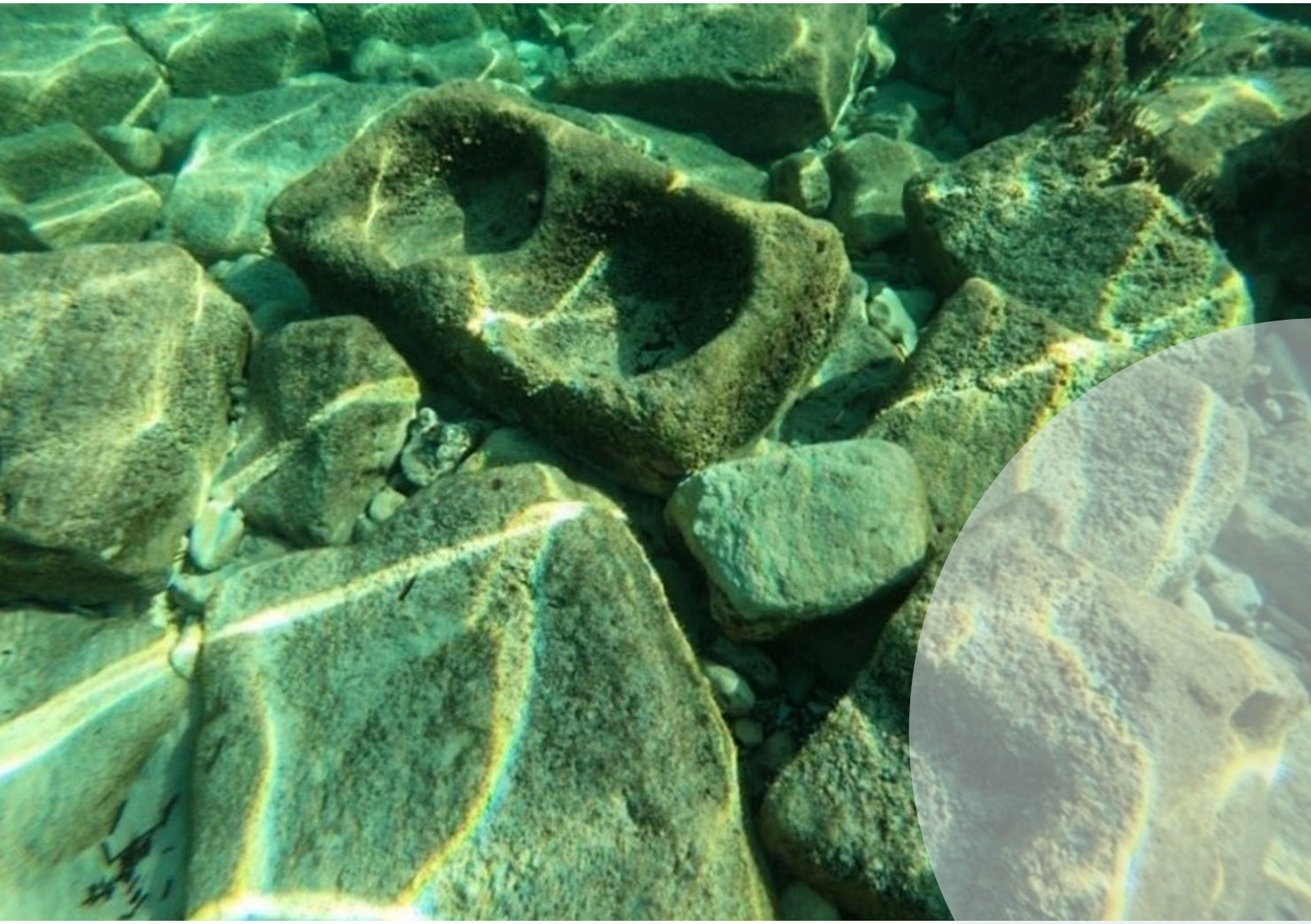

Introduction to Maritime Archaeology

BRITISH COUNCIL

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INTRODUCTION TO MARITIME ARCHAEOLOGY

The sea and the coast played and continue to play a crucial role in human societies and economies. They provide the space through which to explore maritime resources both terrestrial and aquatic, including fish, shellfish, salt and flora. They are also places that facilitate travel and communication both across the coast and through the sea. It is unsurprising then that 40% of the world's population lives within 100km from the sea, highlighting both the importance of the coast, as well as the potential number and density of maritime archaeological sites.

