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Índice

Examples of extraction of ancient shipwrecks in France, Italy and Croatia

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Abstract: The recovery of shipwrecks is an extraordinary opportunity to deepen our knowledge of ancient shipbuilding and the history of technology, and all the more so if the shipwreck is dismantled.

Recovery and consolidation through adapted conservation processes of wooden elements represent the beginning of a new life for the wreck, which becomes an exceptional artefact with its own requirements in order to be conserved and displayed in the best way. For all these reasons, a fruitful dialogue between archaeologists, restorers and museum curators is one of the secrets of success in such complex operations.

This article discusses this issue through examples of the extraction of ancient shipwrecks discovered in France (Marseille), Italy (Naples) and Croatia (Pula).

Keywords: Ancient shipbuilding, Mediterranean, shipwreck recovery, wood conservation

Resumen: La recuperación de pecios es una oportunidad extraordinaria para profundizar en el conocimiento sobre la construcción naval antigua y la historia de la tecnología, más aún si el pecio está desmantelado.

La recuperación y consolidación de elementos de madera mediante procesos de conservación adaptados representan el comienzo de una nueva vida para el pecio, que se convierte en un artefacto excepcional con sus propios requisitos para ser conservado y expuesto de la mejor manera posible. Por ello, contar con un diálogo fructífero entre arqueólogos, restauradores y conservadores de museos, no solo es indispensable, sino que constituye uno de los secretos del éxito en operaciones tan complejas.

Este artículo analiza esta cuestión a través de ejemplos de extracción de pecios antiguos descubiertos en Francia (Marsella), Italia (Nápoles) y Croacia (Pula).

Palabras clave: Construcción naval antigua, Mediterráneo, recuperación de pecios, conservación de madera

The recovery of an ancient shipwreck is a long process with far-reaching consequences. The decision to recover such an artefact is mainly linked to two interconnected factors: the historical, cultural and heritage importance of the wreck on the one hand, and the threats that could lead to its destruction on the other.

In the case of archaeological excavations prior to the construction of major urban infrastructures, as was the case in Marseille (France), Naples (Italy) and Pula (Croatia), the decision to

recover the remains of ancient ships was almost an obligation. The development project can rarely be modified and, in most cases, the works involve the destruction of archaeological remains.

There is also the case of a museum which, in order to enrich its collections with the remains of a ship that can illustrate the nautical aspects of an ancient society, decides to take all the steps leading to the recovery of a wreck, as was the case with the Zambratija wreck (Croatia) dated to the end of the Bronze Age. This includes not only the ability to raise the necessary funds for such an operation, but also to follow a process involving several important stages and different specialists.

It is also important to emphasise that the scientific study carried out by the nautical archaeologists will provide essential documentation and information about the vessel, which will serve as a basis for any future hypotheses about reconstructing the original shape, structure and technical system (propulsion and steering components).

The study is also a necessary guide for choosing the best recovery and conservation procedures. It will indicate the preserved dimensions of the vessel and its components (data needed to calculate the weight and volume of the waterlogged wood), the degree of deformation and damage, such as the presence of fractures in the structures. Finally, the study could reveal the presence of particular elements that might pose problems for long-term conservation in a museum, such as iron nails. Dialogue between archaeologists, conservators and curators is particularly important throughout the entire process, from recovery to display.

This article will attempt to illustrate these aspects through a few examples. The first is the recovery of the famous Archaic-era Greek shipwrecks found in Marseille's Place Jules-Verne, an operation led and followed step-by-step from excavation to exhibition by Patrice Pomey and his team from the Centre Camille Jullian. Other examples are drawn from the author's personal experience in Italy and Croatia.

Marseille

During the excavations at Place Jules-Verne in Marseille, carried out from August 1992 to October 1993 in the immediate vicinity of the *Vieux Port* prior to the construction of a carpark, the remains of seven Archaic Greek and Roman-era ships were discovered (Pomey, 1995). The two Archaic Greek wrecks, Jules-Verne 7 and 9, were the most important discoveries.

