

Chapter 6

Shipwrecks of the Iberian Tradition in the Bay of Cádiz (Andalucía, Spain)



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Abstract The objective of this work is to analyze through documentary and archaeological sources the shipwrecks of the Iberian tradition in the Bay of Cadiz. It supposes the evidence of the commercial redistribution activities between Europe and America that took place in that area of the south of Spain during modern times, in the course of the *Carrera de Indias*, where ships of Iberian–Atlantic construction played a key role in allowing transoceanic navigation. Nowadays, these historic shipwrecks are part of the Underwater Archaeological Heritage of Andalusia. Its analysis and systematization are the two objectives of 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. The research and protection of this heritage has led to the location and scientific study of the two shipwrecks of the Modern Age and Iberian–Atlantic tradition described throughout these pages.

1 Geographical Framework

Together with the Portuguese and the Cantabrian areas, the Gulf of Cádiz is one of the most important geographical spaces in the Iberian Peninsula, with a great maritime projection in modern times (Casado 1991). In its area of influence, there are two subareas of vital importance for the commercial activities that Spain developed

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with overseas territories, in what has been called the *Carrera de Indias*. It covers the fluvio-maritime space of the mouth and channel of the Guadalquivir River, plus the port area of Seville, and the surrounding area. This territory is the object of the present study: the Bay of Cádiz, integrating the towns of Rota, El Puerto de Santa María, Puerto Real, San Fernando, and Cádiz. It is worth noting that the location of this Bay, in the south of the Iberian Peninsula, is in an unmatched geostrategic position as a connection point between continents: Europe with America on a west–east axis, and with the African continent on a north–South axis. The region presents a landscape modeled by anthropic action, the silting caused by the river Guadalete—which has its mouth in the municipality of El Puerto de Santa María—and the sedimentary contribution of the several pipes that pour water into its basin. In this way, the archipelago of the Gadeiras Islands has been transformed, over the centuries, into an optimal harbor for anchoring boats, as evidenced by the commitment made by the different civilizations that settled the area and which is attested by the abundant archaeological remains of underwater provenance.

The Early Modern Era was one of the moments in which there was a notable increase in commercial traffic, with the designation of Cádiz as the main port of the *Carrera de Indias*, where ships of Iberian–Atlantic construction played a key role by allowing transoceanic navigation in much more difficult waters than the Mediterranean ones.

The main characteristics of this Bay include the capacity for shelter and anchorage, loading and unloading, as well as for naval repairs, as evidenced by the intense maritime traffic that this area endured, especially in the eighteenth century (Márquez Carmona 2006; Márquez Carmona et al. 2016; Márquez Carmona 2019; Rodríguez 2017).

2 Historical Context

The incorporation of the new American territories into the Spanish Empire forced the Spanish monarchy to propose a model of exploitation with tight economic and political control, based on a monopoly system, and a large bureaucratic organization. At the same time, it became necessary to build more robust vessels than those used in the Iberian space to withstand the challenges of navigation across the Atlantic. The subsequent trade of the products transported to Spain in the *Carrera de Indias* had a diachronic development from Seville and Cádiz. Through the following pages the existing data on vessels of Iberian–Atlantic tradition—between the sixteenth to the eighteenth centuries—in the Bay of Cádiz will be analyzed, in articulation with the port area these ships have used.

There are various sources that report on the commercial activities that took place in the Bay of Cádiz during modern times. Among them, those of textual, cartographic, or iconographic nature stand out, as well as the archaeological ones.

At the beginning of the *Carrera de Indias*, the role played by experienced pilots and boats from the North of Spain, who already had deep-sea sailing experiences, is

noteworthy. For example, in the whale fisheries, as demonstrated by the *San Juan* shipwreck, a Basque whaler sunk in 1565 in Red Bay (Canada), or in the navigations carried out along the African Atlantic space, to the Gulf of Guinea and the Canary Islands. These pilots came to form a union in Cádiz by founding, in the fifteenth century, the “Colegio de Pilotos Vizcaínos.” Its presence is attested by the shipwrecks of Biscayan ships in the sixteenth century, which have been registered in documentary sources available in the database that the CAS has for the management of historical shipwrecks (DOCUSUB). The monopoly system was structured at first from the river port of Seville, but for different reasons, such as the ship’s increased tonnage and the shallows in certain sections of the Guadalquivir, which the galleons crossed with difficulty already in the sixteenth century, the system was transferred to the Bay of Cádiz.

The feudal control of this space, where there were several population centers, made the Catholic Monarchs aware that they did not have a royal harbor in the area. For this reason, in 1483, the foundation of a little city, the “Real Villa de Puerto Real” was proposed. Officially there is evidence that, since 1680, the fleets of the *Carrera de Indias* were already leaving from the Bay of Cádiz, although the controlling organizations—*Casa de Contratación* and *Consulado de Cargadores*—did not move to this city until 1717. The distinction of Cádiz as the only Spanish harbor enabled for trade with America remained in place until 1778 when it was terminated by King Carlos III. This monopoly provided spectacular financial growth to Cádiz and the other neighboring port populations, and that generated a consequent demographic and urban growth, highlighting, in this sense, the palaces built by national and foreign merchants with their characteristic lookout towers to see the arrival of the ships. At the same time Cádiz, both for its strategic position and its wealth, became a destination coveted by pirates and privateers, justifying, among others, the assaults of the privateer Drake (1587) and the Duke of Essex (1596), the eternal English rivals. To facilitate the harbor’s defense, it was necessary to develop a system of fortifications that turned the city, with its walls, castles, and bastions, into one of the most impregnable harbors in the world. These constructions have become a rich Historical Heritage of a defensive nature.

