

# Digital in Underwater Cultural Heritage



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By

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How inappropriate to call this planet Earth when it is quite clearly Ocean  
—Arthur C. Clarke

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## LIST OF ABBREVIATIONS

2D	Two Dimensional
3D	Three Dimensional
AR	Augmented Reality
CAD	Computer Aided Design
CDH	UCLA Centre of Digital Humanities
DH	Digital Humanities
EDM	Electronic Distance Measurement
ETC	UCLA Experiential Technologies Centre
GIS	Geographic Information System
GPS	Global/Geographic Positioning System
GUI	Graphical User Interface
HABS	Historic American Buildings Survey
HAER	Historic American Engineering Records
HALS	Historic American Landscapes Survey
HCI	Human-Computer Interface
ICAHM	International Committee on Archaeological Heritage Management
ICOM	International Council of Museums
ICOMOS	International Council on Monuments and Sites
INA	Institute of Nautical Archaeology
LoC	Library of Congress
MoCT	Ministry of Culture and Tourism
NAS	Nautical Archaeology Society
NGO	Non-Governmental Organisation
NPS	National Park Service
NPR	Non-Photorealistic Rendering
ROV	Remotely Operated Vehicle
SAD	Sualtı Araştırmaları Derneği (Underwater Research Society)
SCUBA	Self-Contained Underwater Breathing Apparatus
SfM	Structure from Motion
SSS	Side Scan Sonar
SOA	Shipwrecks of Anatolia
TAY	Turkish Archaeological Settlements Project (Türkiye Arkeolojik Yerleşimleri)

UCH	Sualtı Kültür Mirası Projesi – SKM (Underwater Cultural Heritage Project)
UCLA	University of California Los Angeles
UNCLOS	United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific, and Cultural Organization
VENUS	Virtual Exploration of Underwater Sites
VMC	Virtual Museum of Canada
VIZIN	Institute for the Visualisation of History
VM	Virtual Museum
VR	Virtual Reality
VRML	Virtual Reality Modelling Language
VSim	Virtual Simulation
WWW	World Wide Web

# INTRODUCTION

Since Einstein deduced the existence of space-time ripples moving at light speed across the universe, holding everything together, a century of science, engineering, technology, and determination has finally proved that he was right. This inspiration to constantly search for greater understanding may be considered part of the human condition. So we continue, in each realm, each faculty, each discipline, investing resources as effectively as possible, to create a path for those yet to come. We may not always have mighty agencies or massive budgets on our side, but we continue with resolve and ingenuity, to put what we have to good use.

Nautical archaeology may not have gravitational waves to contend with, but we have waves of our own that both hold our secrets and wear away at them. In contrast to terrestrial archaeology, the seas hold their secrets as much by their existence as by their constitution. Learning how seafarers travelled, traded, lived, and died through the ages is as rich a legacy as any artefact retrieved. Such knowledge serves to teach us that the ancients strove ever onward in the harshest of conditions, risking life itself to create a path for those yet to come.

As archaeologists, our concern is with the past, the aim of which is to understand the origins and development of human culture by the evidence of ancient remains. Little wonder then that institutions such as the United Nations Educational, Scientific, and Cultural Organization (UNESCO) encourage the highest order of archaeological discipline by means of least interference; however, disturbed archaeological remains should be restored to live in a form of their original context. Difficult as such restorations might be on land, the notion would not work for nautical sites, and the completely hands-off approach of in situ preservation is becoming widely accepted.

Although the process of in situ preservation is valuable in maintaining the complete integrity of the archaeological site, it does, however, pose several challenges to the traditional methods of survey, not least of which is the lack of resulting museum pieces. With luck, even if taking centuries longer than the experimental verification of Einstein's theories, the in situ archaeological site is also being saved by science, engineering, technology, and determination, via digital data collection, visualisation, and interactive dissemination. The colloquial culture of crowdsourcing and

freely available low-budget means are here to rescue digitally our history from beneath the waves.

The Underwater Cultural Heritage (UCH) project emerged from a need to document, research, and preserve underwater sites along the Lycian coast of Turkey. This region has stood out in recent decades as a centre of underwater tourism, enabling divers from a variety of backgrounds to explore the coastal depths of the Mediterranean. This rising number of recreational divers, with increased access to sites of potential historical and archaeological significance, voiced aspirations to partake in underwater surveys. Recognising this interest, the UCH project performs intensive surveys in a systematic and meaningful way, following in situ preservation of the sites. For artefact documentation, the UCH survey would use digitisation methods rather than remove artefacts to the surface, by transforming their pertinent digital data instead. From the outset, special emphasis was put on low-budget tools, digital methods, and optimal public participation. Overall, the process planned to convert the sites to digital formats enabling the UCH team, or others, to apply further computational power.