Abandoned near the shore towards the end of the 6th century BC, they are both ships built around the middle of that century by the second generation of Greek settlers from Phocaea, who founded *Massalia*-Marseille around 600 BC. These wrecks, therefore, bear witness to the Archaic Greek shipbuilding techniques used in Phocaea and the Aegean Sea that the Greek settlers brought with them to Marseilles (Pomey and Boetto, 2019, p. 25).

While lying in the same archaeological context, the remains correspond to two different boats. The smaller wreck, Jules-Verne 9, is a coaster of about 10 m in length, which served for light transport and fishing for coral (Pomey, 2000). It has the particularity of being fully assembled by stitching (Pomey and Boetto, 2019, p. 24-26). After the full digital reconstruction of the original boat, a sailing replica, *Gyptis*, was built (Pomey, 2014, 2017; Pomey and Poveda, 2017, 2018). The larger wreck, Jules-Verne 7, with a preserved length of 13 m, is that of a small sailing merchant vessel, originally about 15 m long (Pomey, 2003, p. 60-63; Poveda, 2012, p. 383-428). Its construction corresponds to the technical transition that marks the adoption of mortise-and-tenon fasteners in Greek shipbuilding, which had traditionally used ligatures as the assembly technique (Pomey, 1997, 2010; Pomey and Boetto, 2019, p. 28-30).

Figure 1. The shipwreck Jules-Verne 9 in the Marseille History Museum. Photo: T. Seguin.

Due to their exceptional interest, the two wrecks, Jules-Verne 7 and 9, were preserved for public display. They were recovered at the end of the excavation and sent to the ARC-Nucléart laboratory in Grenoble for conservation and restoration (Bernard-Maugiron, 2007). Jules Verne 9, preserved over 5 m in length and 1 m in width, was recovered in two ensembles, one side having been detached from the other along the longitudinal axis of the keel. During excavation, wooden moulds were made to support the remains of the hull in preparation for extraction. In Grenoble, before conservation treatment using polyethylene glycol (PEG) impregnation, these moulds were replaced by a stainless-steel frame. The dimensions of each part of the Jules-Verne 9 were adapted to the dimensions of the freeze dryer, whose diameter is limited to 1 m.

Jules-Verne 7 was recovered in five large ensembles, given the fractures evident on the wreck. The dimensions of each piece led the restorers to opt for spraying the wood with increasing concentrations of PEG. This treatment was followed by drying in a controlled atmosphere. The spray treatment lasted two years and the drying one year.

After treatment, both wrecks required extensive surface cleaning to remove the excess PEG, followed by restoration. Since 2013, the Jules-Verne 7 and 9 wrecks have been on display at the Marseille History Museum. Jules-Verne 9 is presented on a frame suggesting the original reconstructed shape of the boat [Figure 1], while Jules-Verne 7 is presented as it was found.

Naples

The archaeological excavation undertaken in Naples before the construction of the city's metro lines 1 and 6 provided a unique opportunity to explore the ancient Neapolitan coastal landscape (Giampaola, Carsana, Boetto *et al.* 2005). Besides the discovery of impressive port infrastructure, these investigations revealed evidence of seven vessels dating back to the Hellenistic era and to the Roman Empire.

Between 2003 and 2004, the remains of three vessels (Napoli A, B and C) were discovered in the station of Metro Line 1 in Piazza Municipio [Figure 2]. Napoli A and C were abandoned at the end of the 1st century AD, while Napoli B and its cargo of lime and stones, was wrecked at the end of the 2nd-beginning of the 3rd century AD. Napoli A and B correspond to transport vessels (Giampaola, Carsana, Boetto *et al*., 2005, p. 63-76; Poveda, 2012, p. 95-198; Boetto and Poveda, 2018), while Napoli C is a transom bow ship used for harbour service, identified as a *horeia*-type vessel (Boetto, 2009; Boetto and Poveda, 2014; Poveda, 2012, p. 203-296).