The investigation of the maritime activity that took place in this western area of the Andalusian coast can be carried out through the historical documentation preserved, among others, in the General Archive of the Indies, where all the documentation generated by the institutions that controlled the overseas territories is protected, both in its Sevillian and Cádiz centers (García-Baquero González 1976; Chaunu and Chaunu 1977; Flores 1982; Pérez-Mallafina Bueno 2015). The research of the maritime history of the region allows us to register and sometimes locate shipwrecks in the documents analyzed (see Chapter 3, Vol. 1). The analysis and systematization of these data are one of the missions of 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 analysis is framed within the Underwater Archaeological Charter Project (García Rivera and Alzaga 2008), a

basic instrument on which the administration relies when defining specific research and protection strategies (Alzaga and García Rivera 2014).

While analyzing the maritime activity of the *Carrera de Indias*, we note that a significant percentage of ships failed in their arrival at the destination port, in both directions of the voyage. The route carried certain risks: enemy attacks, inclement weather—notable hurricanes in the Caribbean area—, or technical failures. On many occasions, the danger of shipwreck occurred practically at the doorstep of the port of destiny: enemy navies and privateer ships presented a serious danger, stationed along the Portuguese coast, at Huelva, or between Sanlúcar and the Rota coast. Collision with the rocky shallows of the Bay of Cádiz was another cause of problems, sometimes pushed by the strong east and west winds that are frequent at the Bay of Cádiz. Today these historic shipwrecks are part of the Underwater Archaeological Heritage of Andalusia. The CAS of the IAPH carries out its study, for this period, relying on both underwater archaeological remains and documentary sources preserved and guarded in archives, libraries, and newspaper archives. Thus, since 2004 and within the Underwater Archaeological Heritage and Transformation of the Physical Environment Project in the Gulf of Cádiz, work has been developed to identify the archival sources that provide information on the Underwater Cultural Heritage of Andalusia. These studies have, among one of their objectives, the power to position the shipwrecks of which there is documentary evidence (Alonso Villalobos et al. 2010). All this information has been managed through a digital tool designed for this purpose and called SIGNAUTA, a geographic information system created in 2005, and which is divided into six subsystems, among which is the base DOCUSUB data collection, which contains information on shipwrecks that are recorded through historical documentation (Alonso Villalobos, Carlos; Benítez López, David; Márquez Carmona and Valiente Romero, Antonio; Ramos Miguélez 2007).

In the same way, the CAS of the IAPH has worked extensively on the study of cartographic sources of the Bay of Cádiz, documenting the landscape of this geographical space and the maritime cultural heritage associated with it, from the sixteenth to the early nineteenth centuries. This research has addressed specific aspects such as naval construction, port infrastructures, maritime navigation and signaling systems, the defense system of the coastline, transport infrastructure, the maritime health system, the supply system and use of marine resources, and of course the toponymy and its evolution (Márquez Carmona et al. 2016). In this sense, the Bay of Cádiz functioning as a common port area must be re-emphasized. There were first and second-order infrastructures that were insufficient, due to their low importance, to manage the high maritime traffic: Trocadero at Puerto Real, the port area of Cádiz, the port area of the Guadalete River in El Puerto de Santa María, and the area of Fbricas and Caño de Sancti Petri, in the Real Isla de León (San Fernando). The areas dedicated to naval construction and repair were located in the area of Puntales, Suazo Bridge (Real Carenero), in the fifteenth to seventeenth centuries, and from the beginning of the eighteenth century (1717) the Arsenal of La Carraca was added, for the construction of military ships with the impetus given to the

Spanish navy by the new royal dynasty, the Bourbons. All this information obtained through the compilation and analysis of documentary sources has provided relevant data on areas of possible archaeological potential. In these, the second phase of work has been carried out, within the Underwater Archaeological Charter Project, consisting of an archaeological intervention, by conducting surveys.

All this has made it possible to acquire important knowledge about the sites and areas of archaeological potential in the Bay of Cádiz, which has made it possible to apply the existing protection figures in heritage legislation. In this way, this space was declared an Archaeological Easement Zone with the name “Underwater Space of the Bay of Cádiz” (BOJA. Order April 20, 2009), and has in turn been inscribed in the General Catalog of Historical Heritage Andalusian as Assets of Cultural Interest (BIC), as an Archaeological Zone with a total of 17 areas (Alzaga and García Rivera 2014). The Law 14/2007 on the Historical Heritage of Andalusia grants both states the following definition: (a) “Archaeological Zones” are those clearly delimited spaces in which the existence of archaeological remains of relevant interest has been verified; and (b) “Archaeological Reserves” are those clearly determined spaces in which the existence of archaeological remains is presumed, and it is considered necessary to adopt precautionary measures.

The importance of the application of this protection status is clear since among the immediate effects of their registration and declaration is the need to have authorization from the competent Ministry in the field of Historical Heritage to make any change or modification that individuals or other public administrations wish to carry out in properties that are the object of registration as a Site of Cultural Interest or in its environment. At the same time, carrying out construction works or any other actions that entail the removal of sediment in archaeological easement areas, must also be notified to the Ministry at least 15 days in advance. These measures represent an important and outstanding advance by guaranteeing the legal protection of this heritage and by producing an advance in its preventive management, especially in the face of the proliferation of legitimate activities, for example, infrastructure works, which affect the marine environment and that entail, in many of the cases, activities such as dredging, foundations, fillings, spills, etc. All these activities produce sediment movements or transformations of the substrate, actions that can cause the total or partial alteration of archaeological remains, or motivate the perceptual distortion on them (Alzaga and García Rivera 2014).

In this sense, the application of these protection statuses has allowed the establishment of archaeological precautions, whenever they are considered necessary, before the execution of infrastructure and other works. These cautions have also undergone an important evolution from the first archaeological dredging control—carried out in Cádiz in 1982 (Martí and Gallardo 1997)—to the present, in such a way that it has evolved from the mere recovery of archaeological remains to a joint work carried out between the different administrations involved, to try to minimize the impact of these works on the underwater archaeological heritage.