The UCH project was never intended as just another set of surveys. Indeed, there are many groups more qualified to conduct such meticulous operations. Rather, from its inception, the aim was to challenge the nature of such efforts from a designerly point of view, to take a new approach to archaeology in the Information Age, and perhaps to forge a new wave for digital humanities (DH). Far from shirking responsibility, the project actively indulges the combined challenges of working underwater, in situ preservation, crowdsourcing, a low-budget, public participation, new methodologies, visualisation, interaction, and dissemination.

## **Objectives and methods**

The study of cultural heritage relies heavily on the integration and interpretation of data. Unfortunately, there has been a distinct lack of effective systematic methodology for the collection, preservation, and dissemination of data in Turkey. As a digital humanities project, the UCH team would require a seamless array of archaeological data in conjunction with cutting-edge computational tools and methods for effective analysis, visualisation, and communication. Therefore, this study begins with the formulation of a framework for the collection of data on underwater cultural heritage using in situ preservation and for the subsequent transfer of all data into the digital domain. With computational and computerised tools, the data is visualised to experience sensible interaction methods. As

experiential systems are based on automation, immersion, and interaction, the study examines the musealisation issues in acquisition, conservation, research, communication, and exhibition for nautical data. This examination follows four stages:

- How to formulate a framework for the collection of data on underwater cultural heritage using in situ preservation.
- How this collected data is transferred, stored, and shared in the digital domain.
- How computational and computerised methods of visualisation are conducted for the data collected.
- How this system is transformed into valuable experimental and experiential interactions.

The first question is partially answered through existing digital repository examples that were studied for their concepts, theories, methodologies, and practices. With a survey team of divers from different backgrounds, a data collection model was developed using datasheets, visual media, and maps. The analysis of data, which included measurements, photographs, sketches, and geographic coordinates resulting from over 2000 dives, led to an improvement in the data collection methodology following the principles of in situ preservation. Secondly, and parallel to the development of data collection methods, several digitisation tools were designed and tested by the team of divers and archaeologists. This digital data is transferred to a web-based information system, which stores sketches, photographs, measurements, and dive logs, as well as the preliminary field reports, drawings, and images. The UCH team then composed meaningful visualisations of information from this digital data. Besides computerised tools employed in the overall digitisation methods, computational methods were used for visualisation and modelling of the information. This research culminated in the final effort to enhance interaction mechanisms. In a continuation of digital thinking, various experiential and experimental methods were used to create a web-based virtual museum system and several immersive digital experiences. Overall, these four research questions encompass the UCH project approach towards the future of DH.

The UCH study is based on designing a data system to incorporate the practices of collection, digitisation, visualisation, and interaction for the in situ preservation of underwater cultural heritage. Initially named the virtual museum, the study recognises that no single solution exists for the satisfactory definition of DH. It further recognises that computational and

computerised methods continue to bring new modes of visualisation and interaction to the humanities. Seeking to avoid the debate on definitions for virtual museum, virtual reality, and augmented archaeologist, the project instead develops a methodology for collecting, storing, and sharing data, which scholars and other interested individuals can subsequently retrieve and manipulate through digital tools and methods.

Development was begun in 2007 of a comprehensive information system to provide an integrated framework for surveys conducted during the fieldwork campaign. However, the presence of software and hardware alone cannot be considered an effectively functioning system to properly fulfil user requirements. Besides this technological infrastructure, the availability of data empowers a system, as no information system can be fully functional without adequate data. Therefore, despite the user-friendly interfaces and ability to share information via open-content environments, it is nonetheless certain that the time-consuming build-up of data from thousands of individual survey dives adds just as much to the success of the overall ambition.

Before gathering the data that would populate the database, divers worked tirelessly on trial runs of surveys to streamline the eventual data collection and storage process. Several iterations of methodology were tested before an all-encompassing universal system was reached. Additional logistic and bureaucratic complications, typical of archaeological projects, took up much valuable research time; however, conducting seven years of intensive surveying was preferable to using existing archaeological datasets. The reasons for this were fourfold:

- Lack of publicly available digital data on nautical archaeology.
- Archaeological prosperity of the Turkish coast.
- Lack of systematic methodology based on in situ preservation.
- Challenge to redefine nautical archaeology in the digital domain.

The lack of publicly available data on nautical archaeology was the first challenge. In Turkey, various state and non-governmental organisations, such as the Ministry of Culture and Tourism (MoCT), the General Directorate of Foundations, the Turkish Historical Society, the Turkish Academy of Sciences, universities, municipalities, and other non-profit organisations, are each working to establish cultural heritage repositories. To date, besides some non-governmental attempts, such as the Turkish Archaeological Settlements (TAY) Project to collect and conserve the information on archaeological excavations and surveys in Turkey, there is no compilation of this vast heritage. Moreover, Turkish archaeology is

often criticised for having an insufficient publication to excavation ratio, despite the vast archaeological heritage. Accordingly there is no public information system for nautical archaeology in Turkey. The MoCT publishes limited research on underwater cultural heritage in the proceedings of archaeological symposia, journals, and newsletters. However, these publications do not share a common methodology and cannot formulate a database.