Ten years later, a fourth wreck (Napoli E) was uncovered in the passageway (Area 4) connecting the stations of Lines 1 and 6 to the modern touristic harbour (Stazione Marittima). This wreck is dated to the Hellenistic era (2nd century BC). At the end of the year 2014, another wreck was discovered (Napoli F), while two others wrecks (Napoli G and H) and a wooden anchor were uncovered the following year. Napoli H is dated to the 2nd century BC, and Napoli F and G are dated between the end of the 2nd and the beginning of the 3rd century AD (Boetto, Poveda and Zazzaro, 2021).

The seven wrecks were recovered using different methods. Napoli A and C, with a preserved length of around 12 m and 13 m respectively and with very limited distortion of the longitudinal and transverse sections, were recovered in one piece using a variant of the «fibreglass shell» method promoted by the Italian Ministry of Culture. In Comacchio (Meucci and Berti, 1997), Ravenna (Maioli and Medas, 2001) and Pisa (Camilli, 2002), the fibreglass shell covered the inside and outside of the wrecks, so that the wooden structures were sandwiched between two fibreglass

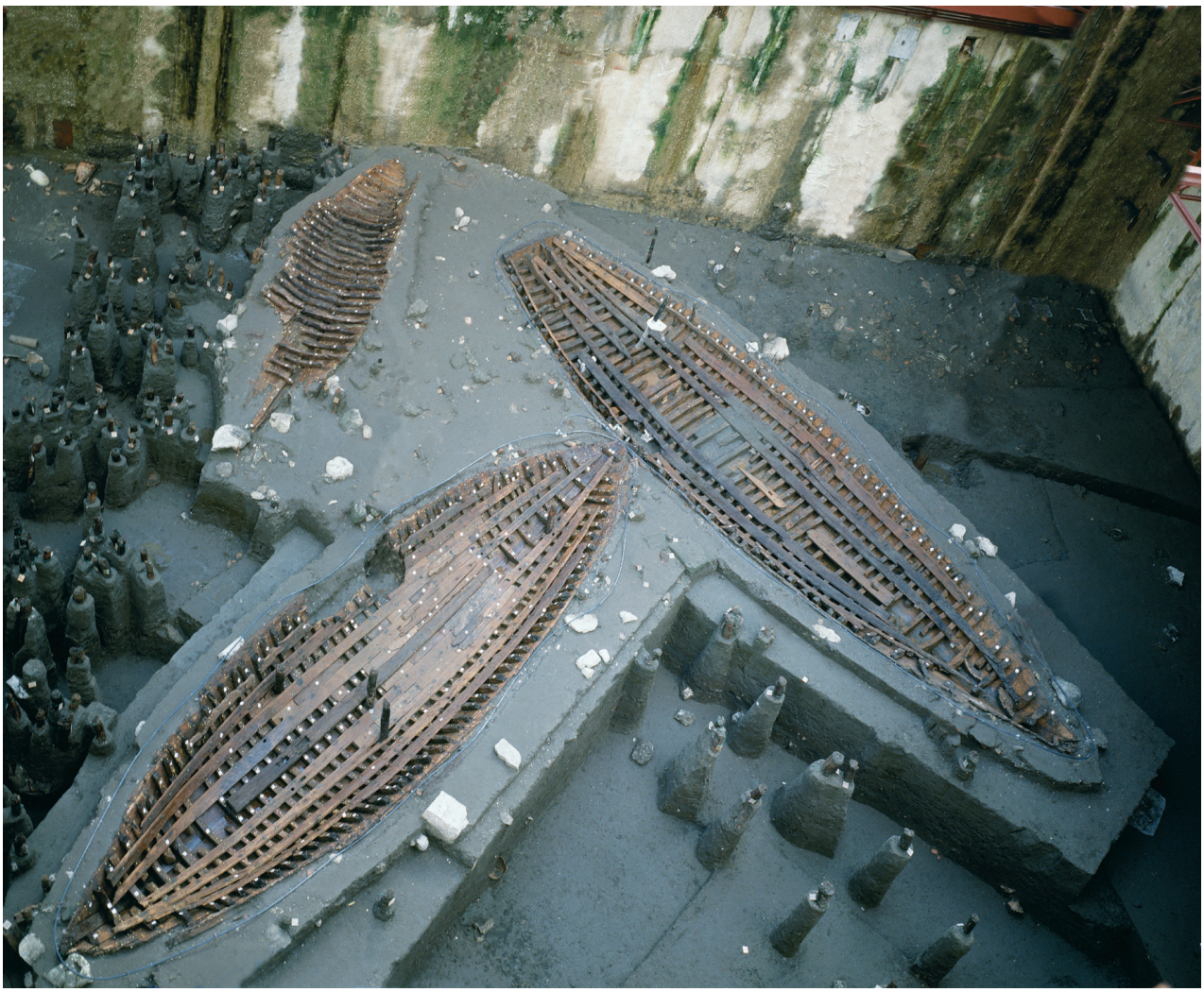

Figure 2. The shipwrecks Napoli A, B and C. Photo: G. Avallone, courtesy of Soprintendenza Archeologia Belle Arti e Paesaggio del comune di Napoli.

shells. The idea was to use this structure also during the conservation treatment: the PEG would circulate in the space between the double fibreglass shells to impregnate the wood.

In Naples, after excavating the layers inside the wrecks, the internal ceiling was partially dismantled in order to clean the room-and-space between the frames and to study the ship structure. Heavy metal scaffoldings were built around the wooden remains and the underlying sediments (Giampaola, Carsana, Boetto *et al.*, 2005, p. 76-82). These solid structures had to support not only the weight of the fibreglass shells and the waterlogged wood, but also the weight of the PEG during the conservation treatment. This system enabled the archaeologists to dig underneath the shipwrecks in order to examine and fully document the outside of the preserved bottom of the hulls [Figure 3]. In this way, a number of different repairs, testifying to the long life of the ships, were revealed.