3 Ibero–Atlantic Tradition Shipwrecks in the Bay of Cádiz

The Bay of Cádiz is widely represented in rutters and on nautical charts, both national and foreign—especially English, French, and Dutch—which are fundamental documentary sources to reconstruct the reality of the region’s maritime cultural landscape. Documents show that the most protected part of the Bay—the internal basin—known as *Ensenada de Puntales*, which currently suffers from a serious silting problem, was the place, together with the Arillo River, where the fleets were prepared for the voyage at an early date. The directions and nautical charts have also been very useful to position the shipwrecks for which there is documentary evidence, presented below in a synthetic and quantitative way, with the intention of trying to discern the shipwrecks of the Iberian–Atlantic tradition that is the objective of this article.

After analyzing the existing information in the database that manages historical shipwrecks according to the available documental evidence, it can be seen that of the 2000 records it currently contains, 559 correspond to shipwrecks in the area of the Bay of Cádiz for Modern and Contemporary times. From the figures provided, it can be concluded that it is one of the areas with the highest concentration of subsidence of which there is documentary evidence in all of Andalusia. If we make a limitation between the fifteenth and eighteenth centuries, a total of 310 records of shipwrecks are obtained, and of 224 shipwrecks for the nineteenth century, which reflects that maritime traffic continued to rise after the Free Trade Decree. However, it should be noted that this last period has been further investigated through a documental collection of the historical press. Obtaining information on ships of Ibero–Atlantic construction has been possible by interrogating the system through the nationality and chronology fields, data that have been reflected in the following table (Table 6.1), where shipwrecks of other nationalities are also included, in order to be able to carry out a comparative analysis.

In the same way, the following table (Table 6.2) has analyzed the typology of the shipwrecks that occurred in the study area from the fifteenth to the eighteenth

Table 6.1 Number of shipwrecks listed by nationality and chronology

Nationality	XV	XVI	XVII	XVIII
Spanish	3	51	28	12
Portuguese		2	1	
French		1	9	4
English		1	3	1
Genoese		1	2	
Dutch	1		2	
Swedish				2
From Hamburg			1	
From Ragusa				1
Without nationality	3	54	98	29
Total	7	110	144	49

Table 6.2 Number of Spanish and Portuguese shipwrecks listed by typology and chronology

Typology	XV	XVI	XVII	XVIII
Ship		3S-1P	5 S	4 S
Galleon		5 S	3 S	
Nao	1 S	33 S · 1P	8 S	
Carabel	2 S		1 S	
Frigate/Bergantine		1 S	1 S	1 S
Polacra				1 S
Urca		3 S	1 S	
Patache			3 S	
Navetta		1P		
Falu				1 S
Faluce				1 S
Tartan				1 S
Diat				1 S
Without references		4 S	6 S	2 S
TOTAL	3 S	49 S-3P	28 S	12 S

centuries, both of Spanish and Portuguese nationality, although it must be noted that it has only been done with reference to those shipwreck records that have the nationality field filled in, in such a way that that number may be increased in future investigations.

As can be seen in the table, the wrecks of Portuguese ships are barely reflected—only three shipwrecks in the sixteenth century—although the number is increased by four more shipwrecks at the beginning of the nineteenth century: two schooners (*goletas*), a *nao*, and a warship. The ships of Cantabrian origin, named Biscaynes, are present mainly in the sixteenth century, with nine shipwrecks and one in the seventeenth century. Undoubtedly, the increase in shipwrecks of Iberian–Atlantic origin is greater, and of course, it will increase as the historical documentation expands.

The information obtained over the last years of research and of documentary sources must be qualified based on the objective and methodological development of the work carried out in the CAS. As has already been commented, the main objective of the Centre is to generate the largest possible amount of data—textual, cartographic, oral, archaeological, and geophysical information—for the Archaeological Chart, as an instrument of protection. In this sense, the documentary investigation that has been carried out has been limited by the following facts:

- The highest percentage of consulted documentary sources comes from the General Archive of the Indies, so references to ships of other nationalities are scarce.
- The main interest throughout the research carried out has been to collect quantitative data on shipwrecks, specifying as much as possible the area where they occurred, to favor the protection and investigation of this heritage.

- It is considered necessary to carry out more exhaustive and qualitative historical research for each of the shipwrecks located. Reference to named ship types can be imprecise if the documentation consulted does not include it.
- From all these reasons it is concluded that the information collected in the summary tables presented above must be qualified in relation to aspects such as:
- The number of ships of other nationalities will increase when other files are investigated.
- The quantitative predominance of shipwrecks in the seventeenth century is due to the fact that it is the most analyzed historical period.
- The high number of shipwrecks corresponding to the nineteenth century, a total number of 224, is due to the massive research carried out on the historical press, as a source of information.

The archaeological work carried out in the Bay of Cádiz has provided the location and study of various archaeological sites, which can be ascribed, from a chronological point of view, from the Phoenician–Punic era to the present time. Among them, two shipwrecks from the Modern Age, of Ibero–Atlantic tradition, stand out: the so-called “Pecio de los Bajos de San Sebastián” and the Delta I wreck, whose description and analysis will be developed in the following pages.