The second challenge concerns the archaeological prosperity of the Turkish Coast. This vast amount of archaeological data that lies unrecorded would be empowered twofold in its dissemination by conducting surveys on undiscovered remains, and subsequently by gaining the attention of archaeologists. The collection of raw data from the coast was preferred, both to avoid potential copyright issues that could occur with an open-content online system and to facilitate further research on the content of data.

The lack of a systematic documentation methodology for in situ preservation was another good reason to conduct independent surveys. In Turkey, research is typically limited to excavations and surveys that include varying levels of destruction to archaeological sites. Early in the UCH project, collecting object data rather than the objects themselves emphasises the preservation of cultural heritage in its original context. With in situ preservation, neither long-lasting systematic destruction nor short-term systematic sampling is appropriate for this project.

The fourth challenge sought to help redefine nautical archaeology in the digital domain and derived from an ambition to apply a designerly approach to museology. Long constrained by the conventions of “brick and mortar”, the definition of the museum is shifting from a passive to a more interactive style in the digital domain. The virtual museum created for the UCH project follows the wiki principles as an open-source information repository. Inspired by initial challenges faced by the UCH project, the aim was to create both a digital location for museology of nautical archaeology and a digital benchmark from which further projects can proceed.

## Outline

*Digital in Underwater Cultural Heritage* investigates a framework for the UCH project by collection, digitisation, and visualisation of, and interaction with, the data collected during the UCH surveys. For the purpose of clarity, it is important to identify the various stages of the UCH project. In 2007, the author formed a group of divers, often referred to as

the UCH team, some of whom worked both in the field and in developing the computer systems. Already SCUBA certified members had to satisfy the Turkish Underwater Research Society (SAD) training procedures, which closely follow the Nautical Archaeology Society (NAS) system. From seven cargo and anchorage sites on the Lycian coast of Turkey, the UCH project detailed 25 sites and over 700 artefacts by 100 dives in its seven-year term. Covering 50 nautical miles of coastline, data was collected digitally without dislocating the archaeological heritage. The UCH team designed a data collection method and created a custom build information system<sup>1</sup> (i.e., the UCH database) for the project. The author then explored various computerised and computational tools for the project. These tools and methods for visualisation were later used for interaction, as the Digital UCH.<sup>2</sup>

The first chapter<sup>3</sup> of this book discusses the theoretical background with a clear definition of underwater cultural heritage. In relation to archaeology, nautical archaeology, and historic preservation, a critical review of the selected legal frameworks is presented to underline the relevance of in situ preservation methodologies. As these methodologies imply, the cultural objects are preserved without decontextualising the archaeology. It is also noteworthy to explain the changing concept of museums based on the criticism of Foucault (1998), defining museum as a heterotopian space. As the digital domain does not always copy what already exists in the actual world, according to Benjamin's article (1969) on mechanical reproduction, for our purposes the potentialities of the

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<sup>1</sup> The information system was built upon an initial development for "The Virtual Museum of Turkish Underwater Cultural Heritage: Kaş Arkeopark Project" (TÜBİTAK SOBAG-107K133). Dr Serkan Girgin of the Middle East Technical University (METU) had constructed the technical framework of the database from codes written for his doctoral research project, while Dr Altay Özyaygen has worked on its online application. In 2010, further changes were made by Yusuf Şafak Bayram, also of METU.

<sup>2</sup> The Digital UCH website builds upon her studies in Architectural Design Computing Programs at Istanbul Technical University (ITU) and in the Experiential Technologies Center (ETC) at the University of California (UCLA). Funded by Turkish Academy of Sciences (TUBA), advisors of this post-doctoral research project are Prof. Dr Gülen Çağdaş, Prof. Dr Diane Favro and Prof. Dr Christopher Johanson. See also the project website: <http://digitalanatolia.etc.ucla.edu/UCH>.

<sup>3</sup> The theoretical discussion of this chapter is partially presented in the dissertation of the author. See also the reference: Varinlioglu, Guzden. 2011. "Recoding the Nautical Archaeology: Virtual Museum of Underwater Cultural Heritage." PhD diss., Bilkent University.



digital domain are discussed in reference to digital reproduction. A new emerging field of digital humanities blurs the pre-established concepts of institutions such as the museum, library, repository, etc. Theoretical approaches for the development of DH projects are explained to include definitions, criticisms, and practices with special focus on concepts of museology and virtuality. The latter stages of the chapter summarise existing information systems, repositories, and virtual museums for preservation, collection, digitisation, and visualisation of, and interaction with, cultural heritage.

