Archaeology:
Just Add Water

volume II

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Archaeology:
Just Add Water
Underwater Research at the University of Warsaw

Ministerstwo Nauki
i Szkolnictwa Wyższego

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THE EXPLORERS CLUB
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ODDZIAŁ POLSKI

WARSZAWA 2019

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Preface

Dear Colleagues,

It is our great pleasure to present to you the second volume of the U Supplement Series of the "Światowit" periodical. To a large extent it is based on the papers presented during the *3rd Warsaw Seminar on Underwater Archaeology*, which took place at the University of Warsaw on the 17th and 18th of January 2019.

An efficient and prompt process of editing we owe to the funding from the Ministry of Science and Higher Education, grant no. 959/P-DUN/2018.

Organization of the Seminar and publication of the hereby volume was possible thanks to the co-operation with the Polish Chapter of the Explorers Club, in particular its President, Professor Mariusz Ziółkowski, and the Vice-President, Marcin Jamkowski, to whom we are deeply grateful.

We would also like to acknowledge and appreciate the support of the University of Warsaw, namely the Vice-Rector Ph.D. habil. Maciej Duszczyk, the Dean of the Faculty of History, Ph.D. habil. Małgorzata Karpińska, Professor UW, as well as the Director's Board of the Institute of Archaeology: Ph.D. habil. Krzysztof Jakubiak, Ph.D. Michał Starski, and Ph.D. Marta Żuchowska.

The special thank you we traditionally owe to the Diving Museum by the Warsaw Diving Club, especially the Museum's Curator, Karina Kowalska, and the Club's President, D.Sc. Grzegorz Kowalski, who have been supporting our activities for many years, and constantly guide and help us in numerous enterprises.

We would like to extend our gratitude to all the Authors and Reviewers, who have been extremely diligent and punctual to keep up with our strict deadlines.

During the editing of the volume we have received invaluable consultations in the matter of ancient languages by Tomasz Płóciennik and Ph.D. Joanna Wegner, who we would also like to thank with all our hearts. The post-editing process was successful due to the the kind assistance of Ph.D. Rafał Dmowski, who we owe enormous gratitude.

The whole book was once again skilfully supervised and managed by the one and only irreplaceable Ph.D. habil. Bartosz Kontny, Professor UW. Him we would like to thank for all the advice and help with difficult choices, as well as the dedication to the organizational matters, even though the really tight schedule.

Last but not least, we would like to thank all the Readers who have reached for the hereby volume. We sincerely hope you will enjoy the outcome of our efforts and wish you pleasant reading!

Aleksandra Chołuj

Małgorzata Mileszczyk

Magdalena Nowakowska

3rd Warsaw Seminar on Underwater Archaeology

3rd Warsaw Seminar on Underwater Archaeology held on 17th-18th of January 2019
at the University of Warsaw
(photos by: M. Sugalska)

Foreword

The volume, which we hereby present to our esteemed Readers, is the vivid proof that underwater archaeology at the University of Warsaw is doing more than well. It is the second publication in the ***"Światowit" Supplement Series U: Underwater Archaeology***, issued for now (and we hope this pace will be sustained!) with a frequency of a periodical. Within the book one might find i.a. the texts being an outcome of the international ***3rd Warsaw Seminar on Underwater Archaeology***, organized in the Institute of Archaeology, University of Warsaw. The Readers will discover here the articles presenting broad chronological and geographical range of issues: from the Prehistory until the Second World War, from Guatemala and Peru to Poland and Slovakia. We are trying to reflect this diversified character also by the choice of photographs on the cover.

The leitmotif of all this vast range of archaeological issues is **water**: realm bearing a magnificent symbolic character. Changing its colour (even during the day – from the blackness, through greyness, then blue, until the bloody-red at the sunset, turning again into black) and visibility, it has manifested also other features, which can be contemplated as signs of its animation, such as movement: horizontal (currents, waves, tides) and vertical (fluctuations of the surface). It was also the source of life quite literally, providing food and dihydrogen monoxide, essential for living.

Along with its whole mystery and dangerousness, water may also serve as a refuge (lake settlements from the early Iron Age) and a trade route, at the end of which there is a (hopefully) safe harbour. That is how underwater archaeology marches onto the land... Although, it is neither place nor time for the deliberation about the definitions of archaeology related to water environment; the discussion in this matter has lasted for many years, abound in more and more new terminological propositions, still being far from any resolutions. Whichever position we assume in the aforementioned debate, it is impossible not to notice that the symbolism, the rituals, and everyday casual activities essential for life and connected with water pass through each other, which is well-exemplified by the hereby volume. Objects lost during transportation and other kinds of exploitation of water basins, items put in the water as a matter of rituals, military aspects connected with watery environment, lake settlements, harbours, and trade – all of that and even more you can discover in *Just Add Water 2*. To all the Readers, who are going to immerse themselves into this topic, I wish a pleasant intellectual adventure and... good dives!

Bartosz Kontny

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The *Mercedes 2015–2017* Project: Exploration and Excavation of the Wreck *Nuestra Señora de las Mercedes* (1 138 m depth)

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Abstract:

Between 2015 and 2017 the National Museum of Underwater Archaeology completed three scientific expeditions to the wreck of the Nuestra Señora de las Mercedes (located in the Gulf of Cádiz, at a depth of over 1 100 m), collaborating with the Spanish Oceanographic Institute, the High Council of Scientific Research, and the Spanish Navy. This institutional coordination and multi-disciplinary collaboration made it possible to carry an archaeological intervention at a very unusual depth of over 1 100 m, counteracting the looting of the wreck by the 'treasure hunter' company Odyssey Marine Exploration in 2007.

The aims of these three campaigns were various, and included the definition of the location and extent of the wreck site, the documentation of its condition following the looting suffered, the compilation of an archaeological map of the materials which remained on the sea bed as well as the excavation and extraction of some of the materials which are mentioned in archive documents.

Keywords:

underwater archaeology, deep water archaeology, *Nuestra Señora de las Mercedes*, National Museum of Underwater Archaeology, ARQVA, ROV, culverins, howitzer, scrap silver, gold mortar

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Introduction

Background

The Spanish frigate *Nuestra Señora de las Mercedes* was sunk by the British Royal Navy on the 5th of October 1804, 30 nautical miles south of the Cape of Santa María in Portugal. The British attack was done in spite of the Peace Treaty signed in 1802 in Amiens between both nations. Having been struck by a cannonball in the gunpowder magazine, the frigate exploded and sank to the sea bed along with its cargo. 275 people have lost their lives as the outcome.

In 2007 the wreck was plundered by the treasure hunter company Odyssey Marine Exploration and the Spanish government reported the fact to the courts of the USA, claiming ownership of the items on board and demanding the application of international law (O'Donnell y Duque de Estrada 2013). In September 2011, the Court of Appeals of Atlanta (USA) recognized the Spanish ownership of the wreck. On the 14th of February 2012, the Supreme Court of Washington (USA) ruled in favour of Spain, and ordered the implementation of a sentence (Cabo de la Vega 2012; Goold and Cabo de la Vega 2014; Negueruela Martínez 2016: 51–57). That sentence obliged Odyssey to deliver to the State of Spain the items of cultural heritage plundered from the wreck of the *Mercedes* (almost 14 tons of objects, mostly silver coins), together with the relevant graphic documentation.

The objects arrived at Madrid on the 25th of February 2012 and were taken to the National Museum of Underwater Archaeology in Cartagena ARQVA[1] (Region of Murcia, Spain) in December 2012. On the 21st of May 2014 a Ministerial Order was published, by which these archaeological items were definitively assigned to the Cartagena Museum.

At the same time as work was undertaken to stabilize, preserve, and document the recovered cargo (Buendía Ortuño *et al.* 2013), a number of exhibitions were held in order to raise public awareness of the case. At the end of May 2014 the permanent exhibition at the National Museum of Underwater Archaeology in Cartagena was enlarged to include material from the wreck. In June 2014, a temporary exhibition opened at the National Archaeology Museum[2] and the Naval Museum[3] in Madrid (García Ramírez and Marcos Alonso [eds] 2014). This exhibition later travelled to Alicante (Valencian Community, Spain), Seville (Andalusia, Spain), and Mexico City (Mexico).

[1] Spanish: *Museo Nacional de Arqueología Subacuática ARQVA.*
[2] Spanish: *Museo Arqueológico Nacional de Madrid.*
[3] Spanish: *Museo Naval de Madrid.*

An important legal battle had been won, but the scientific documentation and exploration of the site had yet to be undertaken.