4 Wreck of “Bajos de San Sebastián”

The wreck “Bajos de San Sebastián” is located in the extreme north-west of Cádiz, in the surroundings of La Caleta, an emblematic landscape formed by an arm of the sea framed by two strings of reefs, that of Santa Catalina-Punta del Nao reef to the north and the San Sebastián reef to the south. This reef continues under the sea to open waters, forming the so-called Punta del Sur. This shipwreck is located on the north cliff of the said point, about 17 m deep, very close to a dangerous shallow called “La Olla.” The first data on this site dates back to 1949 when the local press published a piece of news in which the discovery of the remains of a ship was reported by some divers working to rescue a fishing boat, wrecked near the San Sebastián Castle. In the news, it was pointed out that the remains of gunports, cannons, etc., were preserved at a depth of about 8 or 10 m. The media suggested that these were the remains of a ship that was related to the flagship of the Trafalgar naval combat, the *Bucentaure*. This suggestion was based on information that the Spanish admiral Antonio Escaño provided after the combat, noting that he saw how this French ship touched the stones near the castle of San Sebastián and later sank (Lon Romeo 1950). The first scientific research work carried out on this shipwreck began in the early 1970s, by Olga Vallespín: “It is found at a depth of 16.6 m, on a sandy bottom. It is without question the remains of a ship, of which only the keel and some frames and some 30 iron cannons of a little more than 2 m in length apparently still remain. Sometimes the cannons are one on top of each other, as if when

the timber of the deck on which it was found disappeared and that separated them one from the other, the upper one had remained directly above the lower one. Some of the cannons are not among the ship's wreckage, but in a row further on, giving the impression that they have been thrown overboard before sinking as if she had been shedding the ballast to avoid sinking. On the frames and the guns, stretched from bow to stern, is one of the masts" (Vallespín 1985).

Subsequently and in the context of the development of the National Documentation Plan of the Spanish Coast—charge of the Ministry of Culture between the years 1985/87—a series of archaeological charts of the coast (García Rivera and Alzaga 2008) was developed, which in the Cádiz province materialized in the Project "Underwater Archaeology: Prospecting and Assessment of the Submerged Cultural Heritage in the Gulf of Cádiz," as well as in the 1985 underwater archaeological surveys, directed by D. Manuel Martín Bueno, within which geophysical surveys were carried out by using a proton magnetometer and portable magnetic field detectors. Within this project, the Ministry of Culture and the Institute of Nautical Archaeology of Texas carried out an archaeological action in Cádiz under the coordination of Dr. George F. Bass. During the course of the archaeological work, a plan of this site was carried out, which was renamed "Pecio del Imbornal de Cobre." At this time, five iron cannons and remains of the ship's wooden structure were visible.

Since 1999 and throughout different campaigns, archaeological work at this site has been carried out under the direction of the IAPH through the CAS in order to delimit it, acquire data on the assets that comprise it, analyze the state of conservation of the remains, and making, with the collaboration of the University of Alicante, a collection of images for the realization of a documentary called *Andalusia Submerged* (Rodríguez Mariscal and Martí Solano 2001). During the development of the Specific Archaeological Activity "Experimental application of geophysical techniques for the location, investigation, and dissemination of the Underwater Archaeological Heritage in the La Caleta area (Cádiz)," a series of interventions were proposed for the site in question, which was renamed "Pecio de los Bajos de San Sebastián." During this action, a side-scan sonar was used on the deposit, providing an image of the seabed in which the main elements that make up the deposit can be clearly seen. In 2008 and 2010, geophysical surveys were carried out again, as well as various surveys that allowed a study of both the archaeological materials and the preserved naval structure. The results of these studies yielded the following conclusions:

4.1 Construction System Analysis

The remains of the "San Sebastián Merchant Wreck" belong to a vessel that has been excavated 13.5 m in length and 5.5 m in width, and preserves part of its side, although, with the data currently available, it is not possible to determine whether

this side is the starboard or port side. The height of the same and the elements detected in it suggest that it is a fragment of the hull in which the dead and live works of the ship are present. The presence of scuppers lined in a sector of the structure, beside a group of cannons, confirms the existence of a deck situated above the waterline. The remains present a north–south orientation of longitudinal elements although facing south it is possible to see how the different construction features are disappearing due to *teredo navalis* worm and the dismemberment of its constructive elements, dislocating many of the parts disassembled and displacing them from their original position.

The constructive elements describe, in general, a not very robust structure, defined by a cross-link construction technique that, with alternation of empty spaces, shows a predetermined construction sequence. Regarding the axial carpentry, neither the keel nor the keelson has yet been detected, although their discovery is not ruled out in future archaeological works. The transversal carpentry is defined by a set of frames of the ship—a total of 53 lines—in whose arrangement a possible constructive sequence is observed, in which several groups of five frame lines without spaces of separation give a certain solidity to the structure, alternating with double-thick frames separated by empty spaces. This sequence is more clearly seen in the southern half of the excavated area, where they are arranged in their original form.

The dimensions of the frame members are variable between 150 and 180 mm, reaching a height of 170 mm. Regarding their construction, it has not yet been possible to determine whether all the double-thickness frames are assembled laterally through horizontal connecting elements, as a constructive guideline, since so transverse nailing remains have only been documented in two frames of this type. The members, a priori, do not present joints between them by their heads. Regarding the planking of the vessel, a part of the external planking is preserved, as well as the interior one to a lesser extent. The exterior is represented by a total of 10 runs of strakes, best preserved in the southwest area—where eight rows are apparent—while the last strake to the north is fragmented to join the next two in another fragment of the vessel. Regarding their dimensions, they have widths that vary between 260 and 320 mm, with a thickness of about 70–110 mm, with the exception of a longitudinal piece that stands out for its width—25 cm—and for its thickness—around 20 cm—, which can be interpreted as a wale. This would corroborate the presence of a deck in this sector. The inner planking is only present in a small zone of the ship, of which five runs with similar dimensions, 130 mm wide and 130 mm thick, are preserved. Its conservation in situ has ensured the original position of the frames as they remain fastened, like in a sandwich, between the inner and outer planking, by means of the wood nailing to the frames. Regarding the sheathing of the ship, no traces have been detected under the strakes examined. However, some fragments of it scattered in the deposit have been recovered (Fig. 6.1).