Most people tend to associate maritime archaeology with shipwrecks, harbours and submerged settlements. However, maritime archaeology encompasses a wider range of archaeological features and site types, all of which can provide important insights into the relationship of past human societies with the sea.

When learning about archaeology associated with the sea, we come across different terms that are often used interchangeably. You may have come across the term "underwater archaeology" that refers to archaeology found under the water. You may have also come across the term "nautical archaeology", which is the archaeology of boats. "Maritime Archaeology" is a broader term that is used to describe any material and non-material (intangible) evidence for the engagement of people with the sea. In this respect, it incorporates underwater and nautical archaeology and many more types of archaeology, including coastal, intertidal and even archaeology found further in land.

Tangible maritime heritage includes shipwrecks, marine artefacts (e.g. anchors, fishing weights), coastal settlements, ports, harbours, landing places, fishing installations and anything related to coastal industries, such as salt production.

Intangible maritime heritage includes oral traditions (e.g. legends), social practices, rituals, knowledge and practices concerning nature and the universe (e.g. religious figures protecting seamen), as well as knowledge and skills to produce traditional crafts, such as traditional boats.

Since the 1990s many archaeologists use the term "maritime cultural landscape" (Westerdahl 1992), which describes the interconnectedness of the cultural and natural features related to human interaction with the sea. This holistic approach highlights the significance of the maritime environment in shaping cultural identities and heritage. The ways in which the maritime environment has

influenced cultural heritage has attracted substantial attention in the past decade, particularly within the context of climate change and sustainability.

UNITED NATIONS DECADE OF OCEAN SCIENCE FOR SUSTAINABLE DEVELOPMENT (2021-2030)

The UN has dedicated this decade to advancing scientific knowledge and research to promote the sustainable management and protection of the oceans. Recognising the critical role oceans play in climate, biodiversity, and human well-being, the decade seeks to enhance collaboration among countries, scientists, and stakeholders to address pressing challenges including pollution, overfishing, and the impacts of climate change. By fostering scientific partnerships, improving data collection and sharing, and engaging local communities, the initiative aims to develop actionable solutions, ensuring that oceans and other water bodies contribute to sustainable development goals and benefit future generations.

The role of maritime archaeology in this context is crucial. Maritime archaeology can provide historical depth to climate change studies (e.g. reconstructing sea-level change). Moreover, archaeology through its engagement with local communities e.g. the documentation of traditional maritime economic practices, can highlight more sustainable and balanced ways to engage with the sea. Indeed, the scope of maritime archaeology has expanded in recent years.

A BRIEF HISTORY OF MARITIME ARCHAEOLOGY

3-D model of the Kyrenia. Image: Pat Tanne, Eastern Mediterranean Experimental Seafaring Project, University of Southampton.

While human curiosity with underwater features is centuries old, nautical archaeology and maritime archaeology were established as disciplines in the 1970s (Muckelroy 1978). From the 1960s onwards diver- archaeologists conducted the first underwater excavations in the Eastern Mediterranean at Cape Gelidonya in Türkiye and a decade later, nautical archaeology was taught at university. During that time, a Greek ship was excavated off the shore of Kyrenia on the island of Cyprus – a shipwreck that continues to inform maritime archaeology to date.

While the Mediterranean Sea has been central in the history of the development of maritime archaeology, maritime archaeology is practiced across the globe and follows different research traditions. These include the classical tradition, which focuses on the Greco-Roman World, the prehistoric tradition that developed in Northern Europe and emphasises on submerged prehistoric landscapes, the Historic tradition that focuses on the identification of historic shipwrecks, as well as a strand focusing on commercial maritime archaeology and professionalisation.