Justification and Origins of the Project

With the legal proceedings having been successfully concluded, the next step was to begin archaeological work; the opinion of the director of the Museum was that the Spanish government, rather than accepting the data supplied by Odyssey, should verify the condition of the remains of the wreck and undertake its own scientific research.

The main hurdle to be overcome was the depth of the wreck, which involved two challenges: descending to such depths with scientific equipment and undertaking an archaeological intervention at a depth of over 1 100 m, at which no European country had previously carried an archaeological excavation.

In March 2014 the National Museum of Underwater Archaeology presented a proposal to the Ministry of Education, Culture and Sport[4] to undertake a scientific project of archaeological excavation at the site of the wreck, and eventually, in early 2015 the Ministry gave its approval to the *Mercedes Project: Underwater Archaeological Intervention at the Wreck of the Nuestra Señora de las Mercedes (1804);* this project has been completed in three campaigns, between 2015 and 2017.

Location

The frigate sank in the Gulf of Cádiz, south of the Cape of Santa María in Portugal, to a depth of between 1 130 and 1 140 m. The location is over 30 nautical miles from the coast – in other words, well outside both the 12-mile limit of Portuguese waters and the additional 12-mile Contiguous Zone.

General aims of the project were:

- to establish the exact location of the archaeological site in order to verify the coordinates supplied by Odyssey to the US courts;
- to document the ‘work’ and ‘operations’ carried by the treasure hunter company;
- to carry an acoustic exploration of the sea bed in order to compile a geomorphological description of the sinking zone and to obtain a detailed bathymetric profile: these data

[4] Spanish: *Ministerio de la Educación, Cultura y Deporte, Gobierno de España.*

was to be used as the reference for the safe use of the Remotely Operated Underwater Vehicle (hereinafter: the ROV) and side-scan sonar;

- to create video footage from the ROV in order to document the current state of the remaining elements of the wreck, establishing which material had survived both the sinking in 1804 and the looting by Odyssey, and in what condition;
- to create an archaeological map of the remains;
- to excavate some of the remaining material in order to discover more about the sunken vessel, and to provide archaeological verification of coincidences with extant documentary sources, thus corroborating the historical identification of the wreck;
- to deposit at the site of the wreck a plaque commemorating the civilians and military personnel who had perished in the sinking.

Institutions involved were:

- the Ministry of Education, Culture and Sport, through the Department of Protection of Historical Heritage[5] which financed the campaigns, and the National Museum of Underwater Archaeology in Cartagena, which oversaw the project and supplied various expert staff;
- the Ministry of the Economy and Competitiveness[6], through the Spanish Oceanographic Institute[7] (hereinafter: the IEO), which supplied the oceanographic research vessel *Ángeles Alvariño*, the ROV, and oceanographic equipment as well as experts; in addition, the Marine Technology Unit[8] (hereinafter: the UTM) of the High Council of Scientific Research[9] (hereinafter: CSIC) supplied the oceanographic research vessel *Sarmiento de Gamboa*, geophysical exploration equipment and specialized technicians;
- the Ministry of Defence[10], which provided two Navy observers for each campaign as well as logistical support for mooring and loading.

[5] Spanish: *Subdirección General de Protección del Patrimonio Histórico* (the SGPPH).
[6] Spanish: *Ministerio de la Economía y Competitividad, Gobierno de España.*
[7] Spanish: *Instituto Español de Oceanografía.*
[8] Spanish: *La Unidad de Tecnología Marina.*
[9] Spanish: *Consejo Superior de Investigaciones Científicas.*
[10] Spanish: *Ministerio de Defensa, Gobierno de España.*

Technical Equipment

The oceanographic research vessels used were the *Ángeles Alvariño* (belonging to the IEO) in 2015 and 2016, and the *Sarmiento de Gamboa* (belonging to CSIC) in 2017. These vessels measure 46 and 70 m in length respectively and are both equipped with Dynamic Positioning, the differential GPS, multibeam sonar, parametric sonar, sound velocity profilers, and various winches. In addition, for the 2017 campaign a side-scan sonar device installed on a towed unit belonging to the UTM of CSIC was also brought into use.

Furthermore, in all three campaigns the ROV was deployed; this was the Liropus 2000 belonging to the IEO, a device which can dive to depths of up to 2 000 m. In order to reach 30 m above the sea bed the ROV is housed within the TMS (Tether Management System), a cable management system which shelters and protects it during raising and lowering. This model of the ROV is fitted with six motors, five cameras (including one high definition and one for working in conditions with practically no light), the GPS, sonar, a sample collection drawer, and two hydraulic manipulator arms. During the first campaign one of the manipulator arms was supplied as standard and the other was specially created using titanium by the Advanced Crew and Ship Management (the ACSM)[11] and Grupo CIMA[12] of the University of Vigo. For the 2016 campaign the performance of the ROV was improved by the use of two titanium manipulators and a new camera; this meant that it was possible to achieve a far higher quality of archaeological documentation (than the one which was compiled by means of video footage) by taking excellent shots of the archaeological items and their surroundings from above, and to document the objects concerned in detail.

Implementation of the Project

The campaign diaries and detailed explanations of the work carried during the three campaigns at the wreck of *Mercedes* have been published in a series of monographs by the Ministry of Education, Culture and Sport and at international underwater archaeology congresses and conferences (DEGUWA[13] and IKUWA[14] 6), for which reason the following is no more than a brief summary. For more detailed information please consult specific publications (Negueruela *et al.* 2015; 2016a, 2016b; 2017a, 2017b, 2017c; forthcoming).

[11] The company within the IEO responsible for the management of the used ROV in these campaigns.
[12] A research group of the School of Industrial Engineering of the University of Vigo (Spanish: *Escuela de Ingeniería Industrial de la Universidade de Vigo*).
[13] German: *Deutsche Gesellschaft zur Förderung der Unterwasserarchäologie*.
[14] German: *Internationalen Kongress für Unterwasserarchäologie*.

The 2015 Campaign

The 2015 campaign took place between the 18th and 23rd of August 2015 on board of the oceanographic vessel *Ángeles Alvariño*. On the first day the wreck was located at a depth of between 1 136 and 1 138 m, confirming that the co-ordinates supplied by Odyssey during the trial were correct.

A sound velocity profile was compiled to calibrate the equipment and a geological survey of the area was performed using multibeam sonar and TOPAS (Topographic Parametric Sonar) device, providing a detailed bathymetric map and a reflectivity study in the area.

The next stage was an archaeological study using the Liropus ROV; hundreds of artefacts were referenced, positioned to a high degree of precision, and documented by means of video footage: these included anchors, iron and bronze cannon, copper and tin ingots, a silver dinner service and cutlery, silver candlesticks, a gold pestle, and others (**Fig. 1**).

In addition, an archaeological excavation was performed by means of the extremely careful use of a jet of water. The three variable parameters taken into account were the flow of water supplying the jet, the strength of the jet, and its precision; the aim having been to position and direct it exactly. By this means it was possible to clean one of the bronze Renaissance culverin and to document the presence of the rich, high-quality decoration.

Furthermore, in order to learn about other aspects of the frigate, 13 small items were documented, excavated (**Fig. 2**), and extracted; a small bronze three-pounder howitzer cannon, silver cutlery and tableware, candlesticks, and a gold pestle.

Finally, a bronze plaque was laid at the archaeological site in memory of the victims who perished on the 5th of October 1804, when the frigate *Mercedes* was attacked by a Royal Navy squadron despite Spain and the United Kingdom having signed the Treaty of Amiens two years previously, in 1802 (Negueruela *et al.* 2015; 2016a: 19–23, 33–39; 2016b).

The 2016 Campaign

The second campaign was scheduled from the 10th to the 18th of September 2016, but adverse meteorological conditions made it possible to work at the site only on the 16th of September, when the ROV undertook two long immersions.

This drastic reduction of the effective working timeframe to just one day meant that it was necessary to reduce the objectives which had been programmed for the second campaign. It was not possible to continue with the archaeological mapping of the site, or to extend the documentation of the areas to the south and south-east of the wreck, and thus it was decided

to focus the work on the areas where individual items related to the description of the *Mercedes* in the General Archive of the Indies[15] (hereinafter: AGI) were located, in order to identify the wreck beyond any possible doubt.

The first intervention took place in the area of the scrap silver dinner service, where excavations had begun in 2015. Objects were excavated using a high-pressure water jet, and before extraction they were documented by means of overhead photography (**Fig. 3**). In total, 35 pieces were recovered in 2016, including a gold mortar and 34 items of silverware such as plates, cutlery, candlesticks, coins, and other artefacts.