The second and third chapters discuss theoretical issues for Turkish underwater cultural heritage and continue to develop definitions for the project. These chapters present the methodology used for the digital collection of data, and include an overview of the data collected. As digital heritage requires careful integration and interpretation of data, the UCH team had to formulate a framework for collecting data digitally, by means of dive surveys using in situ preservation. Via low-budget digital tools, the system allowed good process repeatability for rotating dive teams, and resulted in a methodology that can apply to other areas of in situ archaeological surveying. With a clear relationship between data in and data out, significant time was invested at the database development stage before beginning intensive surveys. Satisfied with the final input structure, data sheets were generated to accommodate the seamless transfer of findings to the database.

The chapter on visualisation explores the means and methods of converting the UCH data to digitally generated views. Having logged many years of surveys that respect in situ preservation to populate custom-built numerical and visual databases, the chapter follows the steps taken to build both two-dimensional (2D) visualisation methods and three-dimensional (3D) digital models from an array of data types. Through parametric tools and data modelling, the UCH team produced 3D photorealistic models to display the existing conditions of the archaeological finds. These advances not only propel the function of the academic but also promote the image of archaeology in an age where visualisation has become increasingly important.

Geo-reference data relaying the locations of sites and objects were initially linked to the Google Maps platform, and GeoChart displays generated from this data.<sup>4</sup> Conventional archaeological drawings of survey

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<sup>4</sup> The initial research is partially presented in the conference proceedings of GA 2012. See also the reference: Varinlioglu, Guzden, Yekta Ipek, Ozgun Balaban, and Gulen Cagdas. 2012. "Visualisation of Archaeological Data Using Voronoi

sites and objects were created and used in the generation of computer-aided drawings (CAD). Site and object photographs did not merely form a single entities catalogue as they were further used to generate panoramic views and photomosaic images for a more immersive experience. Using Structure from Motion (SfM) techniques, animated 3D models of selected objects and sites were produced. Finally, having created a suitable database structure from the outset, parametric object and site images were added as a valuable visualisation asset. Procedural modelling<sup>5</sup> was also used to generate 3D models automatically.

The final effort for environments that had previously been visualised involved experimental and experiential interaction methods for UCH data dissemination and state-of-the-art digital interaction. The results derived from three experiential studies: a project website known as the virtual museum, an application in virtual reality (VR), and a collaborative research environment for augmented archaeologists. The project website, Digital UCH,<sup>6</sup> took the opportunity for the author's students to process the data in exploring alternative methods of visualising the heritage objects. The ultimate intention of the website was to create a pathway for immersive 3D visits to wreck and cargo sites charted worldwide. Eventually, after several promising attempts along alternate avenues, an immersive experience was achieved with minor investment, upon the launch of Google Cardboard. Using the affordable device and application (App), a VR experience of the sites and objects was created via split screen smartphone display, allowing the UCH project to share 3D models with interested parties and archaeologists worldwide. Among features considered for further development is the concept of artificial intelligence as an assistant archaeologist.

In conclusion, the widespread use of information technologies has brought challenges to the humanities. A new concept of digital thinking has emerged from the need to acquire, store, research, communicate, and

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Diagrams.” Paper presented at the Generative Art Conference, Lucca, Italy, December 12–13.

<sup>5</sup> The initial research is partially presented in the conference proceedings of SIGRADI 2014. See also the reference: Varinlioglu, Guzden, Yekta Ipek, Ozgun Balaban, and Sema Alacam. 2014. “Parametric Modeling of Archaeological Heritage in the Age of Digital Reconstruction.” *Blucher Design Proceedings* 1 (8): 614–617.

<sup>6</sup> At UCLA, graduate students Mike Rocchio and Mike D’Errico, as well as undergraduate students Anna Sakzlyan, Jaklyn Nunga, Olivia Smith, and Rachael Gorai, attended Varinlioglu’s course on “Documentation and Dissemination of Cultural Heritage in the Age of Computational Thinking.”

exhibit heritage data. Drawing parallels between DH and underwater cultural heritage studies, this project explores the conceptual framework and applications of a digital platform. The objectives of the study are to formulate a methodology for the collection and visualisation of, and interaction with, underwater cultural heritage based on the principle of in situ preservation. Further to 2D visualisation and 3D modelling, immersive online exhibits and experiential interaction methods are explored. An experimental and experiential project, the UCH explores what can be achieved by current digital technology and indicates the potentials for improvement within the humanities, design, and archaeology.



# CHAPTER ONE

## THEORETICAL BACKGROUND

The study of underwater cultural heritage, as related to nautical archaeology, is a major scientific research discipline with regard to archaeological, historical, and architectural sites and objects. Within this discipline, surveyed sites comprise archaeological periods from the Late Bronze Age to the present, including ships and harbours of the historic past which are traces of nautical activity (Bass 2005). Covering the disciplines of maritime, marine, wetland, and underwater archaeology, nautical archaeology began with the excavation and publication of the Cape Gelidonya Shipwreck (Bass 1961). Sometimes called “archaeology under water,” as a relatively young discipline, nautical archaeology followed in the tracks of land archaeology, implying the implementation of theories and practices of land archaeology to underwater remains (Bass 1966). Both land and nautical archaeologists, like detectives, collect data through excavation and survey.

