaped these towns. Moreover, hundreds of ceramics, tools of daily life, coins, jewellery and votive offerings have been documented. Among the most important archaeological remains found in the Bay of Canopus are more

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• 10 - Goddio, F., Bernand, A., Bernanad, E., Darwish, I., Kiss, Z., & Yoyotte, J. (eds.). 1998. *Alexandria: The Submerged Royal Quarters*. London: Periplus.

• 11 - Goddio, F. & Bernand, A. 2004. *Sunken Egypt: Alexandria*. London: Periplus.

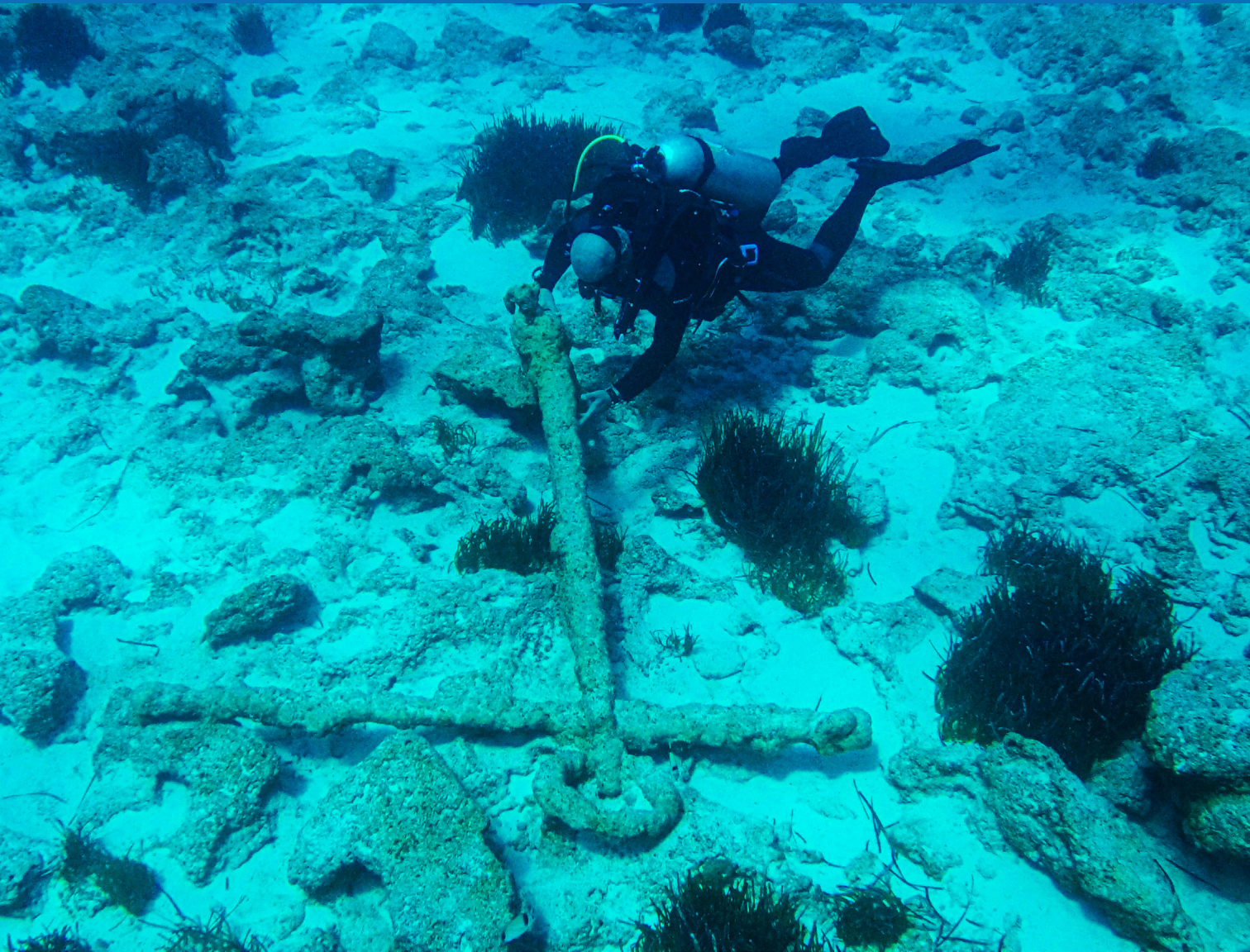
• 12 - Goddio, F. 2007. *Underwater Archaeology in the Canopic Region in Egypt: The Topography and Excavation of Heracleion-Thonis and East Canopus (1996 - 2006)*. Oxford: Oxford Centre for Maritime Archaeology Monograph 1.

than 60 ancient shipwrecks of different dates, which comprise the largest known collection of ancient shipwrecks recorded in one area. The majority of shipwrecks - c. 80% - date to the Late Egyptian and Ptolemaic periods<sup>13</sup>.

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• 13 - Robinson, D. & Goddio, F. (eds.). 2015. *Thonis-Heracleion in Context*. Oxford Centre for Maritime Archaeology Monograph 8, pp. 175–227.

## The Harbour of Marsa Bagoush (Egypt)



• Fig. 5: An archaeologist examining one of more than 40 ancient anchors recorded at the harbour site of Marsa Bagoush, Egypt. © CMAUCH/Emad Khalil



Between 2015 and 2020, the Alexandria Centre for Maritime Archaeology and Underwater Cultural Heritage (CMAUCH) carried out the first systematic archaeological investigation of the ancient sites of Zygris and Ladamantia (present day Marsa Bagoush). This ongoing project resulted in the discovery of a major anchorage site along the northwest coast of Egypt, with evidence of maritime activities extending across more than two millennia. Evidence of several shipwrecks, in addition to a large collection of ancient anchors, was discovered, making the site one of the richest underwater archaeological finds along the northwest coast of Egypt<sup>14</sup>.

The site of Marsa Bagoush covers an area of approximately 3.3 km square, with archaeological material located at an average depth of c.10 m. An underwater survey has, to date, documented c.40% of the site. Evidence of at least three shipwrecks, which date to the Early Roman, Late Roman and Late Medieval periods, has been discovered. In these instances, dating of the underwater archaeological remains has relied heavily on the amphorae found in different parts of the site, alongside a collection of diagnostic ceramics which were raised to the surface for study.

The ceramics dated from the 2nd century BC to the 6th century AD. The collection was documented and photographed before being returned to its point of origin under the water. Photogrammetry techniques were utilised to develop 3D images of the seabed for areas of particular interest. Among the most significant discoveries in Marsa Bagoush are more than 40 anchors of different types and dates. These included stone anchors, lead-stock anchors, Roman iron anchors, Medieval grapnel anchors and 19th century British Admiralty anchors, all of which indicate that the site has been in use for almost 2,000 years (Fig. 5). To date, the Marsa Bagoush survey is the only underwater archaeological project along the Egyptian Mediterranean coast outside of Alexandria<sup>15</sup>.

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• 14 - See: <https://honorfrostfoundation.org/grants-awarded/small-grants/egypt/cmauch/marsa-bagoush/>

• 15 - Khalil, E. 2020. Marsa Bagoush Research Project, Egypt. The Honor Frost Foundation Short Report Series.

• See: [https://honorfrostfoundation.org/wp-content/uploads/2020/03/HFF\\_UTM\\_SR\\_Emad-Khalil\\_figures.pdf](https://honorfrostfoundation.org/wp-content/uploads/2020/03/HFF_UTM_SR_Emad-Khalil_figures.pdf)

## The SS Thistlegorm (Egypt)



Alicia Johnson

• Fig. 6: An archaeologist examining the rudder of the SS Thistlegorm, Egypt. © CMAUCH/Alicia Johnson

Located in the Red Sea, near Ras Mohamed at the southern tip of the Sinai Peninsula, the wreck of the SS Thistlegorm is one of the world's most famous diving sites and attracts thousands of sport divers every year. The SS Thistlegorm was a British merchant steam vessel built in Sunderland, in the UK, in 1940. The ship was 128 m in length, 18 m in beam and had a gross tonnage of 4,898 tons. The SS Thistlegorm carried out three successful voyages to the USA, Argentina and the West Indies before her fourth and final voyage in 1941. Destined for Alexandria from Glasgow with supplies to support the Allied war effort in Egypt, the SS Thistlegorm's hold contained a range of provisions, including ammunition, trucks, motorbikes, trains and parts for aircrafts. Before reaching Alexandria, the ship was sunk by the German air force on 6 October 1941 just off Egypt's Red Sea coast.

The wreck now lies at a depth of 32 m and although it is widely known as one of the best wreck diving sites in the world, the ship and her history are little known to the wider public, either in Egypt or elsewhere<sup>16</sup>. Every day during summer season, an average of 8-10 diving boats, each carrying around 20 divers, moor above the wreck. Each diver carries out 2-3 dives on the wreck, meaning that between 300-600 dives are conducted every day on the SS Thistlegorm. This has had several negative effects on the site over the years. For example, items from the wreck have been looted, inexperienced divers with poor buoyancy control often bump into fragile metal parts of the wreck and cause damage and some dive boats moor directly on to the wreck itself, using ropes and metal cables, which can also result in damage.