Fig. 6.1 Plan of the Los Bajos de San Sebastián Wreck. (Graphic collection of the CAS. Authors: E. Toboso, N.E. Rodríguez Mariscal)

4.2 Analysis of Archaeological Materials

4.2.1 Armament

A total of six artillery pieces have been located, some of them presenting metallic elements concreted on their surface that make it difficult to appreciate their morphological details. It should be noted that one of the cannons located preserves the axle of its carriage wheels. With the data available to date, the six artillery pieces have similar proportions with a total length of 2,5 m and would correspond to the same caliber (maybe 8), although it is possible to appreciate, despite the numerous elements specified on the barrels, different finishes on the breeches, being able to differentiate up to two formal models, which would correspond to two different regulations or ordinances. In the high band of the stock of one of the guns, its serial number data (n° 2) was observed, providing little information.

Based on the materials located, this would be a small ship, perhaps with a single deck and of Spanish nationality, wrecked between the last quarter of the eighteenth century and the first quarter of the nineteenth century.



Fig. 6.2 Weights and balance plate with detail of the brand; Gun; Sword hilts. (Graphic collection of the CAS. Authors: A. Higuera-Milena, N.E. Rodríguez Mariscal, J.M. Higuera-Milena)

4.2.2 Edged Weapons and Portable Firearms

Of the general set of archaeological materials recovered in the surveys carried out, the items related to portable weapons, such as the hilts of swords, various metal pieces, and an almost complete example of a pistol stand out. The portable weapons localized refer to the armament of the Spanish Navy used from the second half of the eighteenth century. The fact that handles have been found in a stored position and forming a concretion suggests that these weapons were stored—possibly in wooden boxes—at the time of the shipwreck (Fig. 6.2).

4.2.3 Ceramic Materials

These are the most numerous statistically speaking, but it is necessary to point out that generally, it is about small fragments that, in general, correspond to tableware of common use in the eighteenth century.

4.2.4 Glass Material

As with ceramics, the glass materials appear very fragmented and dispersed throughout the site. The base of bottles with a square section sometimes called “gin bottles,” stand out from the set, since they generally contained alcoholic beverages. It is a

bottle with a short neck and made of mold, due to its symmetry and the fact that the base is smaller than the shoulders. This shape also facilitated their storage on board, since they were normally stowed inside compartmentalized wooden crates (Moreno 1997).

These bottles present a schematic representation of a bell framed in a concentric circle with the legend BLANKENHEYM & NOLET, which indicate the distillery to which the container belongs. This brand also appears on stoneware jugs (Ruíz and Márquez Carmona 2010). As parallels, we can cite the materials from the excavation of the English sloop HMS *Swift*, where this type of bottle appears, although they are larger than those located in the site under study (Elkin 2011).

4.2.5 Anchoring Elements

A 3.4 m anchor and a second 3.45 m anchor have been located. The position of the first suggests that it was stowed inside the ship, ruling out that it was placed in the bow of the vessel as if it could happen in the case of the second. These are wrought iron anchors with a long shank of circular section. They have curved arms, triangular crowns, and the flukes are visible despite the marine concretions that cover them.

4.2.6 Medical Instruments

Some elements have been located that could be put in relation to a space destined to rooms for the sick, where there could be a storeroom reserved for the storage of medicines and the utensils of the trade. Part of an enema syringe, a suture needle, a metal syringe, and a wound cauterizer have been found, as well as a set of small glass bottles that could have been used as containers for medicinal products. A set of weighing elements was also located, specifically three weighing pans and seven weights of different sizes. In some of the weights, it is possible to see the arms of Castilla y León, as well as the weight in ounces, although it is not possible to read, in the upper part of the image, the name of the marker. One of the saucers is marked with the reference “COBOS” (Fig. 6.2).

Parallels of these elements have been found in the Provincial Historical Archive of Toledo, where different sets of weights and measures are located, among which a complete set of octagonal pharmacy weights made of gilt brass stand out.

4.2.7 Personal Objects

In this section, items such as buckles from the nineteenth or twentieth centuries—buttons, personal hygiene items, a medal, and other items stand out.

In conclusion, and after the analysis of the archaeological materials, we conclude that the remains located correspond to a Spanish medium-sized vessel of a military character, chronologically assigned to the last third of the eighteenth century or the

beginning of the nineteenth century. The comparison of these archaeological data with the documentary information available for shipwrecks that occurred in this area, and always bearing in mind that the survival of weapons could be extensive, provides the following data: At the moment, there is no information regarding shipwrecks that occurred between 1758 and 1784. In 1805 the Ottoman frigate “*La Gracia*” was shipwrecked; and in 1811 the brig “*Nuestra Señora del Carmen*” was lost, coming from Gijón and under the command of José Vidal. In the part of Tavira watchtower (Cádiz) it is indicated that she was carrying a shipment of bullets.

4.2.8 Delta I Wreck

At the beginning of 2012, the Port Authority of the Bay of Cádiz began the work for the construction of a New Container Terminal located in an area protected by the regional administration as the “Archaeological Easement Zone” and the “Archaeological Zone.” For this reason, following the current legislation, the Ministry of Culture of the Junta de Andalucía established the corresponding archaeological precautions that entailed carrying out preliminary surveys with geophysical means—with negative results from the archaeological point of view—as well as carrying out of archaeological controls—during the entire dredging phase, that is, 24 hours a day—in the course of which three wrecks were located, which were called: Delta I, Delta II, and Delta III.