Efforts were then made to tackle the extraction of one of the Renaissance culverins, but this was not possible due to the limitations of the on-board winches and worsening sea conditions. For further information on this campaign please consult other publications (*cf.* Negueruela *et al.* 2017b; 2017c; forthcoming).

The 2017 Campaign

The third campaign at the site took place between the 21st and 29th of August 2017, prior to which three days were spent in the port of Cádiz (Andalusia, Spain), fine-tuning all of the equipment needed on the S*armiento de Gamboa*, belonging to CSIC.

On this occasion the plan was to work around the clock: daylight hours would be devoted to archaeological work with the ROV and the hours of darkness would be occupied by oceanographic studies using remote sensing equipment.

One of the main objectives in 2017 was to excavate and extract the two Renaissance culverins; excavating the first of them proved to be more complicated than expected as it was lying on its side in a layer of extremely hard clay substrate, which was highly resistant to the water jet and therefore very difficult to remove (**Fig. 4**). Ditches were dug parallel to each of the longer sides of the culverin, but progress was slow and the clay became compact again as soon as work paused. For this reason, before excavating under the muzzle of the culverin the characteristics of the water jet were refined to extend it through an elbow joint (**Fig. 5**). After 38 hours of uninterrupted work with the jet, the culverin was freed.

In contrast, the documentation and extraction of the second culverin was far simpler and quicker as it was lying at an angle with the upper third free of sediment and this made its recovery easier.

[15] Spanish: *Archivo General de Indias.*

The strategy for extracting the two cannon was a complex and precise one. The IEO prepared two 25-metre loops of Dyneema® and the ROV was used to place the loops around the muzzles of the culverins. The other ends of the loops were then attached to a 1-ton dead weight, half-sunk into the sea bed near the cannon, which in turn was attached by a steel cable to the main on-board winch.

Dyneema®, a polyethylene of high molecular weight, is an ultra-resistant fibre which can work under tension of 20 tons and which minimized the abrasive effect on the cannon, avoiding scratches or any other damage during the raising process.

Once the Dyneema® was in place the raising procedure began, using steel cables and a combination of winches and lifting devices. This was a critical phase of the extraction operation, given the risks inherent in raising over two tons of cannon and allowing it to swing like a pendulum above the moving surface of the deck of a vessel in open seas. In order to control the movements of the cannon, various restraining ropes were used and two winches were operated simultaneously to deposit the cannon horizontally on the ship (**Fig. 6**).

On the stern deck of the *Sarmiento de Gamboa* a bed of polyethylene foam on top of a flexible structure was prepared to make sure that the cannon were safely secured to the deck, without suffering blows or scratches, while they were prepared for packing and onward transportation.

While they were in this position, first analyses of the decoration and inscriptions on both of them has been carried; it included various coats of arms, the name of the foundry where they were made, the year, and their names: 'Santa Bárbara' and 'Santa Rufina'. Once these first examinations and initial photographic documentation had been completed, appropriate conservation measures were implemented: for protection they were wrapped in an aluminized polyethylene and nylon film (Marvelshield®), which is resistant to water vapour and the oxygen in the atmosphere; then they were encased in wooden crates lined with foam and immobilized by the use of ratcheted tension cables.

Work then proceeded with the documentation, excavation, and recovery of other unusual items: a block with three bronze pulleys and wooden remains, which were found next to one of the large anchors; a bronze tap, a perforated copper air ventilation grill, and a small bronze three-pounder howitzer.

The ROV operations required the boat to be using the Dynamic Positioning system, but once this phase was over, the UTM team began their oceanographic exploration with the boat in motion. This work began with multibeam sonar and the sub-bottom profiler compiling information

to elaborate the bathymetry of a wider area and obtain stratigraphic analysis of the sea bed. Operational tests were also carried on the TD1 multi-use container, which houses a side-scan sonar (hereinafter: SSS) device, and the SSS was used to explore the zones to the east and north of the wreck with the aim of determining its extent (Negueruela *et al.* 2017a: 169–173).

Results

Assessment of the Condition of the Site

Documentation work using the ROV made it possible to observe the nature of the sea bed and the state of preservation of the items of archaeological interest which had not been plundered by Odyssey.

The wreck lies at a depth of approximately 1 140 m over a wide flat area on the middle shelf of the Algarve Basin. The physiography of the continental margin of the Gulf of Cádiz is highly complex and is determined by tectonics as well as erosive and sedimentary processes in which the exchange of water between the Atlantic and the Mediterranean through the Strait of Gibraltar plays an important part (Hernández-Molina *et al.* 2003). The circulation of these water masses is characterized by the entry of surface water from the Atlantic into the Mediterranean, while at the same time a strong outward current of highly saline water, which is warmer and denser, flows out at depth towards the Atlantic following a course which is parallel to the continental shelf (SSE-NNW), creating a series of sedimentary contourite clay channels and plains. These conditions were observed in all three of the summer campaigns. In the area of the site the deep outward current is especially apparent at depths of greater than 750 m, presenting a more or less constant flow rate of 0.8 m per second, a flow direction of 120º and a stable temperature on the sea bed of 12ºC.

In the area where the wreck lies, the processes of diagenesis are conditioned by the interaction of the outward current from the Mediterranean with the sea bed and are especially intense, creating an area without sedimentation (Kelling and Stanley 1972). In geological terms, there is currently no accumulation in the area of the site, and the strong current near the sea bed prevents the deposition of any very fine particles which might arrive from the coast. In consequence, more than 200 years after sinking objects which were on board of *Mercedes* are still lying directly on the sea bed, hardly buried. The sediment in the surface layer was deposited when the sea level was different from its current altitude.

The sea bed consists of a dense, greyish, solidly cohesive substratum composed of very fine mineral particles. Diffracted X-ray analysis of a sediment sample taken shows the following mineral composition: 43% quartz, 26% calcite and calcite-dolomite, with the rest representing various clays (12% muscovite, 11% serpentine chlorites, and 8% albite).

The objects belonging to the wreck are deposited on this firm but plastic surface over a wide area, measuring 130 by 150 m. In case of the larger objects such as cannon, anchors or tin and copper ingots, it is possible to observe hollows around them, formed by the acceleration of the current as it makes its way around the obstacles. This effect also contributes to the lack of any sediment covering the objects, leaving them directly exposed to the current and the effects of erosion and degradation (Sierra Méndez, 2019).

As for the chemical composition of the sediment, although the alkalinity of the substratum could favour the preservation of certain items of archaeological interest, especially those made of metal, as they have not been buried; this has had few repercussions on their condition.

Throughout the wide area in which the remains are scattered there are numerous species of marine fauna – fish, crustaceans, sea urchins, sponges, molluscs, and others; this reveals the aerobic characteristics of the environment.

The fact that the artefacts have not been buried and lie directly on the sea bed, exposed to the strong prevailing current, allied to the aerobic profile of the environment and the warm sea temperature, has caused a good deal of corrosion in the objects made of iron, and after remaining in these conditions for over two hundred years they show thick layers of rust and build-up. It is hardly possible to ascertain the shape of the larger iron objects such as items of artillery, cannon, and shells, due to the flaky accretions which have accumulated and deformed the surfaces. Wrought iron objects, such as anchors and kedges, are not affected by these thick layers of build-up, but do present a certain degree of surface roughness due to the loss of material to rust. The smaller iron objects are scattered around the site in the form of rounded, shapeless lumps, making it impossible to deduce their original shape.

The silver objects are oxidized with a greenish layer (produced by the corrosion of the copper element used in the alloy) and with greenish-purple compounds due to the formation of soft, insoluble silver halides. Small artefacts, such as some of the tableware and cutlery items, have become sharp at the edges and are pockmarked with holes due to the combined actions of degradation by corrosion and the surface erosion caused by the prevailing current.

The objects made of bronze, which are harder and more resistant to corrosion, have endured the erosion and are therefore better preserved. In case where they have been partly buried, as with the two culverins which were on board the frigate, the decorative and structural details have been well preserved. However, the oxidative action of the water flowing around them has provoked the first stages of generalized surface corrosion in those objects which are exposed: these have become porous and holes have formed ('pitting corrosion'), meaning that some of the material is missing.

No organic remains such as wooden planks, textiles, or leather were found. In case these elements remain exposed, they are soon degraded by the marine fauna, molluscs, crustaceans, and microorganisms; only if they are buried there is a chance of them surviving, but in this case they would not be visible. Due to the stratigraphic weakness of the site it is highly unlikely that the large wooden structures of the frigate still survive.