The site of the SS Thistlegorm is less than 100 years old and is not, therefore, protected under the 2001 UNESCO convention. Nonetheless, it is an important historic and scientific site, and a unique tourist resource in need of protection. Thus, in 2017, the SS Thistlegorm documentation project began as part of a wider maritime archaeology initiative aimed at documenting some of the main shipwreck diving sites in the Red Sea. The project is a collaboration between the University of Nottingham, UK, and the universities of Ain Shams and Alexandria, Egypt<sup>17</sup>. The first step at the SS Thistlegorm was to carry out detailed documentation and survey work on the wreck to record and monitor damaging activity. In addition, a complete 3D digital virtual image of the wreck was developed as part of the documentation process, in which over 24,000 high resolution photographs were taken of the inside and outside of the ship and the 7-acre wreck site. A 360-degree video of the wreck

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• 16 - See: <https://thethistlegormproject.com/> and <https://www.bbc.com/news/uk-england-nottinghamshire-41511171?tblang=english-ca>

• 17 - Brown, S., Henderson, J., Mustard, A. & Postons, M. 2020. *Diving the Thistlegorm: The Ultimate Guide to a World War II Shipwreck*. Oxford: Dived Up Publications.

was also developed which can be used with different virtual reality (VR) applications and gives non-divers the impression of swimming over the site. The 3D model and VR applications are available online, making this exceptional UCH site accessible to everyone for the first time (Fig. 7)<sup>18</sup>.



• Fig. 7: A digital model of the SS Thistlegorm, Egypt. © Simon Brown

## The Umm Lajj Shipwreck (Saudi Arabia)



• Fig. 8: A mound of water jars at the Umm Lajj shipwreck site, Saudi Arabia. © Chiara Zazzaro

Very few ancient shipwrecks have been identified and studied in the Red Sea. This is partly due to the environmental conditions, where the warmth of the water often affects the preservation of organic remains and where the constant growth of coral reefs can result in wreck remains becoming difficult to recognise. Most of the ancient shipwrecks recorded in the Red Sea to date are located along its western shore. These include the Early Roman wreck site at Fury Shoals (Egypt), the Byzantine Black Assarca shipwreck (Eritrea), and the 18th century shipwrecks that were excavated near Sharm el-Sheikh and Sadana Island (Egypt) (Fig. 8). The important Umm Lajj shipwreck site is the most significant discovery along the Red Sea's eastern shore<sup>19</sup>.

The Umm Lajj wreck is named after a nearby town on the western coast of Saudi Arabia. The site was discovered by chance, more than a decade ago, by sport divers. The wreck lies at a depth of 22 m about 425 km north of Jeddah. At the time of the site's rediscovery and study, the wreck had already been partially looted. However, in 2015, the site was placed under protection by the Saudi Heritage Commission (SHC), in accordance with the UNESCO Convention for the Protection of the Underwater Heritage, which the Kingdom of Saudi Arabia ratified that same year.

2015 also marked the beginning of an excavation project at the site by a joint research team from the SHC and the Università degli Studi di Napoli 'L'Orientale' (UNO) in Italy. The project team produced a detailed recording of the site, which included the remains of the hull and the cargo. The research revealed that the Umm Lajj wreck site extended over an area of 40 m by 16 m, with the physical remains of the hull stretching across an area of 36 m by 9 m. Analysis of wood samples from the wreck revealed that the hull was probably made of pine and oak. The ship's cargo included around 1,000 ceramic jars and a number of large ceramic storage vessels, most likely for transporting fresh water and foodstuffs. The ship also carried hundreds of Chinese-made blue-and-white porcelain cups and bowls. The porcelain cargo allowed the shipwreck to be dated to around the second half of the 18th century AD. Other cargo items included metal basins, glass bottles and coconut husks, as well as personal objects such as Ottoman-type clay tobacco pipes<sup>20</sup>.

The fact that this ship contained Chinese porcelain and other Indian Ocean products does not necessarily indicate direct navigation from the East to the Red Sea. In fact, it is believed that the ship operated only within the Red Sea, shuttling up and down from Jeddah to Suez. It is possible that the crew picked up the Chinese porcelain at Jeddah, from where it would have been shipped to Suez, before travelling on to other regions in the Middle and Near East<sup>21</sup>.

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• 19 - Chiara Zazzaro, C., Loreto, R. & Visconti, C. 2017. An eighteenth-century merchantman off the Red Sea coast of Saudi Arabia. *Proceedings of the Seminar for Arabian Studies*, 47. Oxford: Archaeopress, pp. 253–268.

• 20 - Visconti, C. 2018. A Cargo of Chinese Porcelain from a Shipwreck in the Red Sea. *Orientations*, 49.3, pp. 102–107.

• 21 - Zazzaro, C., Loreto, R. & Cocca, E. 2016. 3D surveying of an eighteenth century merchantman off the Red Sea coast of Saudi Arabia. *Skyllis*, 16.1, pp. 68–73.

The ship is comparable in its structure and cargo to the two wrecks previously investigated off Sharm el-Sheikh and Sadana Island in Egypt (Fig. 9)<sup>22</sup>. These ships probably operated during a period when European access to Red Sea ports was restricted by the Ottomans, who controlled the movement of large sailing ships. Investigations of the cargo of these two ships have important historical value as they represent some of the last pieces of evidence from Egyptian-Arabian trade routes before European expansion in the Red Sea.



• Fig. 9: Large quantities of water jugs and tobacco pipe bowls were discovered at the Sadana Island shipwreck site, Sadana Island, Egypt. © Institute of Nautical Archaeology/Netia Piercy

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• 22 - Ward, C. 2001. The Sadana Island Shipwreck: An Eighteenth-Century AD Merchantman off the Red Sea Coast of Egypt. *World Archaeology*. 32.3:368–382.

## The Fish Tanks of Cherchell (Algeria)



• Fig. 10 : The remains of Roman rock-cut fish tanks and Cherchell, Algeria. © Rafik Khellaf



With more than 370 recorded sites, the coast of Algeria is rich in archaeological heritage<sup>23</sup>. However, it was not until 2005 that the first research into underwater archaeology was carried out in Algerian territory. In 2018, an underwater survey by Algerian archaeologists improved understanding of notable sites at Tipaza and Cherchell.

Cherchell, ancient Caesarea Mauretaniae (Caesarea in Mauretania), was the capital of a Roman province in north Africa and represents an area of coastline with significant potential for underwater archaeological research. Several sites of different types and dates have been discovered in the underwater environment of Cherchell, among the most significant of which are the remains of rock-cut, Roman fish tanks (Fig. 10). Three rectangular structures were first discovered in 1967, at a depth of less than 1 m. The walls of the tanks had sluice gates leading to the sea, which probably supplied seawater to the tanks during high tide. The tanks were used for the storage of live fish, prior to consumption, processing or transshipment. Recent investigation of the site suggests that there may originally have been up to seven fish tanks in use at Cherchell plus four square stone containers on the opposite shore, which were probably used for salting fish<sup>24</sup>.

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- 23 - Khellaf, R. Underwater Archaeology in Algeria, The Nautical Archaeology Digital Library.
  - See: <https://shiplib.org/index.php/landscapes/africa/underwater-archaeology-in-algeria/>
  - 24 - Kellaf, R. & Bensaidani, Y. 2020. Study of underwater archaeological sites in the western regions of Cherchell. *Journal of Archaeological Studies*, 18.1, pp. 6–20.

## The Harbours of Byblos and Anfeh (Lebanon)



• Fig. 11 : An aerial view of the near-shore area of Byblos, showing the main area of interest for marine survey. © Byblos & the Sea/Martine Francis-Allouche

Ranking among the oldest settlements in the world, ancient Byblos (present Jbeil, located 40 km north of Beirut, Lebanon) was designated a UNESCO World Heritage Site in 1983. In the fifth millennium BC, during the Neolithic period, fishermen settled on the headland of Byblos marking the beginning of an exceptional 8,000-year history of uninterrupted human occupation, which continues to this day.

Building on extensive historical and archaeological evidence, maritime explorations were launched at Byblos by Honor Frost in the 1960s and resumed in the late 1990s. Since 2011, *Byblos & the Sea*, a multidisciplinary programme funded by the Honor Frost Foundation and led by a French-Lebanese team of the Collège de France, in collaboration with the Directorate General of Antiquities of Lebanon, has been expanding Frost's original findings<sup>25</sup>. Ten field seasons have been carried out by the current project to date, with the aim of investigating the Byblos coastline in its entirety, better understanding maritime approaches to Byblos, and locating its important Bronze Age harbour.

In 2013, an electrical-resistivity-profiling survey was carried out on part of the southern extent of the ancient city. The survey produced a two-dimensional image delineating the perimeter of a large, ancient, buried cove, revealing the ancient shoreline which extended approximately 100 m inland from the present coastline. Sedimentology analyses conducted on the same area confirmed the existence of a sizeable silted-up harbour (Fig. 11). The harbour basin extended around 10,000-12,000 m square and averaged a depth of 1.5 m in the shallows and 4 m below the contemporary shoreline. Furthermore, bathymetric surveys investigating the seafloor of the shallow, offshore Jouret Osman Bay, opposite the buried Byblos basin, showed a deeper underlying seabed with a thick layer of loose sediment (c.5 m) covering the ancient seabed<sup>26</sup>. This indicates that the original depth of the Jouret Osman Bay matches the depth of the buried basin floor and suggests that the entire area, including the inland silted basin and the offshore bay, was once a single larger and deeper bay, deep enough to allow the mooring of ships. Thus, the investigations allowed archaeologists to conclude that the Bronze Age harbour of Byblos was originally located in this area at the southern foot of the promontory upon which the ancient city was built<sup>27</sup>.