The preservation of cultural heritage, including underwater heritage, is a relatively novel topic in archaeology. To clarify between the three disciplines of archaeology, historic preservation, and museology, and to understand the theoretical background of preservation principles for cultural heritage, it is necessary to define the key terms as presented by the prominent institutions. The perspectives on preservation of UNESCO internationally, the National Park Service (NPS) in the US, and the MoCT in Turkey, collectively define the creation, usage, conceptualisation, and transformation of these three disciplines.

Archaeological surveys and excavations had traditionally used destructive methods of data acquisition, until 1931, when the International Museums Office drafted the Athens Charter, and international conventions on the protection of cultural heritage allowed the development of legal frameworks. These frameworks are presented to support and promote in situ preservation. The latest legal framework, signed by international authorities, follows the principles of in situ preservation and prohibits the dislocation of material culture. In contrast to international consensus, this preservation method is still not considered an established scientific method

for archaeology in Turkey, where the emphasis is largely given to excavation and destructive methods of data collection.

As one objective of this book is to introduce new concepts to nautical archaeology, it is imperative to define the terms used and continue with this carefully chosen terminology. Archaeology and its sub-discipline of nautical archaeology involve the study of material remains to reconstruct the secrets of history. Paradoxically, archaeological data collection methods have led to the partial destruction of historic evidence, despite historic preservation favouring the long-term preservation of cultural heritage. The methods and terminology used in archaeology reveal the differences and contrasts between the principles of archaeological research and historic preservation.

## Archaeology

Renfrew and Bahn (1991, 9) define archaeology as partly the discovery of the treasures of the past, partly the careful work of scientific analysis, and partly the exercise of creative imagination. Considered as both science and humanities, one of the main concerns of archaeology is the “study of past societies primarily through their material remains – the buildings, tools, and other artefacts that constitute what is known as the *material culture* left over from former societies” (Renfrew and Bahn 1991, 9). This discipline involves the methods of survey, excavation, and analysis of data collected to learn about the past. However, as stated by Sprinkle (2003, 253), these methods result in the “destruction of the past through excavation, analysis, and interpretation” converting the artefacts into the field notes of the archaeologists by isolating the material from its original context.

Unlike many scientific disciplines, the practice of archaeology is not a repeatable experiment or procedure. Forte (1997, 9) stated: “excavation and fieldwork are sometimes rather embarrassing for the archaeologist, because (paradoxically) they involve partially destroying the site that is the object of research without ever being able to recapture the whole of the information it contains.” Excavation, the main source of data collection for the interpretation and observation by archaeologists, is in its nature a destructive process, hence the profession’s concern for recording (Sprinkle 2003, 253). As Sprinkle (2003, 270–271) criticises archaeologists, they “live and breathe data because the archaeological record is an elusive, sexy, democratic past, not one generated by clerks, accountants, or politicians, but by the folks.” In the case of the widely known “Indiana Jones” movie series, we see that archaeologists feel the romance and

mystery of history. For most archaeologists, the excitement is in discovery through excavation and fieldwork, not in revisiting previously excavated materials or places. They want to touch the artefact and discover the hidden past of the earth.

Since its early days, in the late 19th century, the practice of archaeology has evolved to deploy less destructive methods. By the end of the 20th century, with advanced technology, excavations and surveys were benefitting from technologies borrowed from other disciplines. Still, even with adequate tools and techniques, the tradition of archaeology continues to favour excavations rather than non-destructive methods of research and preservation. As one site on land is often occupied by various civilisations sequentially during different periods of history, archaeology relies mainly on excavations and surveys to acquire data. Conversely, archaeological remains found underwater include more than clues, as wreck sites can, in fact, contain entire sub-histories of nautical activity.

A branch of archaeology, nautical archaeology is the systematic study of past human life, behaviours, activities, and cultures from material remains and other evidence found in the underwater environment (Delgado and Staniforth 2002). The term underwater archaeology mostly refers to the environment in which the practice of archaeology is undertaken (Bass 1966). Contemporary definitions of nautical archaeology overlap with the definitions of maritime, marine, underwater, and wetland archaeology. Maritime archaeology concerns humans and their interactions with the sea, and may include sites largely above water related to maritime activities (e.g., lighthouses and harbour sites), as well as other sites found underwater. Marine archaeology is the study of material remains, created by humans and subsequently submerged in the marine environment (e.g., submerged aircraft). Wetland archaeology is the study of humans and their interactions with water, not specifically in a marine environment. Nautical archaeology studies ships and shipbuilding with techniques of underwater exploration, excavation, and retrieval. This book uses the term nautical archaeology, also preferred by the Nautical Archaeology Society (NAS) in the UK, the Institute of Nautical Archaeology (INA) in the US, and other prominent institutions in this field, as it covers the study of all remains of nautical activity.