Material Documented in situ

During the first campaign the archaeological material present at the site was mapped (**Fig. 7**). Hundreds of artefacts were referenced, positioned to a high level of precision, and documented with the video footage: anchors, iron and bronze cannon**,** copper and tin ingots, a dinner service and silver cutlery, silver candlesticks, a gold pestle, and others, including some which remain unidentified (Negueruela *et al.* 2016a: 19–23, 35–47).

Recovered Material

During the three campaigns the decision was made to extract a reduced number of items, selecting them on the grounds of their potential interest in the fields of history, culture, museums, conservation, juridical and archive material. The main criteria used were the following:

- pieces listed in documents of AGI or other archives, permitting the definitive corroboration of the identity of the wreck as the frigate *Nuestra Señora de las Mercedes* and the elimination of any scope for doubt to be expressed in future years and decades from any quarter, particularly the company Odyssey;
- unusual pieces which are not easily recognizable and which may shed new light on the era of the wreck;
- objects in danger of disintegration if left on the sea bed.

Out of the whole collection of hundreds of pieces found and mapped at the site of the wreck, only a few dozen were extracted. These included four bronze cannon (two large culverins and two smaller howitzer cannon), a collection of 45 pieces of scrap silver (including plates, cutlery, and candlesticks), two objects made of gold (a mortar and pestle), a bronze tap, sheet of copper, silver coins, and the remains of a lifting system consisting of three bronze pulleys and four fragments of wood. In total, these represent less than 1% of the archaeological material which remained at the site.

Condition of the Recovered Objects

During the three campaigns all necessary preservation measures were taken to ensure that the archaeological material was correctly transported from the site to the museum laboratory.

In the first campaign 12 objects were extracted: one small bronze cannon, a gold pestle, and various items of silver, including plates, candlesticks, and cutlery.

The gold and silver objects did not present any serious problems of conservation when lifted from the sea bed; and intervention was therefore minimal. They were wrapped in tissue paper lined with polyethylene (Lampraseal®), avoiding any risk of them being scratched or otherwise harmed by the use of a material which can easily adapt to any shape, and tailor--made packaging was then created for each of them in crates and boxes lined with polyethylene foam (Ethafoam®). In this way they were safely transported to the laboratory.

In case of the bronze cannon, there was some potential for accelerated corrosion if it were exposed to the non-marine environment, and for this reason it was protected against oxidation by the application of an alkaline chemical paste containing cellulose and 5% sodium sesquicarbonate (equimolecular mixture of carbonate and sodium bicarbonate) with a pH of 11, and of various layers of polyethylene and aluminium film. These measures ensured that the cannon was in the best possible condition for its conservation, with the access of oxidizing agents to the metal surface limited in such a way as to protect the object from corrosion. For transport purposes the objects were loaded into the refrigerated hold of the ship with a constant temperature of 4ºC in order to slow any oxidation reaction and stabilize them for their journey to the laboratory, which would last several days.

During the second expedition to the wreck in 2016 various more silver objects were recovered, including two candlesticks, eight plates, a large bowl, various forks and spoons as well as a gold mortar, which matched the pestle extracted in 2015. In addition, various silver coins were retrieved with the aim of documenting the original state of those artefacts

at the site, as all coins already at the National Underwater Archaeology Museum had undergone restoration treatments by Odyssey. The condition of these items was similar to those described in relation to the previous campaign, and similar steps have been taken to guarantee their conservation until arrival at the museum laboratory.

The items recovered during the third campaign included two large heavy bronze cannon, items of unquestionable scientific and museographic value. The extraction of these pieces was also conditioned by the fact that far from being in a stable conditions, where the processes of degradation would be reduced to a minimum, the cannon were in an aggressive, erosive, and oxidizing environment, which would eventually lead to them gradually but irreversibly dissolving in the sea until they completely disappeared and became mineral accretions (Sierra Méndez 2019). It has been possible to see the onset of this process in the pieces recovered, which were severely affected by corrosion and had lost their original surfaces due to oxidation of the metal.

All of the items retrieved in 2017 were protected by a film barrier of aluminized polyethylene and nylon (Marvelshield®), which resists the permeation of water vapour and the oxygen in the atmosphere. The cannon were cased in wooden crates lined with foam and immobilized by the use of ratcheted tension slings, while the remaining objects were packed in the polyethylene foam.

Studies of Materials

The analysis and assessment of the archaeological pieces recovered during the three campaigns: two Renaissance culverins which were part of the cargo, two small bronze three-pounder howitzer, the silver dinner service, a gold mortar and its pestle, and other objects including a pulley block or sheave with three pulleys, a bronze tap, and a sheet of perforated copper followed the phase of exploration.

Renaissance Culverins

The main interest of these pieces lies in the fact that they are explicitly mentioned in two documents, one of which is held in AGI and another, which forms part of a private archive (Negueruela *et al.* 2017a: 173–174). The cargo manifest of the frigate when it set sail from the port of Callao in Peru in March 1804 mentions "*two worthless bronze cannons"*[16] (*Estado de los Caudales...*; **Fig. 8**). The document describing the 'state of lives and forces' of the frigate, signed in Montevideo (Uruguay) in August 1804, contains a reference in the first note on the back to "*two bronze culverins excluded"*[17] (*Estado General de la Fragata...*).

It is thus clear that they were a part of the frigate's cargo, and not her operative artillery.

Analysis of the inscriptions they bear has made it possible to determine that both were made in the late 16th and early 17th century by Bernardino de Tejeda, a founder from Seville, who was transferred to Peru by Philip II of Spain. Furthermore, the two have identical decorative elements – the coat of arms of Castile and León and the lifting handles, which have the form of a carnivorous animal instead of the more typical dolphins – and both have female names: 'Santa Bárbara' and 'Santa Rufina'. A detailed description of the two culverins, an analysis of their iconography and an assessment of their historical value have already been published (Negueruela *et al.* 2017a: 174–179), hence the summarizing of the most significant information here.

Culverin 1, 'Santa Bárbara'

The first of the culverins to be extracted from the site is an exceptional piece, in terms not only of its size and weight (4.33-metres-long and 58 quintals, or 2 633 kg) but also of the amount of information it provides and its numerous decorative details (**Fig. 9**).

The coats of arms depicted and the epigraph bear witness to the fact that the culverin named 'Santa Bárbara', owned by the Crown of Castile and León, was commissioned by the Count of Villar (*Conde del Villar*) to the founder, Bernardino de Tejeda, who completed it in 1586. The Count of Villar Dompardo, Fernando de Torres y Portugal, was the Viceroy of Peru from 1585 to 1589.

This culverin is richly decorated with two edgings which are repeated various times: one in which castles and rampant lions are juxtaposed, reproducing the emblems

[16] *"dos cañones de bronce inútiles"* (trad. the authors).
[17] *"dos culebrinas de bronce excluidas"* (trad. the authors).

of the Crown of Castile and León, and another in which the mythological motif of the Tritons of the marine *Thyassos* are reclining against a central amphora.

Besides this, both the lifting handles and the cascabel are decorated with the heads of animals (**Fig. 10**). Although in most cases these decorative animals are interpreted as being dolphins, in this case they are clearly carnivores due to the presence of ears, teeth, and a mane of hair which reaches down over the eyes: what is not clear is whether they are the heads of lions, wolves or dragons.

The choices of iconography made by the Viceroy to decorate this enormous culverin make it obvious that he wished to demonstrate quite clearly that it belonged to the Crown of Castile and León, a desire reflected by the prominent location of the coats of arms. This notion is strengthened by the edging motif containing the juxtaposition of the lions and castles of the coat of arms, and also by the omission of his own family coat of arms (he was the Count of Villar Dompardo, related on his mother's side to the royal family of Portugal): instead, his own identity is referred to only to state that it was he who commissioned the culverin (**Fig. 11**).

In other words, it is made abundantly clear that the Viceroy had absolutely no intention of making the piece his own, and insisted on making it obvious that the culverin belonged to the State (Negueruela *et al.* 2017a: 176–177).

Culverin 2, 'Santa Rufina'

The second of the culverins extracted from the site is 'Santa Rufina', dated 1601 (**Fig. 12**). It is smaller than 'Santa Bárbara', measuring 3.90 m in length and weighing 46 quintals, or 2 214 kg; it is a work of very high quality, produced by the same founder who made the larger culverin (Bernardino de Tejeda); although, it features fewer heraldic decorations and none referring to mythology (Negueruela *et al.* 2017a: 178–179).