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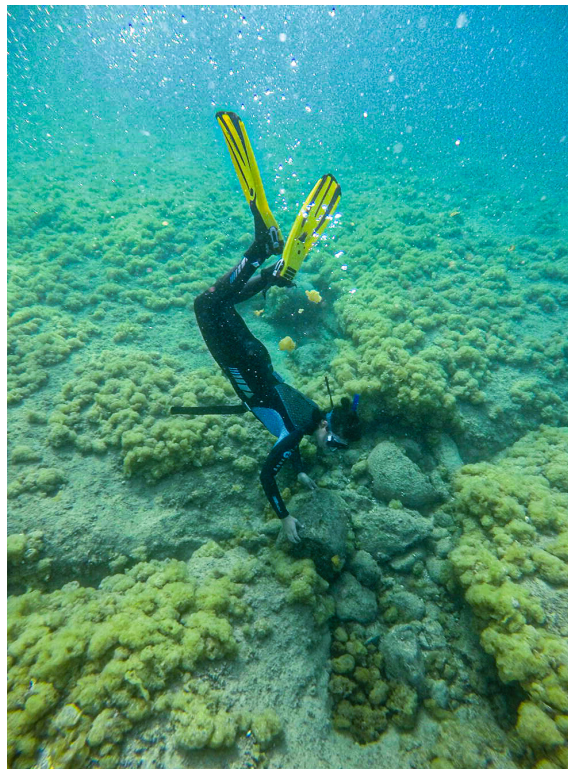
• 25 - See: <https://honorfrostfoundation.org/2020/06/25/byblos-lebanon/>

• 26 - Francis-Allouche, M. & Grimal, N. 2016. *The Maritime Approaches to Ancient Byblos (Lebanon)*. *Journal of Eastern Mediterranean Archaeology and Heritage Studies*, 4.2-3, pp. 242-277.

• 27 - Francis-Allouche, M. & Grimal, N. 2019. *Honoring the Lady of Byblos*. In: L. Blue (ed.), *In the Footsteps of Honor Frost: The life and legacy of a pioneer in maritime archaeology*. Leiden: Sidestone Press, pp. 109-137.

Another significant Lebanon-based project was the investigation of the natural anchorage site of Anfeh<sup>28</sup>. The coastal village of Anfeh is located 15 km south of Tripoli and 70 km north of Beirut. It takes the form of a promontory, 400 m long with a maximum width of 120 m, and is oriented on an east-west axis. The promontory, which rises c.14 m above sea level, is called Ras al-Qalaat. The coastline north of the promontory is exposed to the wind, and offers no protection for seafaring vessels. However, closer to the peninsula, the coastline forms two large, well-protected shallow bays that offer natural anchorages. To the south of Ras al-Qalaat, the rocky shoreline is low-lying and consists of a small cove with an open bay, in the lee of the promontory, that is suitable for landing and anchoring ships during periods of high northerly winds (Fig. 12).

From 2013 to 2018, a comprehensive underwater survey of Anfeh, funded by the Honor Frost Foundation, was carried out by a team from the University of Balamand, Lebanon, and the University of Southampton, UK. The underwater archaeology project in Anfeh resulted in the discovery of a substantial number of anchors of various sizes and types, suggesting that the cove and bay, protected from the northerly wind, were a popular anchorage location in antiquity. In addition, a wider coastal survey, including photogrammetric 3D modelling of the seabed, study of the changing sea-level, and remote sensing surveys, also revealed several possible offshore anchorages and other features of the maritime landscape<sup>29</sup>.



• Fig. 12: An archaeologist examining a masonry feature among the algae covering the seabed at Anfeh, Lebanon. © Lucy Semaan

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• 28 - Semaan, L. 2019. Report on the three-year postdoctoral fellowship of Lucy Semaan. Honor Frost Foundation. See: <https://honorfrostfoundation.org/grants-awarded/research-grants/lebanon/hff-lebanon-team/projects/>

• 29 - Semaan L. & Salama, M.S. 2019. Underwater Photogrammetric Recording at the Site of Anfeh, Lebanon. In: J. McCarthy, J. Benjamin, T. Winton & W. van Duivenvoorde (eds.). 3D Recording and Interpretation for Maritime Archaeology. Coastal Research Library, vol 31. Springer, pp. 67–87. See: [https://doi.org/10.1007/978-3-030-03635-5\\_5](https://doi.org/10.1007/978-3-030-03635-5_5)

## The Submerged town of Neapolis (Tunisia)



• Fig. 13: Archaeologists examining the submerged ruins of Neapolis, Tunisia. © National Heritage Institute , Tunisia

Since 2010, archaeologists from the Tunisian National Institute of Heritage and the University of Sassari, Italy, have been exploring the Gulf of Hammamet in search of the ancient Roman town of Neapolis. The town, which has suffered from significant tectonic activity over the course of its history, was partly submerged by a tsunami following a huge earthquake that affected many Mediterranean coastal cities in 365 AD, and later became submerged completely (Fig. 13).

In 2017 underwater archaeologists discovered the remains of the missing Roman city, which extended over 50 hectares off the coast of the Tunisian city of Nabeul<sup>30</sup>. Neapolis was an industrial and commercial centre famous for the production of fish sauce (garum). Garum was a widely used delicacy in the Greek and Roman periods and was shipped from Neapolis throughout the Mediterranean. Among the remains found by underwater archaeologists was evidence for streets, monuments and around 100 tanks used for making garum<sup>31</sup>. The discovery revealed Neapolis to have been among the largest centres in the Roman world for the production of garum and salted fish, and adds crucial data to our understanding of the wider cultural and trading network of the Roman Empire as a whole.

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• 30 - See: <https://www.smithsonianmag.com/smart-news/ruins-roman-city-found-under-water-180964738/>

• 31 - See: <https://interestingengineering.com/archaeologists-discover-an-entire-city-swept-away-by-tsunami-1700-years-ago>

## Underwater Cultural Heritage in the Skerki Bank (Tunisia) and the Sicilian Channel (Italy)



• Fig. 14: The Team of the underwater archaeological survey mission for the protection of UCH on the Skerki Bank and the Sicilian Channel © Angel Fitor/UNESCO

Skerki Bank is a series of reefs located in international waters approximately 60 km north of Tunisia and 80 km west of Sicily. Between 1989 and 1997, an interdisciplinary team of archaeologists and engineers employed remote sensing techniques, using remotely operated vehicles (ROVs), to carry out underwater archaeological investigations of the large area. This project, under the auspices of UNESCO, is considered a milestone for deep-water archaeology in the Mediterranean as a wealth of archaeological material was discovered, including several shipwrecks, at an average depth of 800 m<sup>32</sup>. The dating of the shipwrecks relied predominantly on the amphorae in their cargo which indicated vessels from the 2nd century BC to the late 19th century AD, with at least five dating to the Roman period<sup>33</sup>. Skerki Bank and the Sicilian Channel lie at the intersection of several important open sea trade routes. Investigation of the area provides important evidence on trade and transport in the ancient Mediterranean, and the variety and density of shipwrecks demonstrates that the area was a frequent sailing route both between Carthage and Rome and between the eastern and western Mediterranean.

In 2018, the Italian authorities informed UNESCO of the discovery of wrecks of significant typological and chronological diversity on the Skerki Bank site and its surroundings. Following the framework of the 2001 UNESCO Convention on the Protection of Underwater Cultural Heritage, a new international initiative joined by 8 States parties to this treaty was launched to study and protect of the Skerki Bank and the Sicilian Channel / Cap Bon area. The submerged archaeological remains are located on the Tunisian continental shelf and on the Italian continental shelf. The new initiative is therefore led by Tunisia and Italy in collaboration with Algeria, Croatia, Egypt, France, Morocco, Spain and the UNESCO Secretariat.

Several international meetings and discussions have taken place concerning the protection of the site, resulting in numerous recommendations, including the development of an inventory of the scientific, technical and legislative state of knowledge surrounding the site. Recommendations also include a joint archaeological and geophysical underwater survey of the sites alongside a communication campaign to raise public awareness of the cultural and scientific value of the area. In 2022, researchers from the 8 stakeholders in the project collaborated to lead a successful underwater archaeological mission. It took place over 14 days, aboard the French scientific vessel, The Alfred Merlin, in international waters, on the Italian continental shelf, under the coordination of Italy, and then on the Tunisian continental shelf under the coordination of Tunisia, as per Article 10 of the Convention. For the first time, international scientists have modeled the shipwrecks and improved the mapping of the area in order to protect important underwater cultural heritage in the long term. The international collaborative initiative builds on a previous management plan for the sites and is considered a landmark, unique example of cooperation for the protection of underwater heritage beyond the jurisdiction of territorial seas, under the principles of the 2001 UNESCO Convention<sup>34</sup>.

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• 32 - Ballard, R.D., McCann, A.M., Yoerger, D., Whitcomb, L., Mindell, D., Oleson, J., Singh, H., Foley, B., Adams J., & Picheota, D. 2000. The Discovery of Ancient History in the Deep Sea Using Advanced Deep Submergence Technology. *Deep- Sea Research Part I*, 47.9, pp. 1591–1620.

• 33 - McCann, A. M. 2000. Amphoras from the Deep Sea: Ancient Shipwrecks Between Carthage and Rome. *Rei Cretariae Romane Favtorvm Acta*, 36, pp. 443–448.