Twenty years later, Napoli A and C are still preserved in a depository of the Archaeological Superintendency of Naples, encased in the metal scaffolding and the fibreglass shells. The fiberglass shells are filled with fresh water to assure the preservation of the wood, but the conservation treatment has not yet begun. Napoli B and the four wrecks discovered in 2014-2015 have been dismantled and are also preserved in fresh water. Only Napoli E, with a maximum conserved length of 1.5 m, was consolidated using PEG and then freeze dried by the Istituto Centrale per il Restauro (Rome).

Figure 3. The fiberglass shell under construction on the prow of Napoli C shipwreck. Photo: G. Boetto, CNRS/CCJ.

Pula

In 2013, during excavations prior to the construction of rainwater and sewage collectors in Flacius Street, Pula, two Roman sewn ships, Pula 1 and 2, were found. Abandoned in the harbour at the end of the 2nd-beginning of the 3rd century AD, both ships were built around the second and the third quarter of the 2nd century AD (Boetto, Koncani Uhač and Uhač, 2017, p. 192-196).

While lying in the same archaeological context, the remains correspond to two different ships. The smaller wreck, Pula 2, is a coaster of about 9 m in length, which served for light transport and fishing. The larger wreck, Pula 1, is a sailing merchant vessel of about 15-17 m long. The planking is sewn, but in two different ways: Pula 2 has simple overedge stitches (/// pattern), while the sewing of Pula 1 is more elaborate and made of overedge stitches with a clamping turn (/I/I/I pattern). These wrecks belong to the north-eastern Adriatic or Istro-Liburnian sewn-boat tradition dating back at least to the Late Bronze Age, as the Zambratija wreck, discussed later in this article, testifies (Pomey and Boetto, 2019, p. 10-12). This tradition survived until the Roman era in Istria and Dalmatia.

The salvage operation started on the smaller of the two vessels, Pula 2 (Koncani Uhač, Petrović and Sardoz, 2017). After the recovery of the frames that were not in their original position, the planking, which lay flat and badly damaged, was retrieved in sections in accordance with some visible breaks in the hull [Figure 4]. Pula 1 was recovered in one piece using transversal moulds adapted to the profile of the wreck and fixed to a metal frame.