On the muzzle there is a decorative design of acanthus leaves which shows clear classical influence, while the barrel of the culverin is adorned with two coats of arms, that of Castile and León and the family blazon of Luis de Velasco y Castilla, Viceroy of Peru between 1596 and 1604, who ordered it to be produced (**Fig. 13**). The two central lifting handles again represent carnivorous animals, but in this case the cascabel is a very simple central stem ending in a ball.

Two Small Bronze Three-Pounder Howitzer Cannon

Two small bronze three-pounder howitzer cannon were recovered during the 2015 and 2017 campaigns. The first of them is fully intact and measures 78 cm in length, while the second is missing the cascabel and is therefore shorter, at 72.5 cm. In other respects they are very similar: the only decoration is three bull motifs on the barrel, they retain the slots which were used as sights to aim the weapon, there is an inscription chiselled onto one of the trunnions (nº 14), and they present some loss of material caused by the explosion on board the frigate before it sank.

These kind of small cannon were installed on the prow, stern, and on the 'top', the platform around a third of the way up the main mast, for use in close combat and boarding operations. Their presence on the frigate is mentioned in various archive documents: for example, the *State of Lives and Forces of the Frigate Mercedes*[18] (*Estado General de la Fragata...*), which was signed in Callao on the 7th of August 1803, indicates that the vessel carried 12 bronze three-pounder cannon. During the three campaigns at the site four of these 12 small howitzers were located, and two of them retrieved.

Scrap Silver and Gold Mortar and Pestle

This group concerns a selection of silver objects (tableware, cutlery, candlesticks, etc.) as well as a gold mortar and pestle, which are mentioned in a document held in AGI. It is for this reason that they were excavated, in order to check the archive information against the archaeological remains.

11 pieces belonging to this group were documented and excavated on the last day of the 2015 campaign: the remains of two silver candlesticks, six pieces of silver cutlery, a group of three plates in very poor condition (encrusted together), a silver coin, and a gold pestle (Negueruela *et al.* 2016a: 46–47, 49, 53–56, 58–62).

In the 2016 campaign the prime objective was to finish the work in the area around the silver service. Excavations were completed and the whole process was documented by means of video footage and photography from above. 35 objects were recovered: the gold mortar corresponding to the pestle retrieved in 2015 and 34 pieces of silverware, including soup bowls, plates, two large but incomplete bowls, another large central bowl – complete with horizontal handles – and various spoons, forks, coins, and other items (Negueruela *et al.* 2017c: 55, 59–67). Several of the aforementioned elements had become

[18] "*Estado de Vida y Fuerza de la fragata Mercedes*" (trad. the authors). It is a short name of the original document (*Estado General de la Fragata...*).

encrusted to each other, but when they were analysed and documented on land some interesting aspects have emerged.

Another document held in AGI (1804) included many details of a private shipment (**Fig. 14**). There is a registry document stating that Francisco Antonio de Murrieta, Master of the royal frigate named *Mercedes*, notes a private shipment sent by Don J. Antonio Álvarez de Villar from Lima (Perú) to an individual in Cádiz. The goods are described as "*a trunk lined with leather, with a mark on the rim (XX), in the charge of Dr. d. José de la Encina, and commissioned in Cádiz for d. Juan Francisco de Espelosín, in his absence for d. Juan Matías de Vertiz*"[19]. It then specifies that the trunk "*contains 232 marks (i.e. 116 pounds) and one ounce of scrap silver, a six-mark gold mortar, and all 'quintado' in these [royal] houses*"[20]. The document is signed in Lima, on the 28th of March 1804 (for the complete transcript *vide*: Negueruela *et al.* 2017c: 57).

Part of this information ('scrap silver') could correspond to any wreck on the shipping route between Spain and the Indies. However, there are specific details which it was hoped might be corroborated, such as the mark *XX*, the name *Encina* as the commissioner of some of the objects, the seals showing that the *quinto* tax had been paid and the weight of the gold mortar.

Once the items recovered in the 2015 and 2016 campaigns had been stabilized and documented in detail, it was possible to check them against the detailed archive documentation. The following details, mentioned in the AGI document (1804), were verified in the objects recovered:

- the mark *XX* which is registered on the rim of the AGI document has been identified on various of the plates which have become encrusted together (**Fig. 15.1**);
- the word *Ensina* is engraved on the handles of some of the pieces of cutlery recovered, corresponding to the surname of the *Dr. d. José de la Encina* mentioned in the document (**Fig. 15.2**);
- the expression "*all* quintado *in these Royal houses*"[21] refers to the fifth part (quinto real), a Royal tax. The seal of this Royal tax accredited that the corresponding tariffs had been paid. The symbol of the *quinto real* is a crown framed by a ring of dots, which has been documented on some of the plates and cutlery, and on the gold mortar and pestle (**Fig. 15.3**);

[19] "*Un cajón forrado en cuero con la marca del margen (XX) en c/r [cuenta y riesgo] del Dr. d. José de la Encina y a comisión en Cádiz a d. Juan Francisco de Espelosín, ausente a d. Juan Matías de Vertiz*" (trad. the authors).
[20] "*Contiene 232 marcos y una onza de plata chafalonía, un almirez de oro con seis marcos, todo quintado en estas R.S. [Reales] Casas*" (trad. the authors).
[21] "*todo quintado en estas RS Casas*" (trad. the authors).

- the "*6-mark gold mortar*"[22] mentioned in the document coincides with the weight of the gold pestle and mortar recovered (**Fig. 16.3**).

These four findings point unquestionably to the definitive identification of the wreck: the exact coincidences between the material recovered by the Museum in the 2015 and 2016 campaigns and the precise details of the AGI document quoted provide definite proof that the wreck under investigation is that of the frigate *Nuestra Señora de las Mercedes*, and provide a level of precision which is without precedent in the field of Spanish underwater archaeology (Negueruela *et al.* 2017b: 58; forthcoming).

Sheave with Three Pulleys

The incomplete sheave or block in which three bronze pulleys alternate with four fragments of wood (Negueruela *et al.* 2017a: 180–181) was also recovered. The bronze pulley wheels are disc-shaped and feature a groove on the outside of the rim (through which ropes would pass), as well as a circular hole in the centre and four oval-shaped holes around it. The wooden remains correspond to the housings where the pulleys were installed.

This pulley design was a feature of Spanish ships in the 18th century, and their location at the site, alongside one of the large anchors of the wreck, suggests that the block could have formed part of the apparatus used to drop and haul the anchor.

It is interesting that four fragments of wood should have remained intact on the sea bed in their original position between the bronze pulley wheels without any kind of sedimentation, despite the block being found on the sea bed. That these organic remains survived in an aerobic environment is due to the wood having been mineralized on account of the formation or iron and copper precipitates inside it as the iron axle and the bronze wheels of the fixture oxidized. Iron acts as an agent of consolidation while copper acts as a biocide, preventing the attack of macro--organisms like *Teredo navalis* (naval shipworm) and microorganisms such as fungi and bacteria, allowing these wooden remains to be preserved *in situ*.

Bronze Tap

A small bonze tap measuring 10.5 × 9 cm, with a barrel-cone-shaped housing, probably used as a barrel tap has been acquired as well. This kind of tap acted as a stopcock which was inserted into a wooden barrel with a hammer blow and was then opened and closed with just half a turn. The barrel might contain water, wine or liquor.

[22] "*almirez de oro con seis marcos*" (trad. the authors).

At the outer end of the device there is a rod which was used firstly to help insert the tap in wooden barrels and then to hang a bucket below it, or a container to catch leaking drops.

The tap was found on its own on the sea bed, making it impossible to deduce in which part of the ship it was located.

As far as it has been established, this is a unique piece on Spanish ships of the time. As such it is of incalculable value, and further studies will allow advances to be made in the knowledge of plumbing and life on board (Negueruela *et al.* 2017a: 179–180).

Perforated Copper Sheet

This complete rectangular copper sheet measures 42.8 × 29 × 3 cm and contains 113 holes with diameters of between 1.2 and 1.4 cm distributed in a non-uniform fashion on its surface. The edges show no sign of it having been attached to a hinge, pin, bolt or fastener of any description, and there is no decoration.

These three features – the irregular distribution of the circular holes, the lack of fastenings, and the lack of decoration – suggest that it could have been used as a ventilation grill for a service galley or hold, possibly an area used for the transport of live animals (Negueruela *et al.* 2017a: 180).