• 34 - See:[http://www.unesco.org/new/en/culture/themes/dynamic-content-single-view/news/first\\_cultural\\_heritage\\_site\\_to\\_be\\_protected\\_in\\_international/](http://www.unesco.org/new/en/culture/themes/dynamic-content-single-view/news/first_cultural_heritage_site_to_be_protected_in_international/) and <https://www.youtube.com/watch?v=PCCHMLFYtWQ>



## Underwater Cultural Heritage and its Associated Knowledge



• Fig. 15: A rosary on board the Mary Rose. © Peter Crossman of the Mary Rose Trust



• Fig. 16: A sounding weight found in a Hellenistic context at the underwater site of Marsa Bagoush, Egypt. © CMAUCH/Emad Khalil

The study of UCH has played a pivotal role in our understanding of the development of societies. UCH, particularly shipwrecks, submerged architecture and urban areas, or previously inhabited landscapes, can shed light on natural events and environmental change, as well as on past knowledge and activities linked to trade, economics, technological advancement, socio-cultural developments, politics, rituals and beliefs<sup>35</sup>. For example, there is significant variety in the design and structure of ships, depending on their era, purpose (e.g., fishing, warfare, trade etc.), the environment (location and climate) in which they were built and the techniques used in their construction. Hence, the study of shipwrecks tells us a great deal about the needs and activities of the societies that built and sailed the vessels.

Of more than a thousand ancient shipwrecks recorded in the Mediterranean, almost 60% date to the period from the 2nd century BC to the 2nd century AD, and some of the largest merchant vessels ever found underwater belong to the same period<sup>36</sup>. This indicates that maritime trade and transport in Mediterranean antiquity reached a peak during the Roman period, and provides us with a clear insight into the ancient economy. The prevalence of warships from different periods is a useful indicator of the political conditions at the time. Moreover, since they are often equipped with the latest technologies, wrecks of warships tell us a great deal about changes in naval tactics and advancements in science and engineering.

We also have a wealth of information from the passengers and crews of boats and ships – sailors, seafarers, merchants, soldiers and travellers – who interacted with each other during voyages and brought with them the material culture and traditions of their societies. The size of this micro-community varied according to the size and type of ship. Whereas, for example, an ancient Greek merchant ship could carry a limited number of sailors – no more than four or five – a military warship from the Middle Ages would carry hundreds of people with different specializations including sailors, soldiers, officers and domestic staff<sup>37</sup>. In every case, these individuals coexisted and interacted in a limited space for a period of time that may have extended from a few days to many months. The material culture found on shipwrecks – personal belongings as well as tools, cargo and supplies – therefore provides useful information about these micro-communities and the daily routines, behaviours, relationships and activities which took place on board<sup>38</sup>, as

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• 35 - Adams, J. 2001. Ships and boats as archaeological source material. *World Archaeology*, 32.2, pp. 292–310.

• 36 - Parker, A. J. 1992. *Ancient Shipwrecks of the Mediterranean and the Roman Provinces*. British Archaeological Reports International Series 580. Oxford: Tempus Reparatum.

• 37 - Gardiner, J. 2005. *Before the Mast: Life and Death Aboard the Mary Rose* (Archaeology of the Mary Rose 4). Oxford: Oxbow Books.

• 38 - Murphy, L. 1983. Shipwrecks as database for human behavioral studies. In R. A. Gould (ed.), *Shipwreck Anthropology*. Albuquerque: University of New Mexico, pp. 65–89.

well as knowledge of the prevailing seafaring and navigation skills of the time (Fig. 16). A sounding weight was found in a Hellenistic context at the underwater site of Marsa Bagoush (Egypt). Sounding-weights were essential navigational instruments for seamen in antiquity. They were used for estimating water-depths, hence warn sailors making a landfall in the dark or in poor visibility. Moreover, sounding-weights can, with the help of a sticky material (animal fat) inserted in a cup in their base, bring up a sediment sample which is used for studying the nature of the sea-bed)<sup>39</sup>.

The study of boats and ships can also tell us a great deal about the rituals and beliefs of societies. In many cultures, vessels have acquired symbolic and ideological values. Many civilisations have myths and epic sagas which revolve around ships and the sea, and boat burials or votive offerings in the form of miniature models of boats and anchors – which are often found underwater in harbour sites<sup>40</sup> – are evidence of the incorporation of vessels into religious practices<sup>41</sup>.

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• 39 - Galili, E., Rosen, B., Zviely, D. 2009. Ancient Sounding-Weights and Navigation along the Mediterranean Coast of Israel. *The International Journal of Nautical Archaeology*. 38.2: 343–368

Ford, B., Halling, J. & Catsambis, A. 2020. *Our Blue Planet: An Introduction to Maritime and Underwater Archaeology*. Oxford: Oxford University Press, pp.257–265.

• 40 - See:[https://www.franckgoddio.org/fileadmin/pics/3\\_5\\_finds/documents/Franck\\_Goddio\\_Votive\\_Boats.pdf](https://www.franckgoddio.org/fileadmin/pics/3_5_finds/documents/Franck_Goddio_Votive_Boats.pdf)

• 41 - Crumlin-Pedersen, O. & Thye, B. M. (eds.). 1995. *The Ship as Symbol in Prehistoric and Medieval Scandinavia*. Copenhagen: Danish National Museum.

Ward, C. 2000. *Sacred and secular: Ancient Egyptian ships and boats*. *Archaeological Institute of America Monographs*, No. 5. Philadelphia: University of Pennsylvania Museum.

## How are Underwater Archaeological Sites Discovered?



• Fig 17: A diver photographing a Roman amphora. © CMAUCH/  
Emad Khalil

UCH sites vary remarkably in terms of type, nature, location and condition. However, due to the problematic nature of their submerged and predominantly invisible conditions, they share a characteristic which differentiates them from most terrestrial sites: they are most often discovered by chance<sup>42</sup>. In fact, the majority of UCH sites across the world have been located by those whose regular activities are closely related to the sea, such as sport divers, free divers, naval staff, oil and gas workers, fishing industry workers, coastguards and so on.

In the case of accidental discovery, UNESCO's 2001 Code of Ethics for Divers recommends documenting the precise location and state of a wreck or submerged ruin, using photos, drawings or notes, and making a report on the discovery for submission to the appropriate authorities (Fig. 17). In the case that objects from underwater sites are brought to the surface for protection from extreme risks or loss, they must also be reported to the competent national authority as soon as possible<sup>43</sup>.

In addition to accidental finds, UCH sites are also sometimes discovered by specialists as a result of specific research, guided by historical sources and/or associated terrestrial archaeology. The Pharos Lighthouse in Egypt and the town of Neapolis in Tunisia are both examples of historically attested sites which were rediscovered through strategic underwater surveys that drew on information from historical sources.

New technologies in the field of underwater archaeological research, particularly over the past two decades, have also contributed to the discovery and documentation of dozens of new sites of UCH. For example, large-scale systematic underwater archaeological surveys can employ remote sensing techniques which can cover large areas of the seabed in a relatively short period of time and with a high level of accuracy (Fig. 18)<sup>44</sup>. Surveys of this kind tend to take place in areas where historical and archaeological evidence indicates the possible presence of submerged sites, such as in the case of ancient harbours and anchorages, along ancient trade routes or in areas with known navigational hazards. Bulgaria, Greece, Italy, Malta, Norway, Spain and Turkey are just a few examples of nations which have discovered numerous UCH sites using this method. However, many countries now employ both remote sensing and traditional archaeological surveys, underwater

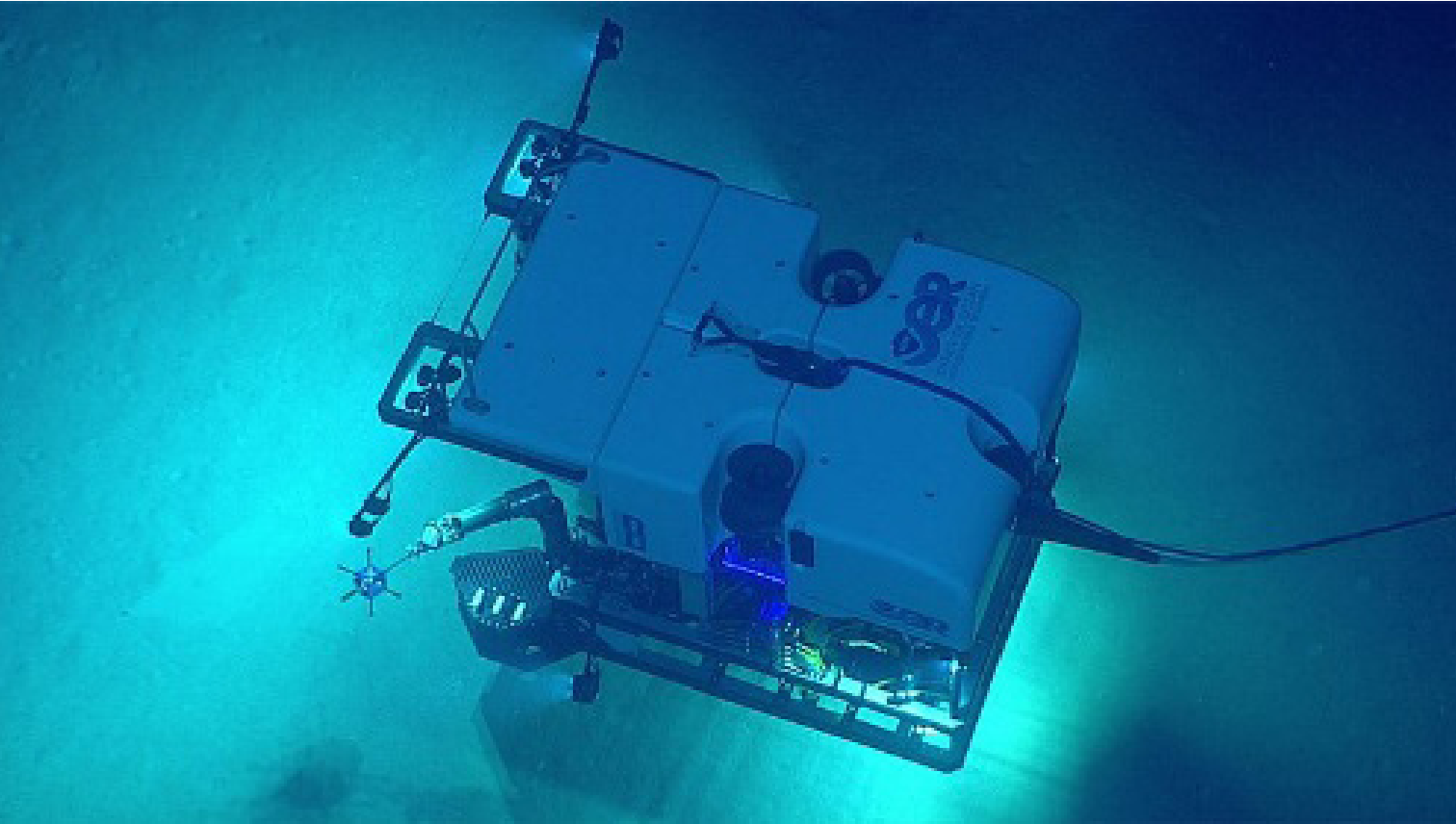
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• 42 - This is, however, beginning to change in some countries, such as the UK, where sites are being much more frequently discovered as part of the development control process within marine planning.