Maritime archaeology has always been interdisciplinary particularly through its collaboration with the marine sector and increasingly new methods are incorporated in maritime archaeological research, most recently artificial intelligence. In this module, we will introduce the most commonly used documentation tools in maritime archaeology, while recognising that access to these tools can be challenging due to financial constraints. It is important also to highlight that even though some of these tools may not always be available in the context of the Middle East and North Africa, much of the maritime archaeology of this region is found in shallow waters. This type of archaeology is extremely

vulnerable, and its documentation should be prioritised, before any further research is conducted for the identification of additional maritime archaeological sites in deeper water. This topic will be covered in lecture 4.

MARITIME ARCHAEOLOGY METHODS AND TECHNOLOGIES

Different approaches have been developed for the documentation of maritime heritage and as mentioned above, it is widely acknowledged that maritime archaeology is a resource intensive discipline, particularly when sites and features are in deep water. It is important, however, to become familiar with the different methods used in maritime archaeology, as they are increasingly becoming more affordable and thus more accessible to a broader community of heritage professionals.

These methods are distinguished in intrusive and non-intrusive. The non-intrusive methods involve geophysical instruments, that is instruments used to study the physical properties of the ocean floor (scan) and sub-seafloor (penetrate). These methods have been developed in the context of marine resource exploitation but have had successful applications in maritime heritage.

NON-INTRUSIVE METHODS

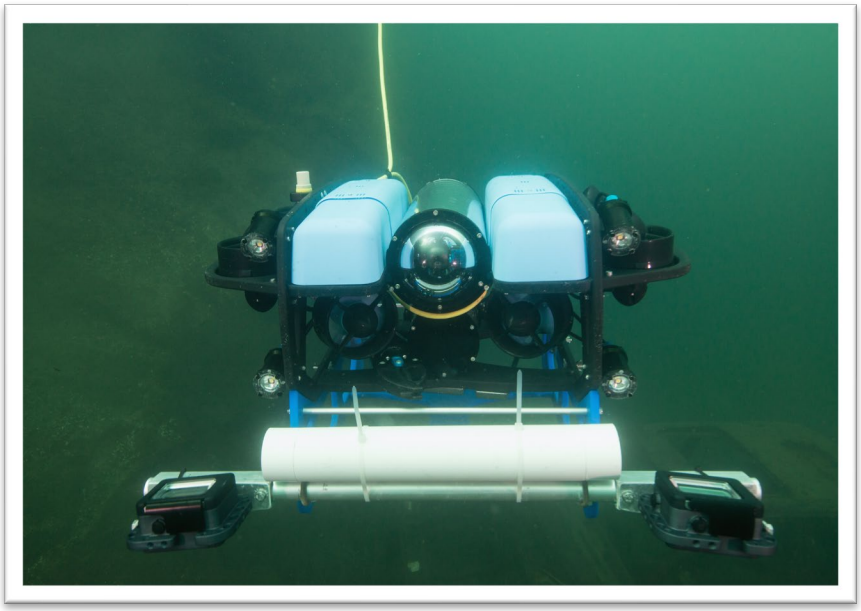
Sidescan Sonar: Is a tool that emits sound waves sideways from an underwater vehicle. It captures the intensity of the returned soundwaves to produce high-resolution maps of the seafloor. The produced images are so detailed as to capture the texture and various features of the seafloor including rock formations, shipwrecks and other underwater objects.

Single beam echosounder: Is another acoustic method measuring water depth through the emission of a pulse and the recording of the time it takes for the echo to return from the seafloor. It is commonly used in bathymetric surveys to produce depth profiles and maps of underwater terrain. Similarly, a multi-beam echosounder multibeam emits multiple sound beams across a wide swath of the seafloor, allowing for the simultaneous collection of depth data over a larger area. This results to more detailed and higher resolution maps of the seafloor.

Sub-bottom profiler: Is an instrument using sound waves to penetrate the seafloor. It thus provides detailed cross-sectional images of sub-seafloor features, including buried archaeological features.