Final Assessment

The Legal Battle against the Plunder and Trading in Underwater Cultural Heritage

The case of the looting, subsequent lawsuits, and the recovery of the items on board, the frigate *Nuestra Señora de las Mercedes* is an extremely important one for the international management of Underwater Cultural Heritage (hereinafter: the UCH), and the case of the *Mercedes* has had wide-ranging international repercussions and attracted attention in the world's media.

It is important to highlight the relationship of the case with the UNESCO 2001 *Convention on the Protection of the Underwater Cultural Heritage*, although this international agreement was not used in the trial due to the document not having been signed by the USA. However, the case represented a juridical triumph for the States Parties which are fighting looting and are in favour of the Protection of UCH, one of the principal aims and purposes of the 2001 Convention. For this reason, at present the case of the *Mercedes* is one of the clearest demonstrations of the reasons for the Convention and the nature of its content.

Archaeological Project

One of the successful aspects of this project was the maximum level of coordination among the public institutions involved: the National Museum of Underwater Archaeology in Cartagena, which oversaw the project, the Directorate-General of Fine Arts and Cultural Heritage and the Deputy Directorate-General of Historical Heritage Protection which financed and managed the campaigns, the IEO, and the UTM of CSIC, which supplied the oceanographic research vessels, equipment and crew, and the Spanish Navy in its role as observer.

The high degree of collaboration among research institutions made it possible to carry three scientific campaigns at depth and achieve optimum results: the first underwater archaeological excavation in Europe at a depth of over 1 100 m, the precise positioning of hundreds of objects at the wreck, their photographic documentation and the excavation of some of them using a water jet, the extraction of a series of objects including two enormous cannon weighing over two tons each, and the establishing of correspondences between these materials and archive documents, to name but a few.

In addition, the project fostered international cooperation. The Portuguese government was kept informed at all times and officials were invited to visit the team during the campaigns. A German colleague and two Mexican underwater archaeologists were also invited. All of this serves to strengthen international cooperation in the protection of UCH, which is one of the main principles of the 2001 Convention.

Similarly, the archaeological project was conducted following several of the specific rules established in the *Annex of the UNESCO Convention*:

- the use of non-destructive techniques and methods of exploration; the decision has been made to use the geo-physical exploration techniques (multibeam and side-scan sonar) in a deep water archaeology project and the ROV designed for biological research was adapted to the needs of archaeological research (mapping and graphic documentation);
- priority given to preservation *in situ*; the archaeological mapping provided the high-precision positioning of hundreds of objects which remain *in situ* at the site after the looting of Odyssey;
- the unnecessary disturbance of human remains and revered sites should be avoided; in this case the site was a war grave, and efforts were made to disturb it as little as possible; furthermore, a commemorative plaque was installed at the wreck as a sign

of respect and homage to the victims who lost their lives in the sinking of the frigate *Nuestra Señora de las Mercedes*;

- selective excavation, then documentation, and selective recovery of objects; excavation was carried only at certain points in the site, and once the documentation had been completed it was decided to recover only a small selection of objects, using three selection criteria:

    a) risk inherent in leaving objects at the site due to their fragility and the lack of sedimentation in the area;

    b) unique or uncommon archaeological material which could contribute to widening of historical knowledge;

    c) objects which are mentioned in archive documentation.

Mention should be made of the perfection with which the documentary sources coincide with archaeological evidence in this case, a quite exceptional instance in archaeology not only under water but also on land, especially in the cases of the scrap silver dinner service and the two Renaissance culverins. The exact coincidence of the material recovered by the Museum in the 2015, 2016, and 2017 campaigns with the equally precise details given by the documents quoted in the Archive of the Indies and others confirm definitively that the wreck under investigation is the frigate *Nuestra Señora de las Mercedes*, and provides a level of exactitude hitherto unprecedented in European underwater archaeology.

Conservation and Documentation Programme

Since 2015, the conservation programme has been planned and carried by the experts in conservation and restoration at the museum. Initially, a specialist was on board the oceanographic research vessels during all three campaigns, taking charge of the preventive conservation of the few objects extracted and their transport in the best possible condition to the museum. In addition, once at the museum, the material has been stabilized, conserved, and restored; the material retrieved in 2015 and 2016 is already stabilized, while the objects brought to the museum in 2017 are still being treated.

At the same time, the task of documenting the deep-water archaeological activity and the material recovered has been addressed. On the one hand, the documentation of the material which remains *in situ* was performed at the site by mapping, photography, and video, and on the other hand, the objects recovered by the museum between 2015 and 2017 have been exhaustively documented at different points; while in their original position

underwater, on being extracted, before, during, and after the conservation and restoration treatment, and, finally, with a studio photo and archaeological drawing (**Fig. 16**). In addition, in case of the two Renaissance culverins, a 3D digitalized model has been created by the technicians at the Technological Research Assistance Service[23] (SAIT) department of the Polytechnic University of Cartagena (Region of Murcia, Spain). These models open various possibilities regarding the culverins: the state of conservation and various alterations can be mapped, an exhaustive analysis can be made of their dimensions, technical characteristics and construction, and it is possible to create holograms and scale reproductions of them.

Scientific Dissemination and Awareness of the Project

Ever since the project began annual reports have been published in order to keep the public abreast of the work being carried. Among these are the reports of the three archaeological campaigns and publications at international underwater archaeology congresses: many of these publications are available online, ensuring that they reach the national and international scientific community.

In addition, to guarantee that the general public is aware of the project and its different phases (court victory, recovery of the looted items and scientific campaigns) numerous activities have been organized, including permanent and temporary exhibitions, conferences, public tributes, publications, concerts and dramatized visits.

The online publications mentioned, along with general information about the project, can be found at the museum website and a microsite of the Ministry of Education, Culture and Sport (Ministerio de Educación, Cultura y Deporte 2014).

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Fig. 1 – Location of the silver tableware set in 2015 campaign
(property of the National Museum of Underwater Archaeology, ARQVA)

Fig. 2 – Progressive excavation of the silver tableware in 2015 campaign
(property of the National Museum of Underwater Archaeology, ARQVA)

Fig. 3 – Extracting a group of silver plates by the ROV (campaign of 2016). In this zenithal snapshot a gold mortar is discovered and other silver objects are documented – crockery and cutlery, candelabra, coins (property of the National Museum of Underwater Archaeology, ARQVA)

Fig. 4 – Location of a semi-buried bronze culverin in 2015 campaign (property of the National Museum of Underwater Archaeology, ARQVA)

Fig. 5 – Water jet with a new elbow-jointed extension that facilities excavating under the muzzle of the culverin during 2017 campaign (property of the National Museum of Underwater Archaeology, ARQVA)

Fig. 6 – Arrival of one of the culverins to the oceanographic ship (campaign of 2017). On the deck, a bed of polyethylene foam on a flexible structure was prepared in order to guarantee an adequate safety of the cannon (property of the National Museum of Underwater Archaeology, ARQVA)