• 43 - See: <https://en.unesco.org/news/unesco-presents-collection-underwater-heritage-diving-cards-raise-awareness-protection>

• 44 - Ford, B., Halling, J. & Catsambis, A. 2020. *Our Blue Planet: An Introduction to Maritime and Underwater Archaeology*. Oxford: Oxford University Press, pp.100–106.

and along the shoreline, to document UCH and preserve it in situ, i.e., without excavation or removal from the underwater environment.



• Fig. 18: Deep Discoverer ROV, operated from NOAA's Okeanos Explorer. © NOAA

## What is special about Underwater Cultural Heritage?



• Fig. 19: An archaeologist excavating the hull of the Sadana Island shipwreck, Egypt. © Emad Khalil



The true value of any archaeological site or artefact, regardless of its type, material or date, lies in what it can teach us about another time, culture or technology, and the people who made, used or came into contact with that place or object. Sites of UCH in general, and shipwrecks in particular, have certain characteristics that distinguish them as archaeological source material. For example, the underwater environment is unique in its ability to preserve certain archaeological materials, namely organic materials such as wood, leather, bone, antler, textile and many others.

The lack of oxygen underwater results in a slower rate of oxidation, leading to better preservation of organic material. It is therefore quite common in underwater sites to find wooden wrecks and their contents which are hundreds if not thousands of years old, and yet remain in a good state of preservation<sup>45</sup>. The second distinctive feature of UCH sites is that the majority are created unintentionally and unexpectedly (e.g., the sinking of a ship or a natural disaster destroying a coastal town). Whereas terrestrial archaeological sites tend to represent occupation and use over long periods of time, UCH sites, particularly shipwrecks, have the potential to capture the lives of individuals and the state of societies at a specific moment in time. This process represents what is known as a “closed context” and means that the ship, its contents and its crew, have not been added to or altered from the moment of wrecking to the time of rediscovery (with the exception of disturbance from the environmental and human threats as outlined below)<sup>46</sup>, and is why shipwrecks are often described as time capsules<sup>47</sup>. Consequently, when a shipwreck is discovered and studied, the artefacts and state of any remains of the ship itself (most importantly the hull) help us recreate a picture of the vessel during her last voyage, and of the lives and activities of those on board (Fig. 19). Other UCH sites come about as the result of natural disasters, such as earthquakes resulting in the sudden submergence of harbours. Again, in these circumstances, sites offer a snapshot of a specific time, preserving information about the communities that built and used them. In order to protect and preserve UCH, it is first essential to recognise the threats it faces. This includes a number of both natural and human threats.

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• 45 - Bowens, A. (ed.). 2008. *Underwater archaeology: The NAS guide to principles and practice*. Oxford: Blackwell Publishing, pp. 15–17.

• 46 - Marsden, P. 2015. *Sealed by Time: The Loss and Recovery of the Mary Rose (Archaeology of the Mary Rose 1)*. Oxford: Oxbow Books.

• 47 - Muckelroy, K. 1978. *Maritime Archaeology*. Cambridge: Cambridge University, pp. 56–58.

## Threats to Underwater Cultural Heritage



• Fig. 20: Ship timber damaged by ship worms. © Michael C. Rygel via Wikimedia Commons

## Natural Threats

The marine environment is complex and dynamic. Thus, there are several environmental factors that could adversely affect UCH sites. Among the most significant are waves and currents. These natural forces can have devastating impacts on submerged sites, particularly on ancient shipwrecks, as the natural movement of the water can cause artefacts to scatter over the seabed. This removes them from their original location (context) and may in the case of some vulnerable objects, particularly items made from organic materials, destroy them completely over time. Waves and currents can also change the features of an underwater archaeological site by moving the sand and sediments, to cover or expose areas of the site.

Other natural threats that affect UCH include the growth of living organisms, which can damage archaeological artefacts. Organic material is particularly at risk as many types of bacteria, algae, and fungi can grow or feed on it, causing it to decompose. There is also the threat from shipworms, a type of marine bivalve mollusc, which penetrate the timbers of shipwrecks. The shipworms grow inside the wood, forming colonies in thousands of small tunnels, which ultimately results in wood erosion and damage (Fig. 20). Most micro-organisms, however, need oxygen to survive which is why vessels and their contents buried under sediments are largely protected from biological damage. Inevitably, metal artefacts made of iron, copper and bronze are often damaged by rust or corrosion as a result of the chemical reaction between these materials and the oxygen in sea water<sup>48</sup>.

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• 48 - Robinson, W. 1998. *First Aid for Underwater Finds*. London: Archetype Publications, pp.25–80.

## Human Threats

Various human actions can pose a threat to UCH. Some human activities, such as looting and treasure hunting, target sites directly, while UCH is also threatened by the side-effects of industries such as fishing (and trawling in particular), or oil and gas prospecting and production. Advances in underwater research in recent decades have made sites more accessible than ever before to those with both legitimate and harmful intentions, including sites in deep waters and remote areas. Many countries lack the legislation, research or management systems they need to protect their UCH from human threats. Looting and trophy hunting by amateur divers is sadly common and results in the loss of archaeological information, as well as damage to artefacts that do not receive appropriate conservation. Treasure hunting has also become a lucrative business, with a number of companies finding ways to work around existing legislation in order to search for, excavate and recover material from UCH sites for financial gain<sup>49</sup>.

Treasure hunters have removed material from ancient shipwrecks around the world and sold many artefacts from these sites during the past few years<sup>50</sup>. Robust local and international laws and agreements are therefore vital in combatting illegal activity.

Trawling, one of the most common methods used in the fishing industry, represents another major threat to UCH. Bottom trawling involves nets, weighted by metal chains, boards or beams, being dragged significant distances along the seabed to maximise the catch. Nets can reach depths of over 500 m and pieces of pottery, statues and wood fragments are commonly recovered from trawling nets around the globe. Bottom trawling nets are not only a threat in terms of picking up and displacing archaeological material, but they can also cause extreme damage to submerged archaeological sites and any associated artefacts that lie in their path<sup>51</sup>. Coastal construction projects can also represent a threat to UCH. For example, the development of marinas, ports, tourist resorts and wind power plants may result in the destruction of undiscovered sites. Land reclamation projects are similarly problematic, particularly for submerged ancient landscapes and coastal sites, if appropriate underwater surveys and protective measures are not put in place.

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• 49 - Zamora, T.V. 2008. The impact of commercial exploitation on the preservation of underwater cultural heritage. *Museum International*, 60.4, pp 18–30.

• 50 - UNESCO, 2016. *The Impact of Treasure Hunting on Submerged Archaeological Sites*. Paris: UNESCO.

• 51 - Søreide, F. 2011. Maritime Archaeology and Industry. In: A. Catsambis, B. Ford & D. Hamilton (eds.), *The Oxford Handbook of Maritime Archaeology*. Oxford: Oxford University Press, pp. 1010–1014.

The oil and gas industry may threaten UCH as a result of exploratory drilling of the seabed and the development or extension of oil rigs and pipelines which affect the sea floor.

Oil and gas companies have a responsibility to work with qualified underwater archaeologists to conduct thorough surveys before starting any intrusive activity, but the quality of the work and the extent to which best practice regarding UCH is enforced varies greatly between companies and countries<sup>52</sup>.

Industrial dredging, much like bottom trawling, can be a significant threat to sunken cultural heritage. This process employs huge suction pumps and hoses or scraping devices, connected to purpose-built ships to extract various types of sediment, such as sand, gravel, clay and others from the seabed to be refined for use in manufacturing and construction<sup>53</sup>. Dredging operations are also carried out to construct or deepen canals or ports. These operations also use powerful suction or scraping equipment which can expose or destroy cultural heritage sites even if they are deeply buried below the sea floor. As with all industrial activity which affects the seabed, conducting archaeological surveys before work begins is essential to determine the presence of archaeological remains and to develop appropriate preservation and management practices to minimise the risk to UCH.