Mangnetometer: Is an instrument that measures the magnetic field strength and its variations under the water. It detects magnetic anomalies that may be caused by geological formations, shipwrecks, and other submerged objects.

Another method for documenting the seafloor includes the Remotely Operated Vehicle/Autonomous Operated Vehicles (ROV) that are widely used in diver surveys. ROVs are essentially underwater robot used documenting submerged archaeological features. They are equipped with cameras and lights and can produce high-detail imagery of underwater features or artefacts often in depths and conditions that are unsafe for human divers.



Blue ROV with a stereopair camera attached. Image: Rodrigo Ortiz Vazquez.

INTRUSIVE METHODS

Coring: A geological technique used to extract cylindrical samples of sediment from the seafloor. The cores essentially provide a vertical profile of the seabed, including valuable information about shifting sedimentation patterns and environmental conditions. It is particularly useful in the reconstruction of ancient coastal landscapes and palaeo-environmental conditions, aiding in timely research areas such as climate change studies and environmental science.

REMOTE SENSING

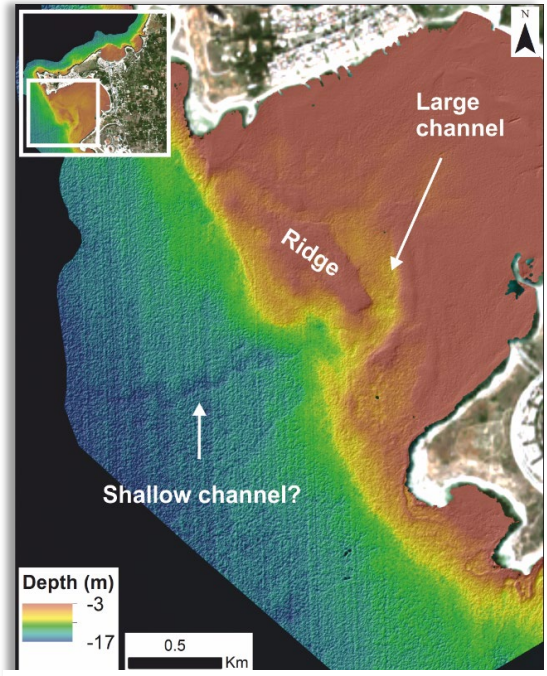
Some of the more affordable methods include remote sensing, which is increasingly used in archaeology through the unprecedented availability of satellite imagery and aerial photography.

Satellite derived bathymetry (courtesy of EOMAP) indicating a channel on the seabed off Ras Ibn Hani in Syria (produced by Kieran Westley on ArcGIS).

Of course, trained personnel (surveyors and archaeologists) are required to accurately identify and document archaeological sites using remote sensing. Moreover, ground-truthing remains the only way to verify remotely sensed observations.

In addition, the use of remote sensing in maritime archaeology can be challenging. While it has been successfully used to document sites, monitor coastal erosion or the impact of modern development on archaeological sites, its use for the identification of submerged features is more limited. It can work best in shallow water, becoming thus suitable for nearshore archaeology. Satellite derived bathymetry (courtesy of EOMAP) indicating a channel on the seabed off Ras Ibn Hani in Syria (produced by Kieran Westley on ArcGIS). Satellite derived bathymetry (courtesy of EOMAP) indicating a channel on the seabed off Ras Ibn Hani in Syria (produced by Kieran Westley on ArcGIS).

In the recent years, substantial efforts have been made in the production of baseline information on maritime archaeology with the use of open access satellite imagery. Currently the largest database of maritime archaeological sites in the Middle East and North Africa has been produced by the Maritime Endangered Archaeology Project.



Satellite identification of the Bronze Age Ras Ibn Hani in Syria. The site is located on a coastal edge, making it extremely vulnerable to sea-level rise and coastal erosion (produced by Kieran Westley on Google Earth Pro).

