

# Chapter 1

## Remains of the Shipwreck: An Introduction to the Iberian Maritime and Underwater Landscape



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**Abstract** The demand for wood in the sixteenth and seventeenth centuries forced the adoption of sustainable policies and practices in forestry in the Iberian Peninsula, as deforestation and increased dependence on imported timber threatened Spanish and Portuguese interests overseas. Little by little, policies for the conservation and organization of resources were developed that reached a significant peak in the eighteenth century, at least in the Spanish case (Nayling and Crespo Solana 2016; Crespo Solana et al. 2018; Crespo Solana 2019). The sixteenth century was also a century of innovation in art, science, and technology, and this technological advance was partly the result of the socio-technological exchange between Mediterranean and northern European cultural traditions epitomized by developments in ship design and construction. In the twentieth century, ships and boats were the protagonists of important and more recent studies that have been of great influence in the development of a more integrated study of the ships and the populations that built, sailed, and lost them. These studies helped the development of an archaeological record (Castro et al. 2018) related to intertidal zones and submerged sites, focusing on the analysis of the transfer of knowledge about ocean navigation, especially between the Mediterranean and the Atlantic (Borrero et al. 2021).

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Portuguese interests overseas. Little by little, policies for the conservation and organization of resources were developed that reached a significant peak in the eighteenth century, at least in the Spanish case (Nayling and Crespo Solana 2016; Crespo Solana et al. 2018; Crespo Solana 2019).<sup>1</sup> The sixteenth century was also a century of innovation in art, science, and technology, and this technological advance was partly the result of the socio-technological exchange between Mediterranean and northern European cultural traditions epitomized by developments in ship design and construction. In the twentieth century, ships and boats were the protagonists of important and more recent studies that have been of great influence in the development of a more integrated study of the ships and the populations that built, sailed, and lost them. These studies helped the development of an archaeological record (Castro et al. 2018) related to intertidal zones and submerged sites, focusing on the analysis of the transfer of knowledge about ocean navigation, especially between the Mediterranean and the Atlantic (Borrero et al. 2021).

The ForSEAdiscovery project intertwined history, underwater archaeology, and wood science with applications of Geographic Information Sciences (GIS) to produce data integration, mapping, and visualization tools (Crespo Solana 2014). As part of this multidisciplinary project, studies of the historical evidence for timber exploitation, selection and supply, contemporary forestry practice and preservation, were complemented by archaeological excavation and investigation of early modern Iberian shipwrecks and the application of dendrochronology to these assemblages. Dendrochronology has developed as an essential tool for the precise dating and provenancing of timbers found in archaeological ship finds but only in areas where well-replicated reference tree-ring chronologies have been constructed (Nayling 2008; Rich et al. 2018). This has limited its use in the Iberian Peninsula where historical dendrochronology has had less application than in the rest of Northern Europe (Domínguez-Delmás et al. 2015). The ForSEAdiscovery project sought not only to build on extant historical tree-ring chronologies in areas known to have supplied timber for shipbuilding, but also to explore additional methods in wood science which might complement provenance based on tree-ring widths alone.

This collection of essays brings together various research projects related to Iberian ships and the world in which they were built and sailed. It features a collection of works carried out by a network of experts in the fields of history, archaeology, anthropology, and associated disciplines. The result summarizes a body of work that we had not planned to achieve, but that was developed beyond and above the goals we had set up and achieved for the Marie Curie Multi-ITN project (agreement no.: 607545) entitled *Forest resources and Ships for Iberian Empires: ecology and globalization in the Age of Discovery*, ForSEAdiscovery, with Ana Crespo Solana and Nigel Nayling principal investigators (Nayling and Crespo Solana 2016). We had not anticipated how well we worked together, the synergies

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we created, and the sense of community we developed. As it stands, this book is a summary of what we learned about these incredible machines—oceangoing ships—and the people who built and sail them. In this sense, it is intended as a set of incremental contributions to our knowledge, and not as a treatise on Iberian navigation in the early modern age, which would require a much more extensive work, and would probably be useless in one decade or so.