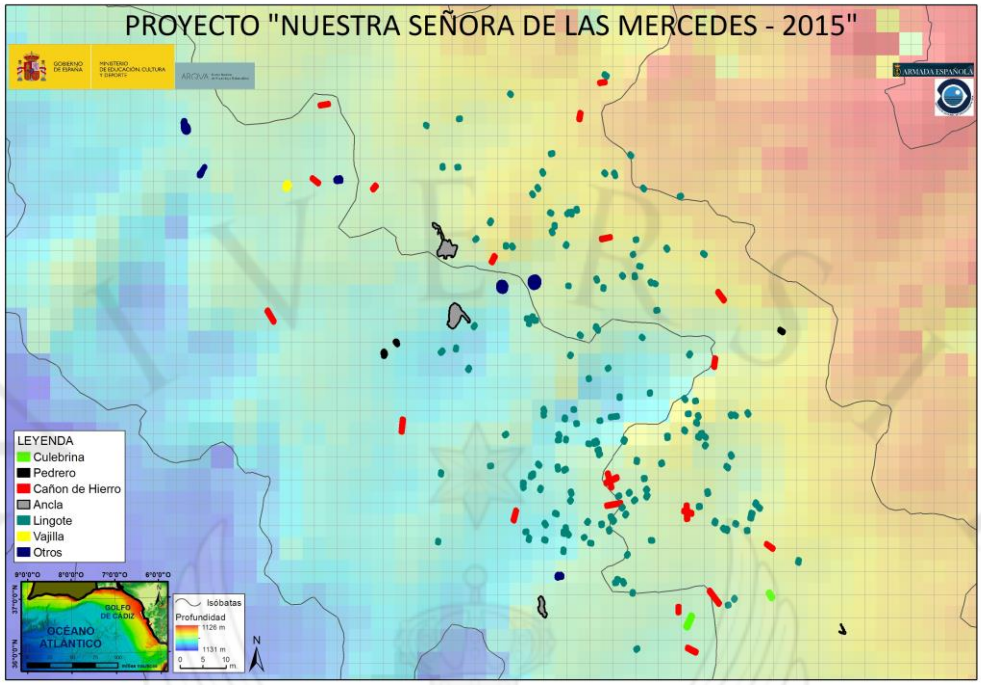
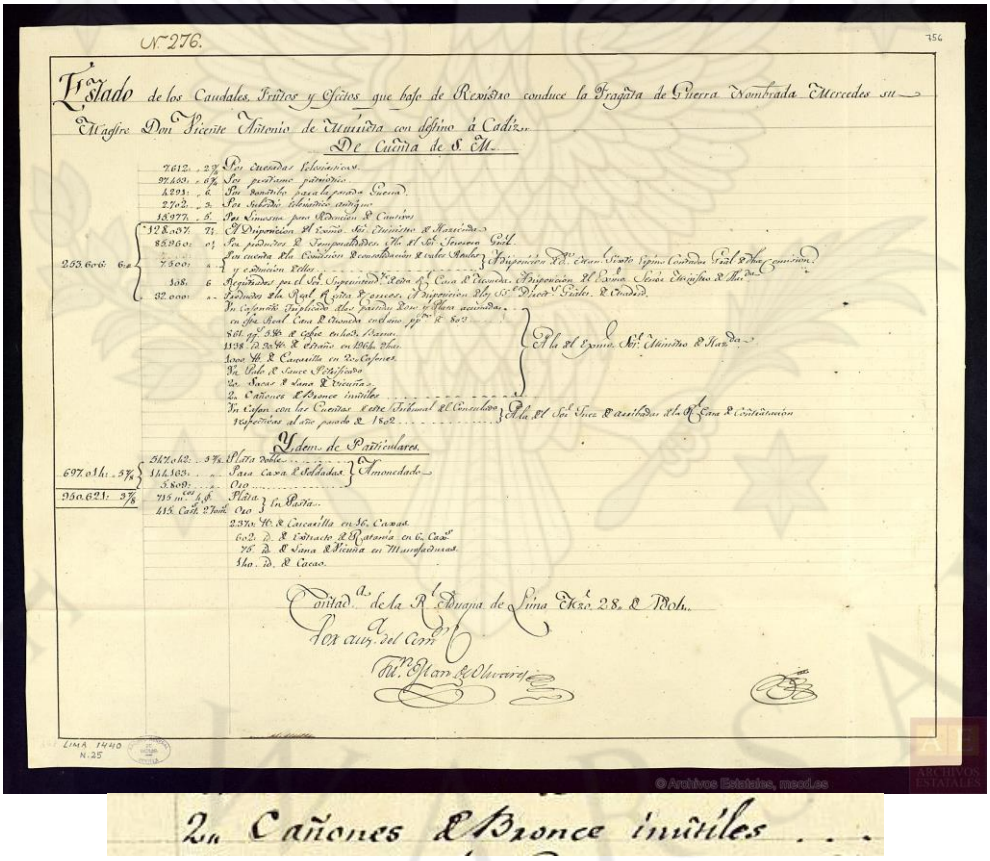


Fig. 7 – General map showing the location, dispersion and distribution of the artefacts on the shipwreck site (property of the National Museum of Underwater Archaeology, ARQVA)



2n Cañones de Bronce inútiles . . .

Fig. 8.1 – "State of the Wealth, Fruit and Effects which, under register, are carried by the war frigate named Mercedes captained by Don Vicente Antonio de Murrieta and sailing for Cádiz" (Andalusia, Spain).
8.2 Detail of previous document: "*dos cañones de bronce inútiles*" ["*two worthless bronze cannons*"] (Spain, the Ministry of Culture and Sport, General Archives of the Indies, Lima, 1440, no. 25)

Fig. 9 – Panoramic photography of the *Santa Bárbara* culverin
(property of the National Museum of Underwater Archaeology, ARQVA)

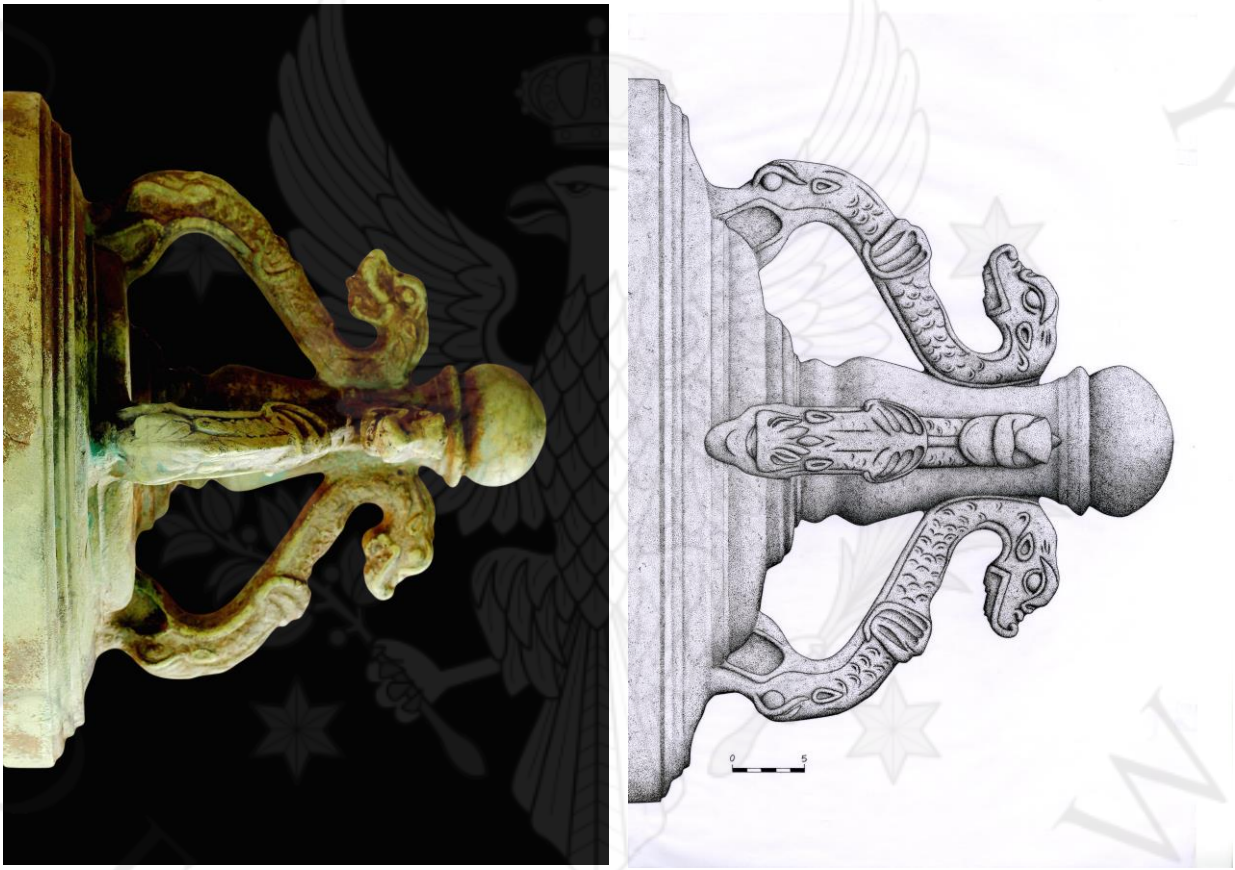


Fig. 10 – *Santa Barbara* cannon's cascabel, richly decorated with four double animal's head
(property of the National Museum of Underwater Archaeology, ARQVA)

Fig. 11 – Shield with inscription, indicating who ordered the manufacture of the *Santa Barbara* culverin: the Count of *Villar Dompardo* (property of the National Museum of Underwater Archaeology, ARQVA)

Fig. 12 – Panoramic photography of the *Santa Rufina* culverin (property of the National Museum of Underwater Archaeology, ARQVA)

Fig. 13 – Coat of arms of the Viceroy *Don Luis de Velasco y Castilla* and the name of the culverin (property of the National Museum of Underwater Archaeology, ARQVA)