THE MARITIME ENDANGERED ARCHAEOLOGY (MAREA) PROJECT

The 'Maritime Endangered Archaeology' (MarEA) project is an eight-year initiative (2019–2027) funded by the Arcadia Fund. This project is a collaborative effort between the Universities of Southampton and Ulster, in partnership with the 'Endangered Archaeology of the Middle East and North Africa' (EAMENA) project at Oxford University. The primary goal of MarEA is to document and evaluate threats to the maritime archaeology in the Middle East and North Africa (MENA) region. Additionally, it seeks to establish professional networks and strengthen existing partnerships with governments, universities, and NGOs in the region. On a broader scale, the MarEA project aims to foster global collaborations for the sustainable management of endangered maritime heritage, particularly within the scope of the UN Decade of Ocean Science for Sustainable Development (2021-2030).

MarEA focuses on documenting dynamic and highly vulnerable maritime landscapes, both coastal and submerged, by employing established methods for remote recording. The primary approach to documentation involves analysing high-resolution satellite imagery and historic aerial photos to identify sites and assess their condition. This is complemented by marine geophysical data, existing grey literature, peer-reviewed studies, and in situ visits and fieldwork when feasible. Recording these observations facilitates the creation of coastal vulnerability models, which help local heritage professionals develop and prioritise management strategies such as monitoring and field assessments.

Further examinations include comparative diachronic assessment of spatial datasets to track shoreline changes and measure rates of erosion and accretion. This is enhanced by documenting human activities such as conflict, land reclamation, shoreline modification, urban growth, and agricultural activities. These insights allow heritage professionals to identify maritime sites, consistently and regularly monitor them and ultimately produce informed decisions on site management.

So far, the recording efforts have concentrated on the coastal areas of Tunisia, Libya, Egypt, Palestine (Gaza Strip), Lebanon, Syria, Sudan, Yemen, Oman, the UAE, Bahrain, and Kuwait.

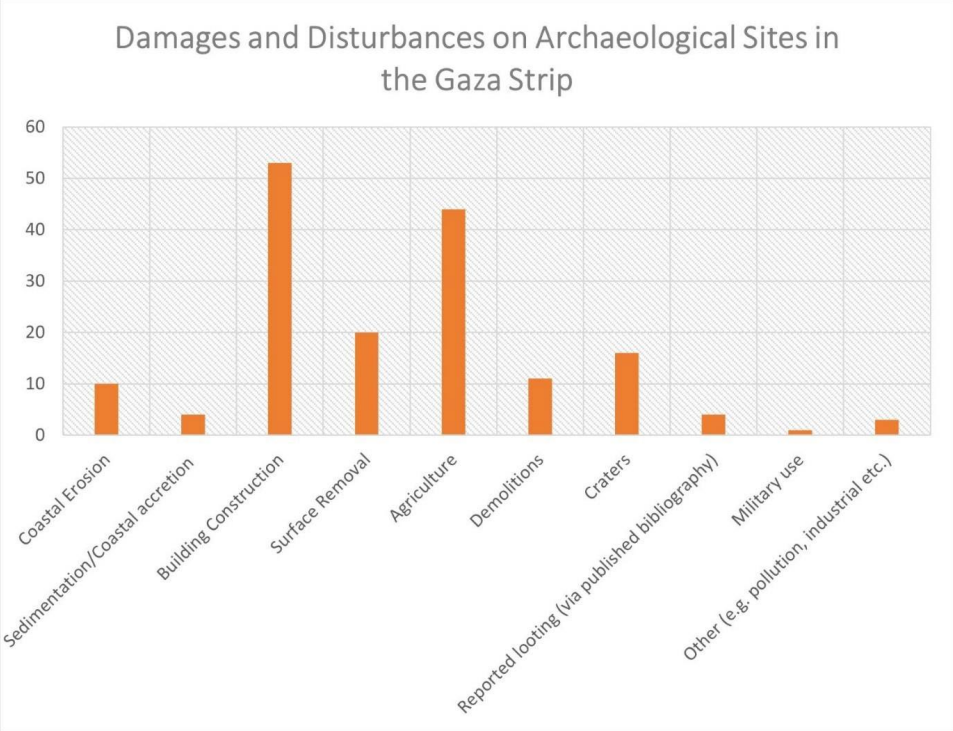
Additionally, the MarEA project is developing heritage management tools tailored to the needs of local practitioners, such as coastal vulnerability indices and a regional coastal and maritime heritage guide. These tools aim to enhance capacity in underwater cultural heritage and archaeological practice in the region.