“How can you call this planet earth, when it is quite clearly water?” is the general slogan of nautical archaeologists. Differing from archaeology on land, while the sea surface shows no traces of these ships and buildings, their remains lie on the seabed, safely protected by water (Delgado and Staniforth 2002). Unlike remains found on land, mostly covered by earth, once discovered in the depths of water, shipwrecks give important clues to

the past. Shipwrecks are often described as “time capsules,” as the term describes the essence and excitement of one instant in time, a slice through history when belongings and commodities on these ships are well preserved (Gibbins 1990, 35). Unless looted, or destroyed by human and natural factors, inorganic archaeological remains found underwater are protected and preserved by the water. Partially submerged under the seabed, the visible remains found underwater provide important clues for archaeologists without the need for archaeological excavation. Usually visited by recreational divers as opposed to nautical archaeologists, who are rare in Turkey, archaeological remains are often encountered in the midst of diving activities.

In Turkey, underwater archaeology is strongly associated with the cargo remains of nautical activity. The visible and long-lasting remains include amphorae, anchors, and other materials carried by ships, as well as architectural elements of harbours, submerged settlements, etc. Once exposed to seawater, organic remains of shipwrecks (e.g., wooden parts) disintegrate; however, when hidden under the seabed, the organic parts of the shipwreck are protected, and thus can be found intact after years. Sealed by a layer of encrustation, cargo remains offer substantial clues on archaeological information such as the shape, texture, and dimensions of earthen artefacts, without disturbing the material culture.

## **Cultural heritage**

Heritage is defined as something that is, or should be, passed from generation to generation because of its value (Webb 2003, 28). Similarly, UNESCO (2003) interprets cultural heritage as “the entire quantity of artistic or symbolic signs handed on by the past to each culture and, therefore, to the whole of humankind.” Given this, any heritage vessel that is movable (i.e., paintings, sculptures, and coins), or immovable (i.e., monuments), and archaeological sites including those found in an underwater setting (i.e., shipwrecks or ruins) are defined as tangible cultural heritage. According to the Convention for the Safeguarding of the Intangible Cultural Heritage, intangible cultural heritage consists of the practices, representations, expressions, knowledge, and skills that individuals, groups, and communities recognise as part of their identity (UNESCO 2003). In this context, human expressions such as oral traditions, performing arts, and rituals are examples of intangible heritage (UNESCO 2003). Cultural heritage is considered “archaeological heritage” where archaeological methods provide the primary information (ICAHM 1990). Thus, the broad definition of cultural heritage covers the



usage, conceptualisation, and transformation of all the preceding descriptions.

The NPS, the federal agency that manages all parks, many monuments, and other conservation and historical properties in the US, defines the term cultural heritage. According to the NPS definition, cultural heritage reflects the significance of collective memory and defines the identity of the community. To encourage consistent preservation practices, the NPS has developed guidelines and standards that facilitate preservation methodologies. Named the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation, they are intended to promote responsible preservation practices that help to protect cultural resources (Weeks and Grimmer 1995). These guidelines offer the four treatment approaches of preservation, rehabilitation, restoration, and reconstruction. The preferred treatment approach is in situ preservation, where possible, rather than the three subsequent treatment methods, as the preservation approach involves the least intrusion on the historical and archaeological material.

Both UNESCO and the NPS define cultural heritage as the place-oriented and physical manifestations of heritage assets, as well as the non-place and non-physical aspects. In the Law Protecting Cultural and Natural Heritage, the Turkish MoCT (1983) defines cultural property as "all movable and immovable property above or underground or underwater that belongs to the prehistoric and historical periods and relates to science, culture, religion and the fine arts." This legislation establishes the national inventory of natural and cultural heritage as a form of possessive protection, as opposed to protection from decontextualisation.

Similar to cultural heritage, underwater cultural heritage means "all traces of human existence having a cultural, historical or archaeological character which has been partially or totally under water, periodically or continuously, for at least 100 years" (UNESCO 2001). Within these interwoven disciplines on the study of underwater cultural heritage, UNESCO estimates there are over three million undiscovered shipwrecks. Many famous shipwrecks have been looted, including the Armada of Philip II of Spain, the Titanic, and the fleet of Kublai Khan (Delgado and Staniforth 2002). The same applies to many wrecks along the Turkish coast, particularly when compared to the limited number of shipwrecks that have been excavated using scientific and archaeological methods. Similarly, the remains of numerous ruins and submerged settlements are often looted, since mostly they lie in relatively shallow water. The excavation of Port Royal in Jamaica, by the INA, and the ruins of Alexandria Lighthouse, known as Pharos, by the Centre d'Études

Alexandrines, are significant examples of systematic excavations of underwater settlements.

However, illegal looting of artefacts, sites, and submerged sites is not the only destruction. No matter how careful the archaeological research, excavation includes irreversible modifications to cultural heritage sites. Due to archaeological research, these objects of material culture are decontextualised and isolated from the milieu they represent. To prevent this decontextualisation, several conventions, laws, and guidelines have been created to establish a legal framework at national and international level.