The first wreck found, Delta I, was located in the area where the concrete boxes that would make up the future dock had to be anchored. Due to the dredging activity, the wreck had been left on a kind of compact mud base where it occupied an unstable position. In order not to paralyze the works and to facilitate the excavation of the wreck, it was decided to move it to an area not affected by the new terminal and to a lower depth—it went from 16–19 m to 7–9 m—thereby improving the digging conditions both for visibility and longer immersion time. The transfer project presented by the Port Authority and approved by the Ministry of Culture was carried out with total success, moving it in a block to a place distant about 600 m from its original position. For the excavation, an agreement was signed between Tanit Archaeological Management—a company hired by the Port Authority—and the Andalusian Institute of Historical Heritage—in which collaboration in the excavation tasks and the performance of the desalination and stabilization works of archaeological materials were assigned to the CAS.

The excavation was carried out between May and July 2013 using a mixed grid—rigid and flexible—where the coordinate axis was made of PVC, 22 m by 10 m, with a fore and aft orientation from a center line. Due to poor visibility conditions, each of the four arms of the grid was painted with a different color, the longitudinal lines parallel to the keel in pink and the transverse lines in white. Each square was labeled—2 m × 2 m—with a yellow card; In this way, it was possible for each archaeologist to know at each moment in which area of the ship she was, and thus be able to correctly record each finding that was produced. From the moment which the sediment removal tasks began, using suction hoses, it was found that only

the bottom (*plan*) of the ship was preserved, and lying on it was a large amount of stones that were part of its ballast. After the removal of the ballast and the cleaning, it was found that both the bow and the stern were not preserved.

4.3 Analysis of the Construction System

From the naval architecture point of view, it was found that the remains of the ship conserved about 20 m in length by 7–8 m in width. The absence of elements corresponding to the bow and stern did not allow us to know the original dimensions of the ship (Fig. 6.3). The main characteristic of its construction is the robustness of its wooden transversal structure, defined by the design of double-thickness frames separated by a minimum spacing as a clearing. Of its axial carpentry, both the keel and the keelson were preserved in good condition. The keel has an average molded dimension of 27–28 cm and a sided dimension of 31–32 cm. It was possible to verify the presence of three sections of the keel, assembled with flat horizontal scarves. A rabbet was detected in the central area of the ship, disappearing towards the extremities, where the garboard butts against both sides of the keel, reinforced by lateral planks, which run at least the initial and final sections of the keel. It is worth mentioning that a recess in the lower face of the keel was found, at one of its ends, probably towards the bow, which would house a sacrificial piece (in English named shoe) that would act as reinforcement and protection of the keel in this sector.

The keelson, broken after the third floor, which was located at meter 6–7, has a greater sided dimension than the keel, ranging between 410 and 430 mm. It runs in two sections until meter 17.5. It is indented over the floors in the central area of the ship. Regarding the elements that define the transverse structure, it should be noted that a total of 26 double-thickness frames are preserved, corresponding to floors and futtocks designed, in many cases, with chocks and wedges at the ends.

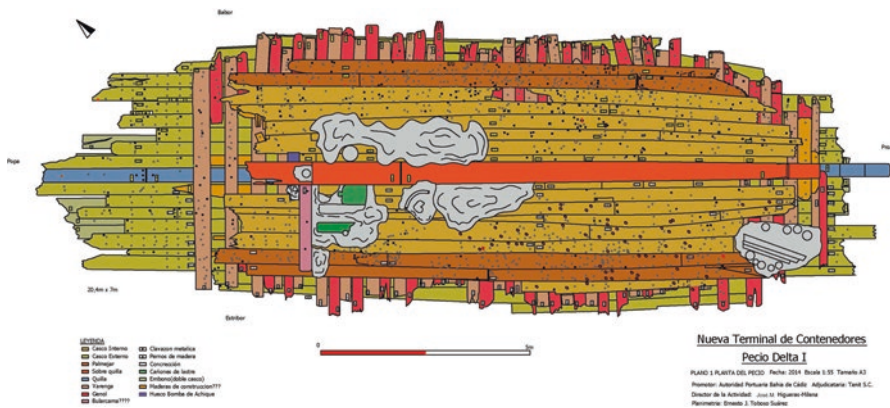


Fig. 6.3 Plan of the Delta I wreck. (Tanit GestiónArqueológica. Author: E. Toboso)

The removal of part of the inner planking, in a sector corresponding to the central body of the ship, allowed access to the overlapping area between the floors and their futtocks. This analysis confirmed the existence of a lateral assembly system between these elements by means of two rows of iron bolts. This type of assembly between frame members is typical of the Iberian–Atlantic construction, defined by the placement of a basic structure called “fastener.” This structure is built using the floor-futtock method consisting of the lateral union between frames and futtocks by means of nailing, in this specific case of iron. That is why the spaces between frames are minimal, mainly in the central area of the boat. It is worth mentioning that in the accessible area of the wreck, between the elements that form the frames, there has not been detected any presence of lateral dovetail joints or the use of wooden fasteners.

This construction system gives the ship great strength and weight, which has the advantage of reducing the amount of ballast required. This type of ship was designed for Atlantic navigation. Regarding the dimensioning of the floor timbers, as usual, a widening in the center line is observed, reaching values that oscillate between 370 and 400 mm, observing a narrowing towards the ends. The narrowest piece measures 200 mm while the widest reaches 350 mm. The rest of the floors oscillate between 210 and 300 mm. In the line of the futtocks, at their ends towards the keel, there is a practical absence of spaces. However, the pattern of reduction of the floors towards their heads allows the presence of narrow lateral spaces that favor ventilation between the timbers, thus avoiding the dreaded rotting of the same.

Inside, the floor or internal planking is in very good condition. In the central area of the ship, six rows of strakes were counted on both sides of the keelson, decreasing towards the ends of the vessel. As can be seen in the adjoining Table 6.3, the first of the rows, located on both sides of the keelson, are narrower and fastened to the floors by means of small iron nails. The presence of two stringers was verified, not ruling out, through the information provided by the existing nailing pattern in contiguous floors and futtocks to the second-stringer, the possibility of a third-stringer, not preserved.