In the fifteenth century a new and large enterprise spread over the oceans, creating new theatres for exchange, and generating a new globalized interculturality that profoundly affected European culture. New maritime routes were opened in all directions, as new resources were sought to meet the demands that this historical process produced. The exploitation of natural resources, especially wood, is at the origins of the mercantile capitalism of classical modernity. The use and exploitation of timber resources was determined by both the traditional demand of materials for the shipbuilding industry and the new experimental needs of the developing shipbuilding technologies. Ships became the most important instruments of this globalization and extraordinary inhabited machines (Castro 2008). The wrecks of ships built in the Iberian Peninsula and in the Americas during expansion of Iberian Empires (sixteenth-eighteenth centuries) are iconic examples of underwater cultural heritage where multiple modern sovereign states and their citizens hold interests. All too frequently, these shipwrecks have been commercially exploited leading to the degradation and destruction of internationally important heritage. The sixteenth century has perhaps attracted more attention from the public because its shipwrecks fuelled a treasure hunting industry that has inspired many to seek and destroy the archaeological remains of most of these ships. These shipwrecks have attracted some scholarly attention as well, and Thomas Oertling was the first to propose a set of architectural signatures characterizing the ships of the Iberian Peninsula, with his seminal paper “The concept of the Atlantic vessel” (Oertling 2001), which highlighted the construction of the Iberian ship as a paradigm. However, Iberian ships are still a largely unknown collection of ship types that cruised the oceans to and from the Iberian Peninsula from the fifteenth to the eighteenth centuries (Castro 2008).

ForSEAdiscovery is the first project funded by the Marie Curie program of the European Union aimed at an interdisciplinary study on modern history and maritime archaeology. Its objectives were based on a trans and interdisciplinary methodological and theoretical perspective to investigate the supply of wood for shipbuilding in the Iberian empires between 1500 and 1800. The origin and reason for the project revolves around thousands of fragmented stories shipwrecks and the problem of the scarce nautical and underwater archaeology that makes a historiographical revision necessary as well as to explain the reasons for this interdisciplinary history. The prevailing historical context forms a time-space framework of undoubted transcendence due to the wide commercial and financial networks related to the lucrative business of wood (the oil of the first global age), the master carpenters, delegates and servants of the crown, seafarers, suppliers, and many other agents whose

empirical presence becomes a reality both in the documentary sources collected in archives and in the remains of archaeological evidence found in wrecks. The naval history and narrative history behind the shipwrecks has hardly interested those who have intervened in archaeological sites. Unfortunately, most of the attention of his existence was on treasure hunters.

Studies have highlighted the focus of route logistics, the reason for the evolutionary perfection of shipbuilding techniques. The ForSEAdiscovery project has also drawn attention to the relationship between the maritime empire and capitalism and the plundering of natural resources, especially wood. The historical investigation allows us to know how the routes, places of origin, and networks of agents involved in the transport and use of wood were organized, from the forest to the shipyards (Varela Gomes and Trapaga Monchet 2017). There is already knowledge about this, especially regarding the transport of wood from North and East Europe to the Iberian Peninsula between the sixteenth and eighteenth centuries. Much is known about these networks, but little is still known about the timber monopolies that constituted true global trade. We have organized this book into 26 chapters, organized along three main lines of research: history, dendrochronology, and archaeology.

Chapter 2 introduces the ForSEAdiscovery Marie Curie research project and explains the main goals of our multidisciplinary research. A special emphasis is placed on explaining in depth the meaning and scope of the project, which was a look into the importance of timber the basic source of energy and construction materials behind the European driven globalization of the early modern period. This project entailed a holistic approach and the coordination of a wide team of experts from both the hard sciences and the humanities. This interdisciplinary teamwork focused on the maritime cultural heritage, its historical significance, and its methodological and transdisciplinary relevance in relation with environmental sciences, necessary to understand the natural and patrimonial dimensions of the historical processes. In Chap. 3 author Ana Crespo Solana introduces the people and the networks of commerce of the Spanish *Carrera de Indias*. This chapter presents a short overview of the connections between ships, merchants, cargoes, harbours, and routes, and emphasizes the cosmopolitan nature of the intertwined interests of the merchants and the political power. Chapters 4, 5, and 6 discuss the shipbuilding traditions that flourished in the Iberian Peninsula during the late middle age and the early modern period. Chapter 4, by Filipe Castro, Marijo Gauthier-Bérubé, and Miguel Martins, is a short summary of what characterizes the ships of the Iberian Peninsula in this period. It presents the generally accepted sources for the Peninsula's shipbuilding tradition – Mediterranean and North European – and details the evidence behind these assumptions. Chapter 5, by Filipe Castro and José Virgilio Pissarra, presents a summary of the characteristics that characterize the most commonly mentioned ship types, with a special emphasis on caravels and galleons. Chapter 6, authored by Marcel Pujol y Hamelink, is a detailed history of the Medieval origins of Spanish shipbuilding.