### *Legal frameworks*

The legal issues relating to the discovery, survey, and excavation of underwater cultural heritage were once described as a “legal labyrinth” (Bowens 2009, 45; Altes 1976). Borrowing rules from different professional fields, such as historic preservation, archaeology, and nautical archaeology, research on underwater cultural heritage follows a path through this web of national and international laws and regulations. As underwater cultural heritage is found in the seas and oceans, the United Nations Convention on the Law of the Sea (UNCLOS) is the particular international law to be referred to (Bowens 2009, 45). Adopted in 1982, this Convention outlines the divisions of coastal waters into five different zones: deep seabed and the high seas, continental shelf, exclusive economic zone, contiguous zone, and territorial seas. Defined mainly by distance to the shoreline (i.e., coastal baseline), these zones have different regulations regarding natural resources, navigational rules, and ownership of cultural heritage. When this convention was negotiated, underwater cultural heritage was not the main concern; however, it is important to know where the land ends and the sea begins (Bowens 2009, 45). As the locations of the surveys conducted for this book are in the territorial sea, which extends up to 12 nautical miles from the coastal baseline, Turkey has the exclusive right to regulate all activities relating to the underwater archaeology.

The UK and US authorities created the two most important policies concerning the preservation of wreck sites. Current English policy heavily relies on a voluntary approach to heritage management by local organisations for a comprehensive and national vision on the management of underwater cultural heritage (Oxley and O’Regan 2001, 12). In the case of the US, the current legislative environment frames the management of underwater cultural heritage. Depending on where the resource is located,

and subject to specific and individual requirements, this heritage falls under one of three regimes: General Maritime Law (1789), the Abandoned Shipwreck Act (1987) and the Marine Sanctuaries Act (1972) (Street 2006, 468). The first act outlines the laws of salvage and finds, while the last two, more recent acts, pertain to the ownership of shipwrecks. Turkey considers all cultural heritage to be owned by the government, and no private trade in these items is allowed (Bowens 2009, 49). Some countries, such as Greece and Turkey, restrict search and diving activities, and in the case of Turkey, permission from the MoCT is required to conduct underwater research surveys (Bowens 2009, 49).

### *National perspective*

Although legislation in the UK and US draws a general outline of theory and practice for preservation, an overview of Turkish legislation is needed to understand whether these international methods are applicable. Turkish lands and waters have such a vast cultural heritage that the complexity of ancient remains would require a major adaptation of international legislation, if not an entire redesign of the legal framework. Situated in geography that has housed numerous civilisations throughout history, Turkey is a prominent research area for many national and international scholars from diverse disciplines, such as archaeology, architecture, history, and historic preservation (Blake 1994).

The MoCT compiles reports from these diverse archaeological activities in its annual International Symposium of Excavation, Survey and Archaeometry. The published conference proceedings are accepted as the primary resource of documentation for field studies conducted in Turkey. The MoCT is responsible for all cultural heritage management activities through its Department of Antiquities, which issues and regulates the permits for archaeological or historic preservation study and research. Following previous Turkish legislation, the Antiquities Law (1973) that did not explicitly include nautical sites, the MoCT passed the Law Protecting Cultural and Natural Heritage in 1983. This second piece of legislation was designed to be more comprehensive in protecting and conserving underwater cultural heritage in its expanding meaning (Blake 1994, 276). According to this law, archaeological sites are classified into three groups with respect to the characteristics and values they carry. These sites are then graded as first, second, or third degree, based on their significance and archaeological values. This grading defines the level of intervention allowed for research, conservation, and restoration.

The current law of 1983 extends the scope of legislation on antiquities to cover underwater archaeological sites and other remains while retaining most of the perspectives of the 1973 law (Blake 1999, 173). From a prohibitive perspective, some designated areas of the Turkish coast are declared to be underwater protection zones. In these protection zones, recreational diving activity has been banned to protect their underwater cultural heritage. Although the law expected to designate “no diving zones” as a solution to the looting and destruction of archaeological heritage, these areas became more attractive to the public. Even though it is not clearly defined how they are designated, it is believed that these zones are driven from research conducted by the INA during the 1980–90 surveys. As there is no publicly available database for this archaeological heritage, these “no diving zones” are accepted as *de facto* shipwreck areas.

In Turkey, various state and non-governmental institutions, such as the MoCT, the General Directorate of Foundations, the Turkish Historical Society (TTK), the Turkish Academy of Sciences (TUBA), universities, municipalities, and other non-profit organisations are working on establishing cultural heritage repositories. To date, besides some non-governmental attempts, such as the TAY project, there is no compilation of this vast heritage. Moreover, Turkish archaeology is often criticised for having insufficient publications on excavated and surveyed sites relative to the vast archaeological heritage (Yamaç and Tanındı 2009).