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• 52 - Evans, A. & Keith, M. 2011. The consideration of archaeological sites in oil and gas drilling operations. UNESCO Scientific Colloquium on Factors Impacting the Underwater Cultural Heritage, 10th Anniversary of the Convention on the Protection of the Underwater Cultural Heritage. Brussels: Royal Library of Belgium.

• 53 - <http://www.marineaggregates.info/>

## Underwater Cultural Heritage Management



• Fig.21: An archaeologist carrying out non-invasive survey at a ship wreck site near Alexandria, Egypt.  
©Archives CEALex (Cnrs/Ifao)

The development of best practice guidelines, local, national and international cooperation and legislation regarding the management of UCH has attracted increasing attention over the last two decades<sup>54</sup>. Management of this underwater resource, from planning to implementation, is a wide-ranging process that incorporates recommendations regarding exploration, research, conservation, presentation, public awareness and education. These features all build towards a key objective: to preserve UCH within the framework of sustainable development. Hence, the management of UCH seeks to balance issues of preservation with those of access and use. These processes do not have to be mutually exclusive. For example, a site may be closed to divers/visitors due to its fragility, but can remain accessible to the public via museum installations, camera footage and online resources. This enables the site to be preserved in situ without neglecting the duty of archaeologists to mediate the sustainable development of the site (and/or artefact(s)) in research, education, entertainment, economic growth and so on<sup>55</sup>. Therefore, several disciplines are involved in managing UCH, including archaeology, museology, tourism, restoration, economics, law and others.

## **The Protection of Underwater Cultural Heritage**

The threats faced by UCH discussed above, including their remote nature or low visibility, mean that robust protective measures are needed to insure their long-term survival. Methods of protection are generally divided into two types; legal protection and physical protection.

### **Legal Protection of Underwater Cultural Heritage**

Developing legislation for the protection of UCH at local, national and international levels is vital. However, the laws, implementation methods and degree of protection vary widely between countries. Some nations, often with a wealth of underwater sites, have developed specific legislation dedicated to UCH<sup>56</sup>, while others include UCH within the framework of general antiquities legislation. For example, of the

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• 54 - Satchell, J. & Palma, P. (eds.). 2007. *Managing the Marine Cultural Heritage: Defining, Accessing and Managing the Resource*. York: Council of British Archaeology.

• Manders, M. R. 2012. *Management of Underwater Cultural Heritage*. In: M. Manders & C. Underwood (eds.), *Training manual for the UNESCO foundation course in the protection and management of underwater cultural heritage in Asia and the Pacific*. Bangkok: UNESCO Publishing, Asia and Pacific Regional Bureau for Education, Unit 3, pp. 1–20.

• See: <http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CLT/pdf/UNIT3.pdf>

• Ford, B., Halling, J. & Catsambis, A. 2020. *Our Blue Planet: An Introduction to Maritime and Underwater Archaeology*. Oxford: Oxford University Press, pp. 355–382.

• 55 - Jameson, J. H. & Scott-Ireton, D. A. (eds.). 2010. *Out of the Blue: Public Interpretation of Maritime Cultural Resources*. New York: Springer.

• 56 - Roberts, P. & Trow, S. 2002. *Taking to the water: English Heritage's initial policy for the management of maritime archaeology in England*. London: English Heritage.

15 Arab countries with legislation dedicated to antiquities and heritage, none has specific legislation for UCH or tailored regulations governing underwater archaeological work.

While a handful of Arab nations have clauses within their wider antiquities' laws dedicated to UCH<sup>57</sup>, the absence of dedicated legislation regarding site protection or underwater archaeological work can lead to complications. In contrast, many European countries, alongside the USA, Canada, Australia, and others, have detailed laws on regulating and monitoring the protection and preservation of UCH<sup>58</sup>. In many cases, there are multiple laws dedicated to underwater heritage resources in order to ensure the full range of concerns are covered in detail.

It is important to note that the laws made by sovereign states, and their ability to implement them, focus on territorial waters. Problems therefore frequently arise when addressing the protection of UCH in international waters. Legally, deep international waters, which are not subject to the authority of any country, can be exploited by any entity, such as treasure hunting companies, which could excavate, recover and remove underwater archaeological material.

International legislation attempts to bridge this gap and to balance preservation alongside the cultural, economic, touristic and scientific potential of UCH.

In 1997, UNESCO's General Assembly agreed that the protection of UCH must be overseen at an international level through a dedicated convention. Accordingly, between 1998 and 2001, a committee of experts in archaeology and law, alongside representatives of non-governmental organisations and other relevant stakeholders, drew up the provisions of the convention. The 2001 Convention on the Protection of the Underwater Cultural Heritage was approved on 2 November 2001 and came into force in 2009 following ratification by 20 state parties. Additional countries have since ratified the Convention, which now has representation from 64 states, including 12 Arab countries. The 2001 UNESCO Convention on the Protection of the Underwater Cultural Heritage is the first international legal document in this field. It aims to establish the rules that countries must abide by in their dealings with UCH sites<sup>59</sup>. The agreement is divided into two parts: the first section – the Convention's main text – consists of 35 articles that define the principles for preserving UCH, and

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• 57 - Khalil, E. 2016. *Maritime Archaeology and Underwater Cultural Heritage*. Alexandria: Dar Almarefa Al Gameia (in Arabic), pp. 223–226.

• 58 - See: <http://www.environment.gov.au/heritage/historic-shipwrecks>  
• [http://www.legislation.gov.uk/ukpga/1973/33/pdfs/ukpga\\_19730033\\_en.pdf](http://www.legislation.gov.uk/ukpga/1973/33/pdfs/ukpga_19730033_en.pdf)  
• [http://www.legislation.gov.uk/ukpga/1979/46/pdfs/ukpga\\_19790046\\_en.pdf](http://www.legislation.gov.uk/ukpga/1979/46/pdfs/ukpga_19790046_en.pdf)

• 59 - Favis, R. 2012. *The 2001 Convention on the Protection of the Underwater Cultural Heritage*. In: M. Manders & C. Underwood (eds.), *Training manual for the UNESCO foundation course in the protection and management of underwater cultural heritage in Asia and the Pacific*. Bangkok: UNESCO Publishing, Unit 1, pp. 2–10.



presents recommendations for international cooperation in order to protect that heritage. The second part provides an appendix of 36 operational rules that can be used in the planning and implementation of underwater archaeology projects and serves as a guide for researchers in the field at various stages of underwater archaeological work. The annex to the Convention is a development of the 1996 International Council on Monuments and Sites (ICOMOS) Charter on the Protection and Management of Underwater Cultural Heritage<sup>60</sup>. In 2013, UNESCO transformed this annex into a dedicated manual for activities concerning UCH<sup>61</sup>.

The 2001 UNESCO Convention on the Protection of Underwater Cultural Heritage is rooted in several basic principles. The first specifies that priority be given to preserving UCH in situ, but allows for recovery if the heritage in question is exposed to damage or if recovery would be of clear and direct scientific importance<sup>62</sup>. The Convention also emphasises that member states must preserve that heritage and take the necessary measures in this regard. It also encourages states to form bilateral, regional or multilateral agreements with the aim of enhancing the protection of UCH. Moreover, the Convention stresses that scientific research should not impact negatively on underwater archaeological sites, and that the principles of research, documentation, scientific publication and others must be adhered to. The Convention also affirms the prohibition of commercial exploitation of UCH, whether by selling, auctioning, bartering or anything else. In addition, the Convention urges member states to cooperate in training, capacity building, exchanging information and transferring technology in the field of UCH. Furthermore, the Convention is concerned with public accessibility, and raising public awareness of the importance and value of UCH.

It is important to note that while a number of articles in the Convention lay down the foundations for dealing with UCH, whether in territorial or international waters, the Convention does not take precedence over the laws of sovereign states nor settle relevant legal disputes between countries.

## Physical Protection of Underwater Cultural Heritage

In addition to legal protections, there are also physical and practical methods for protecting UCH sites in situ. There are, in fact, a number of possible actions that can be taken when an underwater site is discovered:

1. Leave the site as it is, without any interference;
2. Take measures to preserve the site in its original condition for as long as this is sustainable;
3. Carry out limited, non-intrusive activities, such as surveying, sampling and

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• 60 - See: [https://www.icomos.org/charters/underwater\\_e.pdf](https://www.icomos.org/charters/underwater_e.pdf)

• 61 - Maarleveld, T., Guèrin, U., & Egger, B. (eds.). 2013. UNESCO Manual for Activities Directed at Underwater Cultural Heritage. Paris: UNESCO Publishing.

• 62 - Aznar, M. J. 2018. In Situ Preservation of Underwater Cultural Heritage as an International Legal Principle. *Journal of Maritime Archaeology*, 3, pp. 67–81.