Chapter 7 is authored by specialists Arnaud Cazenave de la Roche, Fabrizio Ciacchella, Cayetano Hormaechea deals with an important late sixteenth century Ragusan scholar, Nicolò Sagri, or Nikola Sagroević, who wrote several texts on

navigation and shipbuilding. The manuscript presented in this chapter is titled “*Il Carteggiatore*”, and includes an important section that offers an overview of Italian-influenced shipbuilding of the early modern period through the example of a typical merchant ship of that time, a nave, the method of calculating its tonnage, the making of sails and anchors. Chapters 8 and 9 address some of the problems of supply and demand of timber for shipbuilding. Chapter 8, by Germán Jiménez Montes, presents an interesting overview on the north European timber trading networks, and associated trades, related to naval provisions in Seville. Jiménez Montes details the development of the Seville shipyards and the key role that the Low Countries, as well as Dutch, Flemish, and German agents, played in the trade between the Baltic and the Iberian Peninsula. Chapter 9, authored by historian Koldo Trapaga Monchet, presents a new and important overview of the provisioning of Portugal shipyards during the reign of king Philip IV (1621–1634). This chapter is an excellent and thorough account of this important period and its technological and logistical changes related to the shipbuilding industry.

Chapters 10, 11, and 12 analyse documents and vocabulary related to shipbuilding in the dawn of the early modern age. In Chap. 10 Ana Crespo Solana presents an interdisciplinary approach to the study of shipbuilding in Modern Spain, combining archaeology and history as complementary sources for a better understanding of both the socio-institutional framework of fleets and navies and to the technical characteristics of shipbuilding architecture. Chapter 11, authors present a summary of current knowledge on technical texts on shipbuilding. As these are rare before the Renaissance, the story of the evolution of watercraft in Europe in the two millennia before the appearance of the first shipbuilding treatises is regional and complex. It is not until the fifteenth century that the first technical texts describe the large European merchantmen, which start converging into a small number of types, sharing the same characteristics because they were designed and built for similar functions. Following up on the technical subject, Roberto Junco introduces and presents an early eighteenth-century manuscript in Chap. 12, written by a monk named Joseph de Ledesma after a voyage from Mexico to Rome. One of the earliest known maritime glossaries in Spanish, its importance is thoroughly explained in the author’s introduction.

Chapter 13 details a GIS application on sixteenth to eighteenth century shipwrecks. The authors present a georeferenced database framed within the context of the project ForSEADiscovery. The general objective of this database is to cross-link historical information with dendro-archaeological evidence in order to date and provenance the wood used in Iberian shipbuilding, and to provide a large amount of shared data through GIS-oriented databases that further analyses. The authors emphasize the importance of special analysis for an historical understanding of the definition of the Iberian ship characteristics and their evolution. In Volume 2, Chap. 1, Marta Domínguez Delmás, Sara Rich, and Nigel Nayling present a summary of the advances in dendrochronology in the Iberian Peninsula, during the last decade, and detail the challenges and strategies selected to develop this discipline. In Vol. 2, Chap. 2 the author, Sarah Rich, ventures into theory and proposes a philosophical approach to the study of shipwrecks, “object-oriented ontology, to the study of ships

and shipwrecks in order to address commonly encountered, and overlapping, issues of mereology, identity, origins, and representation". Volume 2, Chap. 3, by Miguel San Claudio, the director of the archaeological excavation of the Ribadeo shipwreck, a warship named *Santiago de Galicia* that ended its days in 1597, at the mouth of the Eo River. San Claudio describes how the particular geographical position of Galicia, on the extreme west of Europe, made its coasts part of a number of important maritime routes and a theatre of operations during the religious wars that ravaged Europe during the sixteenth and seventeenth centuries. Two important shipwrecks lie on the coast of Galicia, namely San Jerónimo and Santiago de Galicia, both warships, galleons, which are providing the scholars with unique information about the life aboard the huge Spanish war galleons of this period.