TAY (1998) is a project started in 1993 through a non-governmental effort for documenting and conserving information on archaeological settlements in Turkey. The principal aim of the project is to gather a chronological and regional inventory of the entire cultural heritage of Turkey by means of thorough documentation of archaeological settlements. Composed of both professional and volunteer archaeologists, architects, historians, scholars, and students, the project disseminates the collected, documented, and organised knowledge of Anatolian and Thracian history. The concern was to underline that the Turkish archaeological records on excavations and surveys are neither well organised nor easily accessible. Thus, the team highlights the importance of a central inventory to document and preserve information on Turkey’s cultural heritage for the future. Not accepted as scholarly initially, archaeologists now extensively acclaim the endeavours of the TAY project. Greaves and Helwing (2003, 71) indicate that whereas few countries are experiencing the same levels of destruction as Turkey, few can document and publicise as effectively as the TAY project.

### *International perspectives*

There is a sequence of charters and conventions that leads the establishment of guidelines on the preservation of archaeological and historical remains. The Athens Charter, from the Athens Conference of 1931, organised by the International Museums Office, establishes basic principles for an international practice for preservation. The Venice Charter, of 1964, underlines the importance of setting respect for the original fabric, the precise documentation of any intervention, and the significance of contributions from all periods to the cultural heritage. The Venice Charter, which was adopted by the newly formed International Council on Monuments and Sites (ICOMOS), published in 1966, is an important modern milestone for the preservation movement. The Venice Charter was followed by a series of other standards, charters, formal recommendations, and conventions relating to protection.

Similarly to these charters, ICOMOS lists archaeological heritage preservation. The Charter for the Protection and Management of Archaeological Heritage is relatively new, when compared to charters on architectural preservation. Dating to 1990, this charter defines “archaeological heritage” as part of the material culture. Following archaeological methods to provide primary information, archaeological heritage comprises “all vestiges of human existence and consists of places relating to all manifestations of human activity, abandoned structures, and remains of all kinds [...] together with all portable culture associated with them” (ICAHM 1990, article 1). Favours in situ preservation, this charter forbids the destruction, degradation, or alteration, of any archaeological site, monument, or their surroundings without “the consent of the relevant authority” (ICAHM 1990, article 3). Accordingly, excavations are only supposed to be carried out on sites and monuments threatened by development, land-use change, looting, or natural deterioration (ICAHM 1990, article 5). In exceptional cases, unthreatened sites may be excavated to answer research problems or to interpret them more effectively for presentation to the public. In such cases, excavation is supposed to be partial, leaving a portion undisturbed for future research. Moreover, excavations should be conducted under the principles embodied in the 1956 UNESCO Recommendations on International Principles Applicable to Archaeological Excavations. These principles propose adequate conservation, research, and exhibition of excavated sites, for the dissemination of the information to the public.

For the protection of underwater cultural heritage, the 1996 charter and the 2001 UNESCO Convention on the Protection of Underwater Cultural

Heritage explain the general principles and guidelines of protection in nautical archaeology. According to the Charter for the Protection and Management of Underwater Cultural Heritage of 1996, underwater cultural heritage is defined as the archaeological heritage which is in or has been removed from an underwater environment. It includes submerged sites and structures, wreck sites, wreckage, and their archaeological and natural context. Accordingly, the UNESCO Convention on the Protection of Underwater Cultural Heritage of 2001, which was adopted at the UNESCO General Conference in 2001, intends to enable States to better protect their underwater heritage. As promoted in the 2001 convention, approaches that favour in situ preservation of underwater cultural heritage should be considered as the first option. When further research is needed, non-destructive techniques or non-intrusive surveying and sampling should be encouraged in preference to excavation. During these investigations, unnecessary disturbance of underwater cultural heritage should be avoided. If any disturbance is necessary, adequate documentation should accompany the research. In the overall design of the research, public awareness should be encouraged as well as the education of related parties (UNESCO 2001, article 1). Consequently, the question is how to protect these underwater sites and also retrieve the necessary information on the artefacts that are defined as underwater cultural heritage. As a general review, all the charters and conventions encourage in situ preservation and non-destructive surveying as a general philosophy. This preservation methodology seems to conflict with archaeological fieldwork, as the latter favours methodologically destructive excavations.

A review of current legislation on cultural heritage shows that legislative measures for the control of major archaeological research are lacking in Turkey. Although there are a few regulations in effect, partially relating to the topic and including requirements for research and reporting, many aspects, such as cultural heritage management and dissemination of information to the public, are not covered by this legal framework. While several studies have been performed, covering broad topics such as cultural resource management and preparation and implementation of coastal zone management plans, the outcomes of the studies have not been put into practice. Moreover, archaeological sites are often delegated to archaeologists who have limited systematic excavation, conservation, or display programmes for cultural heritage sites. Where resources are available for maintenance, importance is largely given to excavation and moving artefacts to museums, thereby separating them from the context in which they were found. As favoured by UNESCO (2001), the in situ preservation of underwater cultural heritage should be considered as the