Collaborative training and fieldwork activities in Bahrain, Egypt, Jordan and Libya organised by the MarEA project.

Examples of applied research include:

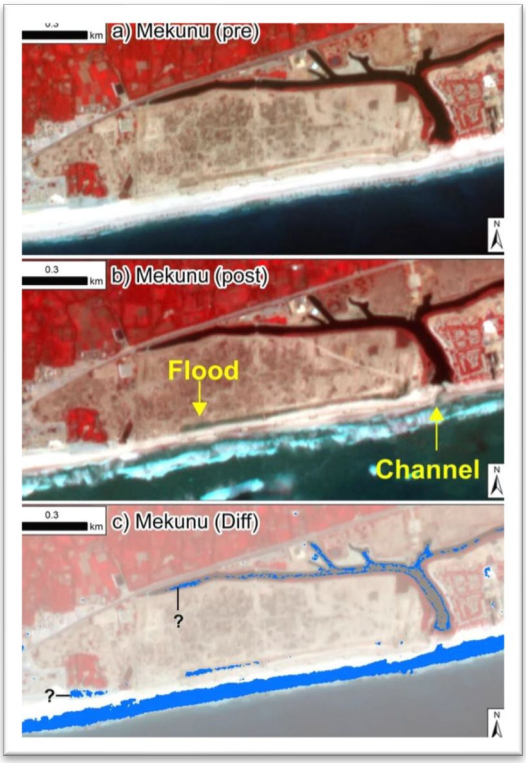
(1) Damage and disturbance assessment of archaeological sites in the Gaza Strip between the 1970s and 2022. This research produced a record of archaeological sites, which it subsequently examined through satellite imagery and aerial photographs in order to identify key drivers for damage. The results suggest that before the ongoing war in Gaza heritage damage was related to demographic pressures and associated building construction, as well as agriculture. Coastal erosion and craters resulting from airstrikes have also impacted significantly Gazan heritage up until 2022.

This assessment provided a necessary baseline to identify vulnerable coastal sites, which were subsequently surveyed by students from the Islamic University of Gaza.



Damage and disturbances at archaeological sites in the Gaza Strip (Image adapted from Andreou et al. 2022a: 35, tbl.3)

(2) Flooding assessment of coastal archaeological sites in Oman (Arabian Peninsula) before and after extreme sea level evens, like tropical cyclones. Accessibility to sites during and after these events is largely unsafe. However, the flooding impacting the sites can be identified through high-resolution imagery taken before and after the tropical cyclones. The imagery can be further processed, to identify and visualise pixels that represent standing water. MarEA conducted such analysis at the Medieval site of Al Baleed (Dhofar), which is a site particularly vulnerable to flooding and erosion resulting from an increasing frequency and intensity of hurricanes and cyclones.



Flood assessment in Oman. (Image adapted from Andreou et al. 2022b: 478, fig.8).

After identification:

Following the identification of maritime sites or features, different methods can be used for their documentation. These range from traditional survey and excavation methods to photographic surveys that collect overlapping imagery of the site to produce 3D models. We will explore some of the more affordable methods in lecture 4.

CONCLUSION:

In this lecture we learned what maritime archaeology is and clarified that it encompasses tangible and intangible evidence that can be found both on land and under the water. We traced the intellectual and methodological foundations of maritime archaeology in the Mediterranean Sea, which is the key geographic focus of this online module. Lastly, we briefly introduced some of the most commonly methods to identify and document maritime archaeological sites.

The following section will introduce some of the key maritime archaeological features found along the Eastern Mediterranean and the North African coast, using Palestine and Libya as case studies.

Disclaimer: The materials and information presented in these lectures have been compiled from a range of academic sources, which are listed in the Bibliography and Further Reading section of this course.