- documentation, before taking measures towards preserving the site in situ;
4. Preserve the site via the best possible means until there is an opportunity to conduct an archaeological excavation;
  5. Carry out partial or complete archaeological excavations of the site and its contents

Of these possibilities, there is a general trend towards the second and third options, which move away from the prevailing traditional ideas of excavation and object recovery<sup>63</sup>. Site excavation is generally discouraged for a number of reasons. Namely:

1. The discovery of thousands of new underwater archaeological sites around the world, particularly in recent decades following technological advancement in underwater research. UNESCO estimates there to be in the region of 3,000,000 shipwrecks in the world's seas and oceans, in addition to significant numbers of coastal sites, sunken cities, and so on<sup>64</sup>. It is, therefore, not practical to excavate and recover all underwater archaeological remains.
2. The technical, financial and logistical difficulties associated with excavation, object recovery, transportation, restoration, storage and display. A single shipwreck can contain tens of thousands of artefacts of various types and materials, in addition to the hull of the ship itself, meaning a full excavation is both expensive and time consuming<sup>65</sup>.
3. The ability of the marine environment, in most cases, to preserve the submerged archaeological materials in good condition, as has been demonstrated by scientific research<sup>66</sup>. There is no definitive method for the prevention of damage to archaeological material, whether underwater or following recovery. It is therefore incumbent on archaeologists to choose the most appropriate approach from a range of possible techniques to reduce the rate of damage and decay. In many cases, keeping archaeological material underwater is better for the artefact's preservation than recovery.
4. The significance of preserving UCH in situ for future generations for the purpose of research, study and public awareness. The value of UCH lies not only in the archaeological material (the artefacts) itself, but also in the wider archaeological site and its context. Study, access and public dissemination

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• 63 - See: <http://www.unesco.org/new/en/culture/themes/underwater-cultural-heritage/unesco-manual-for-activities-directed-at-underwater-cultural-heritage/unesco-manual/general-principles/in-situ-preservation-as-first-option/>

• 64 - See: <https://unesdoc.unesco.org/ark:/48223/pf0000152883>

• 65 - Jones, M., 2015. *For Future Generations: Conservation of a Tudor Maritime Collection (Archaeology of the Mary Rose 5)*. Oxford: Oxbow Books.

• 66 - Bowens, A. (ed.). 2009. *Underwater archaeology: The NAS guide to principles and practice*. Oxford: Blackwell Publishing, p. 17.

• Maarleveld, T., Guèrin, U., & Egger, B. (eds.). 2013. *UNESCO Manual for Activities directed at Underwater Cultural Heritage*. Paris: UNESCO Publishing, pp. 179–222.

surrounding sites in context are therefore vital in highlighting the unique value of UCH. For this reason, non-intrusive archaeological activities, such as surveying and documentation are often promoted over excavation. In these instances, environmental and human factors, including climatic impacts, that might threaten underwater archaeological sites have to be investigated in order to determine the best course of action on a site-by-site basis. UCH sites threatened by human activity, such as coastal development or the oil and gas industry, are therefore more likely to require excavation if they cannot be preserved in situ.

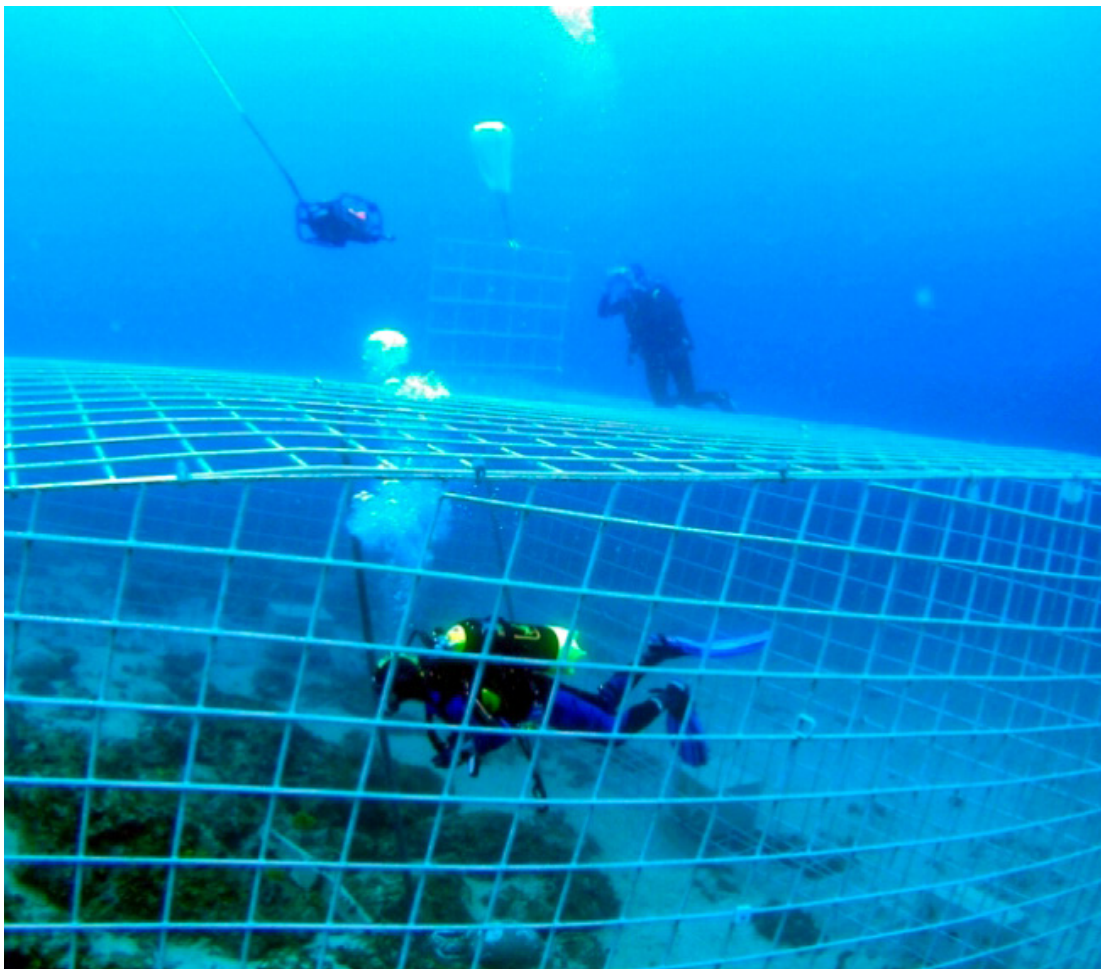
The methods and techniques utilised for in situ preservation of UCH vary according to the nature of the site, the material culture to be preserved and the possible threats. The reburial of discovered underwater sites is becoming one of the most common means of preservation<sup>67</sup>. The aim of this approach is to preserve a site in a safe and stable environment for as long as possible, especially if the site contains organic material such as wood. Reburial can prevent biological damage caused by shipworms feeding on the wood, minimise damage resulting from the movement of



• Fig. 22: A protective covering of artificial seagrass matting providing in situ preservation at a UCH site. © ICR

• 67 - Manders, M. 2012. In-Situ Preservation. In: M. Manders & C. Underwood (eds.), Training manual for the UNESCO foundation course in the protection and management of underwater cultural heritage in Asia and the Pacific. Bangkok: UNESCO Publishing, Unit 1, pp. 20–33.

currents and waves, and reduce the possibilities for interference from divers. It also allows researchers to return and restudy the site in future. Reburial can be carried out in a number of ways, including the placement of sandbags to form protective layers over the site, or the use of synthetic coverings, resistant to water and damage, which in some cases are designed to resemble seagrass (Fig. 22). With time, sand and sediments accumulate over the protective layers and begin to resemble the seafloor, thus protecting the buried heritage from various types of human and environmental damage. These techniques have proven very effective in protecting UCH sites around the world.



• Fig. 23: A protective metal cage covering a shipwreck off the island of Pag, Croatia.  
© Irena Radic Rossi

In some countries an alternative approach is employed, using metal cages to protect sites<sup>68</sup>. This method is normally used to protect shipwreck sites within a relatively limited area and involves covering the site with metal units in the form of grids, installed side-by-side to form a large metal cage over the entirety of the site (Fig. 23). The cages can be opened by researchers in order to study or monitor the conditions of the site. The advantages of the metal cage technology are that they protect sites from theft or interference without excluding the possibility for divers to experience the underwater remains. In the event that an archaeological excavation is required, the cages can be removed. The approach, however, can be expensive and the cages require constant maintenance, as algae and aquatic plants are likely to form. Regular cleaning is therefore necessary in order to maintain visibility.

## Public Access to Underwater Cultural Heritage

The public's right to access UCH in a responsible manner is one of the main principles of the 2001 UNESCO Convention. Public access to in situ UCH is encouraged in order to raise awareness and appreciation of this particular type of heritage and, as a consequence, to enhance its preservation and protection.

In situ access is preferred where possible as it preserves the scientific integrity and authenticity of the site and reduces costs related to display, storage and conservation. Therefore, in addition to traditional museum displays of UCH, several innovative methods have been adopted globally to present this heritage to the public in its original location<sup>69</sup>.

Underwater archaeological parks and dive trails are one of the main methods for displaying UCH sites (Fig. 24)<sup>70</sup> (c)CISMAS. These approaches are mainly aimed at sport (i.e., SCUBA) divers<sup>71</sup>. With the international increase in popularity of SCUBA diving, and the presence of many sport diving federations and clubs, certifying thousands of divers at various levels each year, diving on heritage sites is becoming a major global attraction. Consequently, many countries have established underwater archaeological parks at UCH sites, where divers can enjoy entertainment and educational experiences. These parks have become open-water museums in which divers can move freely, albeit within the rules and regulations set by the relevant authorities. Instructions for visiting these sites vary according to the type and nature

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• 68 - Bekić, L., Miholjek, I. 2009. exploring underwater heritage in Croatia: a handbook. Zadar. International Centre for Underwater Archaeology in Zadar

• 69 - <https://heritagecalling.com/2013/05/27/diving-into-history-with-the-english-heritage-dive-trails/>

• 70 - Alves, F. J. S. 2008. Underwater Archaeological Trails 1. Museum International, 60.4, pp. 81–90.