Chapter 4 signed by Beñat Eguiluz Miranda, Marta Domínguez-Delmás, Koldo Trápaga Monchet, Miguel San Claudio, and José Luis Gasch-Tomás, is a study of the Ribadeo 1 shipwreck, or *Santiago de Galicia* (c. 1597), and the results of the 2015 archaeological survey work, and the new historical research that was conducted in Spanish archives to search for documents referring to the wreckage. The results of this multidisciplinary research led to the tentative identification of this shipwreck as *Santiago de Galicia*, a galleon built in Castellamare di Stabia, near to Naples, Italy, in the late 1580s or early 1590s, and sunk in Ribadeo in AD 1597. Volume 2 Chap. 5 is authored by Ana Almeida, Tânia Casimiro, Filipe Castro, Miguel Martins, Alexandre Monteiro, and Rosa Varela Gomes, and presents a summary of the Belinho 1 Shipwreck project. The ship was found in the winter of 2014 and exposed between 2015 and 2017 by a succession of storms which pushed timbers and artifacts ashore. All timbers and artifacts were recovered, conserved, and curated by the archaeologists of the Esposende municipality. This chapter describes the present state of the research on this shipwreck and the collaboration between a large and diverse community of domain experts and the participating public. In Vol. 2 Chap. 6, Milagros Alzaga García, Lourdes Márquez Carmona, Mercedes Gallardo Abárzuza, Nuria Rodríguez Mariscal, Josefa Martí Solano, Aurora Higuera-Milena Castellano, José Manuel Higuera-Milena Castellano, from the Underwater Archaeology Centre (CAS) of the Institute of Historical Heritage of Andalusia (IAPH), created in 1997 to investigate the Underwater Archaeological and Maritime Cultural Heritage of the Andalusian autonomous community. This chapter presents two shipwreck sites of Iberian tradition in the Bay of Cadiz, Andalucía – the San Sebastian and the Delta I shipwrecks—and analyses the date through documentary and archaeological sources. Volume 2 Chap. 7, by Nick Budsberg, Charles Bending, Nigel Nayling, and Filipe Castro, is a case study in field archaeology: The Highbourne Cay Shipwreck, an early sixteenth-century Spanish ship lost in the Bahamas. The authors revisit this shipwreck, which was looted and partially destroyed by treasure hunters in the 1960s, surveyed and partially excavated in the 1980s, and revisited by the ForSEAdiscovery team in 2010s.



Volume 2, Chap. 8 is an overview of the state of maritime archaeology in the Dominican Republic. The author, Carlos Leon Amores, presents a history of the policies for the submerged cultural heritage and the impact of treasure hunting on the country's cultural heritage, and describes a set of important case studies of ships found around the coast. Volume 2, Chap. 9 is authored by Ana Rita Trindade, Marta Domínguez-Delmás, Mohamed Traoré, Nathan Gallagher, Sara Rich, and Adolfo Miguel Martins. It is an analysis of the timbers of the eighteenth-century frigate *Santa Maria Magdalena*, one of the case studies developed within the ForSEAdiscovery project. This interdisciplinary approach combined history, archaeology, and wood science to identify and characterize this ship. In Chap. 10 José Luis Gasch-Tomás presents an overview of the so-called Manila galleons, which crossed the Pacific Ocean from 1565 to 1815 in a commercial route between Mexico and the Philippines that connected the two worlds and facilitated the exchange of goods, persons, and ideas between the two continents. Chapter 11, by Pablo Ortega del Cerro, is an overview of the maritime routes and the knowhow necessary to ensure a steady and safe flow of ships, cargos and people throughout the Spanish world. This chapter details the Spanish Navy effort to produce and disseminate geographical and hydrographical knowledge, develop new maritime routes, and improve shipbuilding techniques in the second half of the eighteenth century.