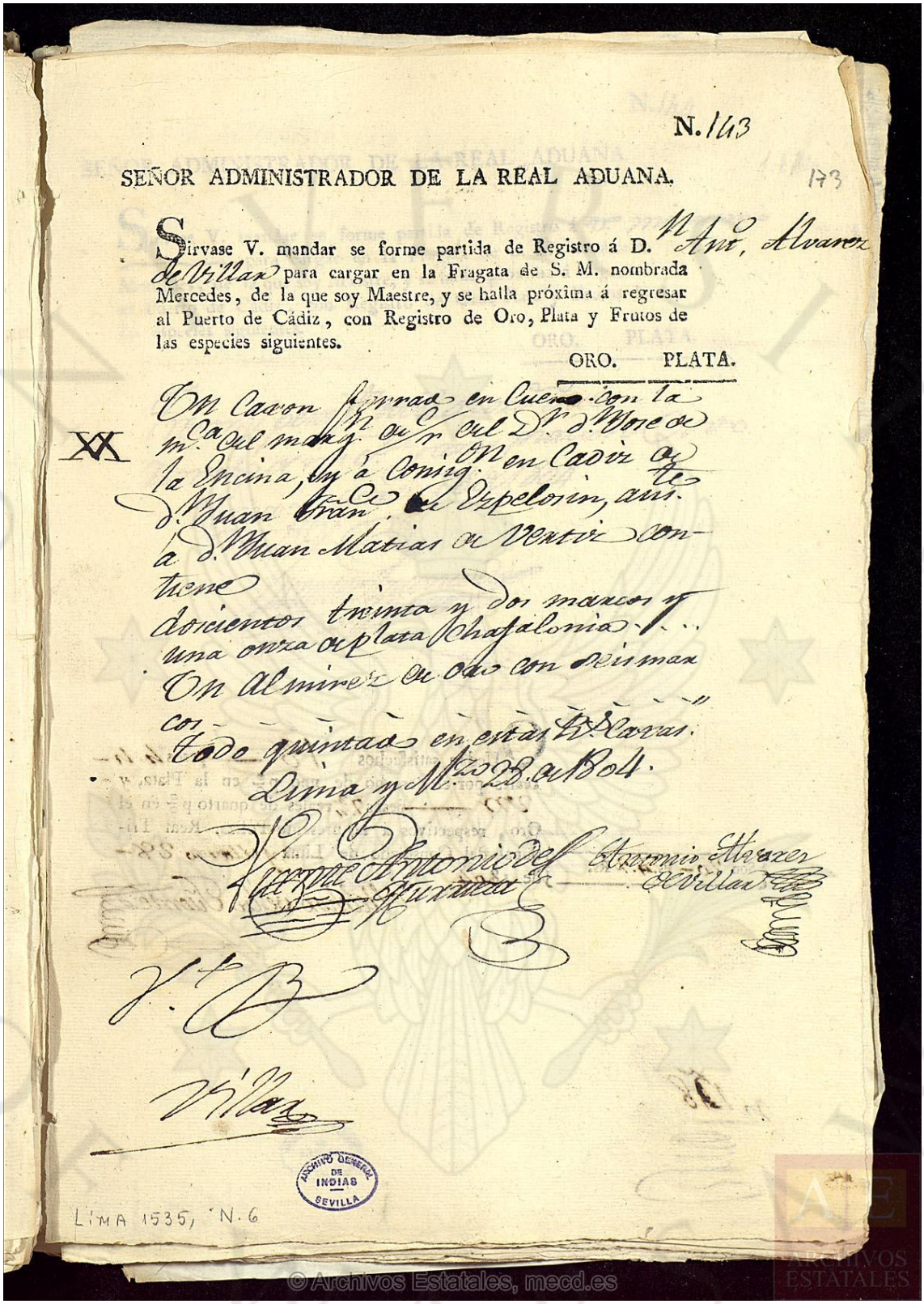


Fig. 14 – Document of the General Archive of the Indies that included details of a private shipment and its contents: a leather lined drawer containing scrap silver and a god mortar (Spain, the Ministry of Culture and Sport, General Archive of the Indies, Lima, 1535, no. 6, folio 173)

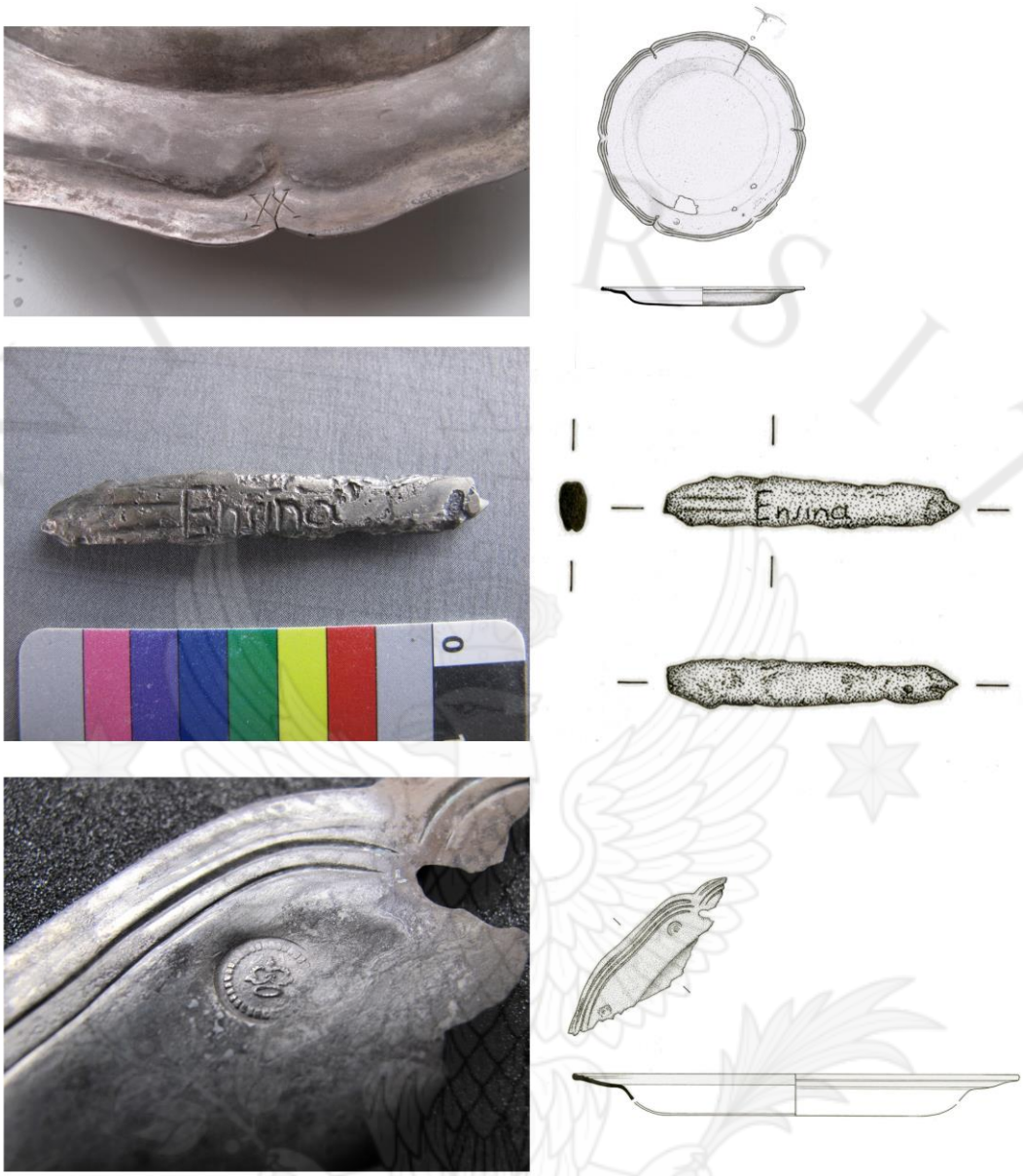


Fig. 15 – Marks cited in the General Archive of the Indies document and identified on the objects recovered in 2015–2016: *XX*, *Encina* and *quinto real*, the seal of the royal fifth tax (property of the National Museum of Underwater Archaeology, ARQVA)

Fig. 16 – Photographic documentation and dotwork archaeological drawings of a silver candlestick and fork, and a gold mortar with its pestle, after finishing its conservation and restoration process (property of the National Museum of Underwater Archaeology, ARQVA)

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