Figure 4. Recovery of Pula 2. In the foreground Pula 1. Photo: T. Braiković, Archaeological Museum of Istria.

After being stored in a tank of fresh water, Pula 1 and 2 were sent to the ARC-Nucléart laboratory for conservation by PEG/freeze drying. It is important to underline that, due to the dimensions of the freeze drier, Pula 1 had to be dismantled into two major parts not larger than 3 m. Currently, both the treated shipwrecks are stored in boxes awaiting future display in Pula.

Zambratija

The earliest evidence of the Adriatic sewn-boat traditions is provided by the Zambratija wreck (Umag, Croatia), which was reported to the Archaeological Museum of Istria in 2008, assessed in 2008-2010, and excavated in 2011 and 2013. The wreck, found empty and without cargo, is dated between the last quarter of the 12th and the last quarter of the 10th century BC. The preserved part of the boat is 6.7 m long and 1.6 m wide, and the reconstructed length around 10 m. Zambratija is a fully sewn boat: the sewing of the planking is made up of simple overedge vegetal stitches (/// pattern) and the frames are lashed to the planking (Koncani Uhač, Boetto and Uhač, 2019; Pomey and Boetto 2019, p. 8-10).

Because of its exceptional interest, the Archaeological Museum of Istria decided to recover the Zambratija wreck in July 2023 and exhibit it to the public in a future museum that will also house the Pula wrecks. It has also been decided that the museum will continue working with the ARC-Nucléart laboratory to preserve the wreck by PEG impregnation followed by freeze drying. Given the costs involved in recovering the wreck in one piece, the technical difficulties of such an operation, and the size of the freeze dryers available in Grenoble, it was decided to recover the wreck in several pieces.

Recovery of the three floor beams posed no particular problem, as the stitches connecting them to the planking were not preserved. However, a specific method was developed by Pierre Poveda (CNRS, Centre Camille Jullian) in order to recover the planking. Custom-made supports were designed for the planking, which consisted of eight strakes. The plan was to recover the longest strake, the keel plank, around 7 m long, in three sections, most of the other strakes in two sections, and the two smallest in a single piece. The cuts were located at the level of existing breaks or under the floor timbers. In this way, they will be invisible when the wreck is mounted on its support in the museum.

Three-dimensional models of each structure (strakes, frames etc.) were produced using photogrammetry of the wreck and its components that was conducted in 2013. This made it possible to obtain separate moulds adapted to the profile of each section of the strakes. Each mould was made up of a number of separate elements cut directly from PVC panels. The system worked successfully: each composite mould was inserted under the strake and, after securing the wood with Velcro strips, each section was recovered [Figure 5].

Figure 5. Recovery of part of a strake. Photo: L. Damelet, CNRS/CCJ, Adriboats/ Archaeological Museum of Istria.

The operation also included a specific documentation process in a fully equipped storage facility of the Archaeological Museum of Istria. Each section of the wreck was cleaned, scanned, photographed in detail and then turned over to carry out the same steps on the outside. At the same time, a dendroarchaeologist analysed the cross sections to study the morphology of each element and its position in the tree. Tree-ring measurements will be done from photographs taken specifically for this purpose. The elements are currently stored in a tank filled with fresh water. If necessary, further documentation will be carried out in Grenoble where the Zambratija wreck will be transported for conservation treatment.

Conclusion

The examples briefly presented in this article illustrate the different methods used to recover ancient wrecks in the Mediterranean. Each method has been carefully chosen, taking into account a range of constraints.

It should also be emphasised that the scientific study of a wreck is an extraordinary opportunity to deepen our knowledge of ancient shipbuilding and the history of technology, and all the more so if the wreck is dismantled. This is, in a way, a method of preserving the wreck even though recovery of the wooden structure is not possible.

In conclusion, the recovery is only the beginning of a new life for the wreck, which has become an exceptional artefact with its own requirements in order to be conserved and displayed in the best way. A fruitful dialogue between archaeologists, restorers and museum curators is one of the secrets of success in such complex operations.

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