Chapter 12 is authored by Gregory Votruba and explains the technological development on the production of iron anchors from the second-millennium AD to the Age of Exploration. It is a thorough study of the construction changes faced by anchor makers from baton-assembled or laminated-beam anchors to lone-bar and then bundled-bars construction process. The author emphasizes the harness of waterpower as a determinant factor for the increase in size and weight of anchor-frames. Chapter 13, authored by world specialist Javier Lopez Martín, presents the study of the different types of cannon used during the first decades of the sixteenth century, and describes the reforms implemented on ships to increase the number and size of cannons carried. Lopez Martín explains the armament of merchantmen, the developments started in the Mediterranean, the introduction of gunports, and other aspects related to the protection of the valuable transatlantic cargoes.

This collection of papers ties a significant number of research strategies and developments pertaining to the study of the European seafaring history in the early modern period. It is intended as a holistic collection of looks and strategies and presents a kaleidoscopic approach to the study of a particular portion of the history of technology. The chronological scope of this book is quite wide, ranging from the late medieval period to the enlightenment. The wide range of research topics addressed results from the interdisciplinary nature of the ForSEAdiscovery project and beyond. As mentioned above, it was a look at shipbuilding, the technical and scientific knowledge necessary to conceive, build, and sail these great machines of the seas, and its influence on both forestry policies and the management of shipyards and docks.

## References

- Borrero RL, Schwindingera P, Castelli A et al (2021) Seeking a common ground for the nautical archaeology digital library (Nadl). Reflections on science, method, theory and templates. *Virtual Archaeol Rev* 12:11–24. <https://doi.org/10.4995/VAR.2021.14331>
- Castro F (2008) In search of unique iberian ship design concepts. *Hist Archaeol* 42:63–87
- Castro F, Bendig C, Bérubé M et al (2018) Recording, publishing, and reconstructing wooden shipwrecks. *J Marit Archaeol* 13:55–66. <https://doi.org/10.1007/s11457-017-9185-8>
- Crespo Solana A (2014) The Wider World: spatial expansion and integration in the Hispanic Atlantic, 16th to 18th centuries. In: *Spatio-Temporal Narratives. Historical GIS and the study of global trading networks (1500–1800)*. Cambridge scholars Publishing, Cambridge, pp 1–45
- Crespo Solana A (2019) ForSEADiscovery: la construcción naval y el comercio de la madera del siglo XVI al XVIII. *Rev PH*:114–141. <https://doi.org/10.33349/2019.96.4279>
- Crespo Solana A, Nayling N, García-González I (2018) ForSeaDiscovery forest resources for iberian empires: ecology and globalization in the age of discovery marie curie. CSIC, Madrid
- Domínguez-Delmás M, Alejano-Monge R, Van Daalen S et al (2015) Tree-rings, forest history and cultural heritage: current state and future prospects of dendroarchaeology in the Iberian Peninsula. *J Archaeol Sci* 57:180–196. <https://doi.org/10.1016/j.jas.2015.02.011>
- Nayling N (2008) The application of dendrochronology to underwater archaeology. In: Tsang C (ed) *International symposium on underwater archaeology*, Taiwan, pp 64–73
- Nayling N, Crespo Solana A (2016) ForSEADiscovery. forest resources for iberian empires: ecology and globalization in the age of discovery (16th–18th centuries). In: *Proceedings of the 5th Int Congr Underw Archaeol A Herit Mank Cart*, 15th–18th Oct 2014
- Oertling T (2001) The concept of the Atlantic vessel. In: Alves F (ed) *Proceedings of the international symposium on archaeology of medieval and modern ships of Iberian-Atlantic tradition*. Instituto Português Arqueologia; Centro Nacional de Arqueologia Náutica e Subaquática, Academia de Marinha Lisboa, Lisbon, pp 233–240
- Rich S, Crespo Solana A, Momber G, Nayling N (2018) Shipwrecks and provenance in-situ timber sampling protocols with a focus on wrecks of the Iberian shipbuilding tradition
- Varela Gomes R, Trapaga Monchet K (2017) *Árvores, barcos e homens na Península Ibérica (séculos XVI-XVIII)*. Pórtico Librerías, Lisbon