• 71 - See: <https://floridakeys.noaa.gov/shipwrecktrail/welcome.html>,

• <http://www.cismas.org.uk/colossus-dive-trail.php> and

• by Francisco J. S. Alves, F. J. S. 2008. Underwater Archaeological Trails. Museum

• International: Underwater Cultural Heritage. No. 240, 60.4: 81-90



• Fig. 24: A diver exploring a gun as part of the HMS Colossus Dive Trail, UK. © CISMAS

of the site itself. In some cases divers must be accompanied by a tour guide. Other sites can only be visited by a limited number of divers at a time, or require visiting divers to have a certain level of proficiency.

Before sites are opened to the SCUBA-diving public, several measures are usually taken to prepare the UCH resource for visitors, including setting out specific underwater trails for divers to follow, installing underwater signage and markers, and providing waterproof information brochures that can be taken on the dive. These elements enhance enjoyment and safety, and help raise awareness and appreciation of the UCH site and its significance.

The nature of underwater archaeological parks varies greatly: some revolve around a single shipwreck or a number of wrecks in one area, while others are located in submerged ports and harbours and other submerged structures. In all cases, visitors should comply with UNESCO's Code of Ethics for Diving on Submerged Archaeological Sites<sup>72</sup>, which sets out general rules for visiting sites in order to protect UCH for future generations. It advises divers to leave wrecks and submerged ruins untouched and to comply with the legal protection of archaeological sites. Divers are also instructed to seek permission to dive on other archaeologically designated sites and to respect all measures for protecting these sites.

Diving on UCH sites is only one form of public presentation of in situ archaeology. Other approaches to display include documentary films and online content (websites and social media), which are among the most common and effective tools for introducing sites and sharing information about them with the public. More recently, VR techniques are spreading as an effective, immersive and informative tool for presenting UCH to the public<sup>73</sup>. Virtual models of underwater sites allow users to interact with a site via three-dimensional representations<sup>74</sup>.

A number of VR systems and applications are currently used in the field of UCH: some use conventional computer monitors whereas others require special VR goggles. Many museums, educational and research institutions are now using this

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• 72 - See: by Francisco J. S. Alves, F. J. S. 2008. Underwater Archaeological Trails. *Museum International: Underwater Cultural Heritage*. No. 240, 60.4: 81-90  
• 73-See:<https://historicengland.org.uk/get-involved/visit/protected-wrecks/virtual-dive-trails/>  
• 74 - See: <https://en.unesco.org/news/virtual-museums-underwater-cultural-heritage-respond-covid-19-crisis>

technology to document and present UCH, especially where a physical visit to a site is not possible (Fig. 25)<sup>75</sup>.

## Museums and Underwater Cultural Heritage

Museums represent the best established and most conventional method for presenting UCH to the public. Numerous museums around the world are dedicated to the study and public display of maritime and underwater cultural heritage, and some of these are among the most popular and financially successful museums in their respective countries<sup>76</sup>.

Museums of maritime and underwater archaeology are often concerned with presenting different aspects of humankind's relationship with the sea. This is traditionally achieved through the display of cultural and natural materials, including shipwrecks and their cargoes, anchors, navigation instruments, personal belongings, fishing gear, weapons, and much more. Most of these items originate from UCH sites. While a number of maritime museums exist in Arab countries, including in Algeria, Kuwait, Oman, and the United Arab Emirates (Fig. 26), the region still lacks museums dedicated to UCH.

However, other museums such as the Grand Egyptian Museum (GEM), which is scheduled to open towards the end of 2022, is expected to have a section dedicated to UCH in which several artefacts excavated from underwater sites in Alexandria will be exhibited. Moreover, Egypt's Hurghada museum currently exhibits a collection of objects that were excavated from the Sadana Island shipwreck (Fig. 27). What is important about all these museums is that they tell not only the story of ships or underwater archaeological sites, but also represent the stories of the wider cultures to which they belonged.



• Fig. 25: The use of VR goggles to introduce UCH sites to school children in Alexandria, Egypt. © CMAUCH-BAHAR

• 75 - Bruno, F., Lagudi, A., Barbieri, L., Muzzupappa, M., Mangeruga, M., Cozza, M., Cozza, A., Ritacco, G. & Peluso, R. 2018. Virtual Reality Technologies for the Exploitation of Underwater Cultural Heritage. In: F. Bruno, A. Lagudi & L. Barbieri (eds.), Latest Developments in Reality-Based 3D Surveying and Modelling. Basel: MDPI, pp. 220–236.

• 76 - See: [http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CLT/images/1.6c\\_Underwater\\_Cultural\\_Heritage\\_Museums.pdf](http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CLT/images/1.6c_Underwater_Cultural_Heritage_Museums.pdf) and <https://www.scubatravel.co.uk/unesco-underwater-tourism.pdf>



• Fig. 26: The maritime museum at Sharja, UAE. © CMAUCH/Emad Khalil

## Underwater Cultural Heritage and Sustainable Development

Different facets of UCH can be linked to the UN's Sustainable Development Goals, which were agreed as part of the 70th session of the UN General Assembly in 2015<sup>77</sup>. Sustainable Development Goal (SDG) 14, which addresses the conservation and sustainability of the oceans, seas and marine resources, is the most relevant to UCH<sup>78</sup>. Sustainable ocean management is necessary if the aims of this SDG are to be achieved. Among the targets of SDG 14 are the sustainable management and protection of marine and coastal ecosystems in order to achieve healthy and productive oceans. There is a clear relationship with UCH since underwater archaeological sites around the world create ecosystems for many marine species. Protection and safeguarding of UCH sites will, therefore, contribute to the preservation of these ecosystems<sup>79</sup>.

• 77 - See: <https://en.unesco.org/sustainabledevelopmentgoals>

• 78 - See: <https://sdgs.un.org/goals/goal14>

• 79 - See: <http://www.unesco.org/new/en/culture/themes/underwater-cultural-heritage/2001-convention/official-text/sustainable-development-goals/>



SDG 14 also targets an increase in economic benefit from the sustainable use of marine resources. UCH, as a non-renewable resource linked to cultural tourism, is perhaps the most obvious connection in this regard<sup>80</sup>. Dive tours on in situ UCH sites, for example, are growing in popularity and tend to generate a higher tourist spend over longer periods of time than other tourism activities. Diving tourism is therefore an invaluable resource for sustainable development as it raises awareness of UCH sites and can enhance localised economic activity. Studies have demonstrated a positive economic impact on the entire tourism supply chain, including hotels, restaurants, transportation and so on<sup>81</sup>, and that the funds generated through visits to UCH sites can contribute effectively to their protection, preservation and further study.



• Fig. 27: A collection of artefacts from the Sadana Island shipwreck on display at the Hurgahda Museum, Egypt. © Ziad Morsy

Early underwater archaeological parks, developed in Australia, Italy, the USA and Finland, among others, have already begun to prove that UCH can become a significant driver for economic growth. The development of aspects of UCH in future initiatives targeting coastal and ocean sustainability therefore seem inevitable. Furthermore, SDG 14 seeks to deepen scientific knowledge and develop research capacity in ocean sciences, and provides another area where the multidisciplinary and inclusive approach to UCH can play a significant role (Fig. 28)<sup>82</sup>. In order for these sustainable development goals to be achieved, however, those involved in UCH and ocean science have to communicate their research effectively. This entails various forms of public engagement, international and cross-disciplinary working between specialists, as well as the creation and implementation of appropriate policies by decisionmakers. Only when “ocean literacy” is achieved among the public, that is to say understanding the need to protect the natural and cultural heritage of the ocean – recognising the past and supporting the future – will true progress have been made, allowing UCH to contribute to sustainable development and vice versa. 2021 saw the beginning of the UN Decade for Ocean Science for Sustainable Development 2021-2030. As one of the marine sciences that the “Decade” is

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• 80 - UNESCO. 2013. The Benefit of the Protection of Underwater Cultural Heritage for Sustainable Growth, Tourism and Urban Development. See : [http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CLT/pdf/UNESCO\\_UCH\\_Development\\_Study.pdf](http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/CLT/pdf/UNESCO_UCH_Development_Study.pdf)

• 81 - Garrod, B. 2008. Market Segments and Tourist Typologies for Diving Tourism. In: B. Garrod & S. Gössling (eds.), *New Frontiers in Marine Tourism: Diving Experiences, Sustainability, Management*. London: Routledge, pp. 31–47.

• 82 - Henderson, J. 2019. Oceans without History? Marine Cultural Heritage and the Sustainable Development Agenda. *Sustainability*, 11.18, p. 5080. See: <https://www.mdpi.com/2071-1050/11/18/5080>

concerned with, the study of UCH has a vital role in this common framework<sup>83</sup>. As part of this international initiative, UCH research, with the support of governments, organisations, academia and NGOs, should go from strength-to-strength, and continue to enhance global understanding of the vital relationship between people and the marine environment.



• Fig 28: UCH research at Marsa Bagoush. © CMAUCH

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• 83 - Trakadas, A., Firth, A., Gregory, D., Elkin, D., Guerin, U., Henderson, J., Kimura, J., Scott-Ireton, D., Shashoua, Y., Underwood, C. & Viduka, A. 2019. The Ocean Decade Heritage Network: Integrating Cultural Heritage Within the UN Decade of Ocean Science 2021–2030. *Journal of Maritime Archaeology*, 14, pp. 153–165.

# Underwater Cultural Heritage in the Arab States Region



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Protection of  
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