4.4 Other Interior Items

At the height of futtock No. 8, the presence of a piece of timber arranged transversely on the inner planking stands out, which runs from the side of the flange to the first stringer, where it ends as a diminishing wedge.

Table 6.3 Delta I wreck: widths of the internal longitudinal elements (cms)

TS2	TS1	6	5	4	3	2	1	KS	1	2	3	4	5	6	TS1	TS2
27	35	34	33	31	33	34	14	43	18	36	26	33	28	33	35	27

The thickness of the strakes of the ground or *plan* oscillates between 7 and 5.5 cm, reaching 12 cm in the stringers

On the other side, the piece has disappeared. However, traces of its presence were detected. The proximity of these pieces to the circular and quadrangular perforations that are observed in the first two strakes, next to the flange, may presuppose that they are reinforcements associated with possible bilge pumps installed in this sector of the ship or, by way of boat ties, as reinforcing elements of a non-preserved mast step. The external planking on the supposed port side and eight rows on the starboard side. The dimensions of its widths were taken on a transversal line drawn at the height of meter 3, obtaining the results given in Table 6.4.

As a protection for the hull, the ship has a wooden sheathing or double-hull installed over a 5 mm layer of well-preserved caulking. An analysis of this compound has determined the presence of animal hair and vegetable fibers, mixed with what could be tar. For the outer layer of planking, lighter timbers were used, possibly pine or beech. The thickness of this layer seems constant in different areas of the boat, reaching 50 mm. Almost 90% of the fasteners observed were treenails. Its use is restricted to fastening the inner and outer planking onto the transversal structure. However, the most important structural elements are fixed with iron bolts located on the centreline—in the keel, floors, and keelson fastenings—and in the construction of the transverse carpentry, fastening floors and futtocks laterally.

As a constructive guideline, with respect to the nailing used, the use of two treenails per strake and frame member can be observed in the outer planking. This arrangement, not noticeable inside the ship at the level of the inner planking, clearly indicates that fasteners were introduced from the outside, a practice that required the prior installation of part of the transverse structure, to which the planking is attached. The hoods of the outer planks were reinforced with iron nails. Not all the treenails fastened the outer and inner planking to the frames, many of them being flush with the floors and futtocks. The inner planking is further secured with iron nails inserted from the inside that have no outlet to the outer planking.

Regarding the water drainage system, it has been possible to document a solution that allowed the creation of channels for the passage of water to the bilge pumps without carving channels at the base of the floors. From the rabbet, the keel rises a few centimeters above the internal face of the planking. Taking advantage of this unevenness and about 5–6.5 cm from the keel, some longitudinal timber was inserted under the floor timbers, running through the ship from bow to stern, giving rise to the drainage channels. No elements belonging to the bilge pumps were located, although there are indications of their possible position. As mentioned above, the existence of two holes made in the inner planking on both sides of the keelson at the level of futtock No. 8 suggests the position of the bilge pump and sump.

Table 6.4 Delta I wreck: Widths of the external longitudinal elements (cms)

7	6	5	4	3	2	1	KE	1	2	3	4	5	6	7
38	13	38	31	25	31.5	30.5	33	30.5	34.5	32	28.5	30.5	6 + 22	28.5

The thicknesses varied between 7 and 8 cm

Abundant stone ballast has been documented. In some areas stones with an angle and a flat base were strategically placed on the inner planking, forming a “floor” on which boulders of different volumes and pebbles are mixed. The presence of iron cannons and different iron elements, such as a fragment of an anchor ring and undetermined iron pieces placed on both sides of the keelson suggest that they were most likely part of the ship’s ballast.

The construction evidence observed in this ship seems to indicate that it is a construction with an important Iberian–Atlantic influence, originally ascribed to the seventeenth century. However, future studies may provide more information on their construction techniques and their chronological assignment.

4.5 *Analysis of Archaeological Materials*

The fact that only the bottom (*plan*) of the ship was preserved determined that archaeological materials were found, in most cases, among the ship’s ballast and that fragmented or incomplete ceramic remains were abundant.

4.5.1 **Ceramic Material**

A classification system was used in the study of the ceramics, dividing them according to functional criteria: transport containers (amphoras, jars, bottles, and commercial jugs), storage (jugs, jars, tubs), agricultural–industrial (buckets), hygienic use (chamber pot), multiple uses (basins), kitchen ceramics (pots, pans, lids, mortars, flasks), pantry (daggerboards, albarellos) and tableware (plates, dishes, bowls, bowls, baskets, jugs). The ceramics collection yielded a varied origin in production centers, such as north-western Italy, Portugal, the Rhineland area, or the Sevillian pottery.

Special mention can be made of the jars, storage, and transport containers, which came for the most part from the Triana pottery (Seville). As a curiosity, a type C jar mouth was found sealed with a wooden stopper, when it was usual for them to be made of cork (Fig. 6.4). In the utilitarian and tableware groups were located: “Blue ware” in imitation of the “*ligurianberettina*”—original from Sevillian pottery—whose production lasted until the end of the seventeenth century; “Figurative blue–white” from the second half of that century.

- Italian majolica, documenting both the Pisan graffito and the typical marble of the Arno Valley. Portuguese glazed earthenware among which the Lisbon one with the decoration of “*aranhões*” from around 1660 and others decorated based on “*rendas*” or lace stands out, a theme that began to be documented in Portugal around 1645 and experienced a great boom between 1650 and 1680, especially in the production centers of Coimbra and Vila Nova.



Fig. 6.4 Delta I wreck finds: Botija with wooden stopper; Astrolabe; Ponderal. (Tanit Gestión Arqueológica. Author: J.M. Higuera-Milena)

4.5.2 Navigation Instruments

Four bronze compasses were found: three arched and one straight, with a chronology of the second half of the seventeenth century. One of the emblematic pieces of the Delta I wreck excavation is the bronze astrolabe found among the ship's ballast (Fig. 6.4). The astrolabe as a navigation instrument is a very important innovation with respect to those used previously since it allowed the pilots to calculate the latitude of the ship's position by measuring the height of a star above the horizon. The one for Delta I belongs to the Ia5 typology by Waters, Stimson, and Castro, the date 1606 is engraved and it is made in Spain.

4.6 Measuring Instruments

The weight was used to calculate the weight that the coins should have, they have a series of indications that give the value of their exact weight. The one found during the excavation presents on the reverse a gold shield on the sun (France), sun motif under the crown, and on the obverse, the symbols II MD XV (two deniers 15 grains) the theoretical mass of this coin could be 3.4 grams (Fig. 6.4).

4.7 Silver

During the excavation and dredging work around the wreck, 21 pieces of silver were found, 18 in the form of bars or ingots, and three in the shape of a round or yew. Silver is one of the constants in the transatlantic trade, mainly from Mexico and Peru. The argentiferous outcrops were exploited by hundreds of owners and companies who, in order to obtain their licenses, had to swear that all mineral obtained would, once purified, be sent to the Caja Real, in one of at least two shipments per year. In the Caja Real, the silver was smelted at about 960.5 °C, transforming it into bars or ingots which were then marked. The marks or stamps gave testimony of their legality, origin, grade value, owners, payment of taxes to the fifth real, and assayer, among other information (Fig. 6.5).

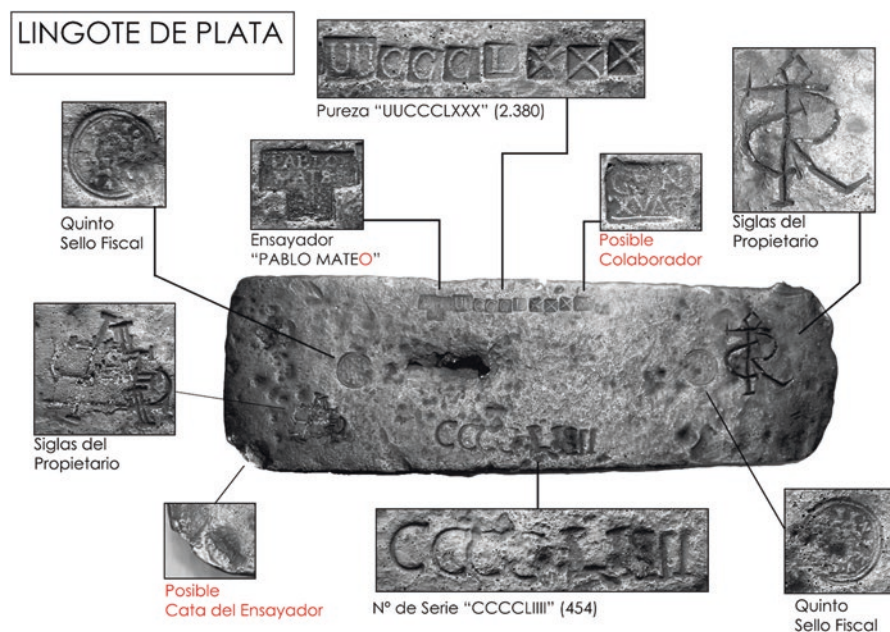


Fig. 6.5 Delta I wreck: Silver bullion. (Graphic collection of the CAS. Author: N.E. Rodríguez Mariscal)

In the case of the Delta I bullion, there are two places of origin—both in upper Peru—those of the Caja Real de Potosí, active between 1575 and 1767, and those of the Caja Real de Oruro, which began its activity in 1607. In 1651, the crown established the “Ordinances to be kept by the assayers in Peru” where it is determined that in addition to the name of the assayer, the casting date must be recorded. Such a date does not appear in any of the ingots, so it is likely that they were made prior to 1651, assuming that the application of the new ordinances had been immediate (Higueras-Milena et al. 2014).

4.8 *Armament*

A total of 27 pieces of iron artillery appeared during the excavation and dredging of the surroundings of the Delta I shipwreck. Due to the typology of the barrels and the marks located on some of them, on the trunnions, cylinder headbands, and the first teinforce, it was possible to establish that they are of Finbanker type, of Swedish manufacture. “In the mid-seventeenth century, Sweden, a country with abundant iron ore, immense forests and streams for hydropower, began to dominate the European market for cast iron weapons as a result of an energy crisis in England caused by deforestation. Swedish guns were produced in various cities, such as Huseby, Stafsjö, Aker, Ehrendal and Finspang” (Valentini 2015). In eight of the artillery pieces, the letter “H” has been identified on its left stump; this mark identified the cannons from the Swedish Huseby foundry that operated between 1643 and 1800 (Kennard 1986). Given the data collected, it could be concluded that the Delta I is a ship with a constructive system of Ibero–Atlantic tradition, of Spanish nationality, and with a chronological assignment around the third quarter of the seventeenth century (Higueras-Milena and Gallardo 2016).

5 **Conclusions**

The studies carried out within the framework of the Underwater Archaeological Charter have resulted in the knowledge of both a potential underwater archaeological heritage and a real archaeological heritage. All this information has been the basis on which the legal protection of this heritage has been enacted and sustained and, consequently, its protection against legitimate activities such as infrastructure works. The research and protection of this cultural heritage has led to the location and scientific study of the two shipwrecks of the Modern Age and Iberian–Atlantic tradition described throughout these pages. These documentary and archaeological studies corroborate the historical, geographical, and strategic importance of the Bay of Cádiz throughout history in general, and the Modern Age in particular.

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