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The 18th century Umm Lajj shipwreck (KSA, Red Sea). The 2022 field season

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Riassunto

Il relitto della nave Umm Lajj del XVIII secolo (KSA, Mar Rosso). La stagione sul campo 2022.

Il relitto di Umm Lajj è finora il relitto meglio conservato nel Mar Rosso. Situato a 16 miglia dalla costa e di fronte a una barriera corallina isolata, è testimone del commercio intorno al Mar Rosso settentrionale e meridionale, insieme all'Oceano Indiano orientale nel XVIII secolo. Le prime indagini sono state condotte nel 2015 e nel 2016 da un team del Ministero della Cultura dell'Arabia Saudita (MoC) e dell'Università di Napoli L'Orientale e si sono concentrate sul rilevamento dell'area e sulla documentazione dei materiali visibili sulla superficie del fondale marino. La ricerca è ripresa nel 2022 con un team allargato: il relitto di Umm Lajj è stato scavato per la prima volta e vari tipi di reperti sono stati portati in superficie per essere studiati. Questo articolo riassume i risultati preliminari della campagna 2022.

Parole chiave: Mar Rosso, naufragio, Umm Lajj, archeologia subacquea, porcellana cinese.

Abstract

As of now, the Umm Lajj shipwreck is the best-preserved shipwreck in the Red Sea. Located 16 miles off the coast and facing an isolated coral reef, it bears witness to the trading around the northern and the southern Red Sea, with the eastern Indian Ocean in the 18th century. The first investigations were conducted in 2015 and 2016 by a team of the Saudi Arabian Ministry of Culture (MoC) and the University of Naples L'Orientale and focused on surveying the area and documenting the materials visible on the seabed surface. Research resumed in 2022 with an enlarged team and the Umm Lajj shipwreck was excavated for the first time and various types of finds were brought to the surface for study. This article summarizes the preliminary results of the 2022 field season.

Keywords: Red Sea, shipwreck, Umm Lajj, underwater archaeology, Chinese porcelain.

1. Introduction

The Umm Lajj shipwreck lies some 20-23 m east of an isolated reef extending around 1 km north-east to southwest, located between the Shaybārā (Sheibara) reef and the island of al-Hassānī, 16 miles from the city of Umm Lajj on the Saudi coast of the Red Sea (*fig.* 1). This area comprises several groups of continuous or scattered reefs. Navigating this section of the Red Sea requires good experience and knowledge of the wind patterns and the coral reefs that still provide shelter for the boats.

Along with other two shipwrecks previously excavated in the Red Sea, the Sharm el Sheik (Raban 1971) and the Sadana Island (Ward 2000, 2001, 2002), the Umm Lajj shipwreck has been identified as a merchantman of the 18th-century which sailed up and down the Red Sea with food provisions from Ottoman Egypt to Mecca and returned with locally produced jars, Chinese porcelain and exotic products from the Indian Ocean acquired in the ports of Jeddah and Mocha (*fig.* 2) (Zazzaro, Loreto, Visconti 2017).

1.1 *Previous research*

The first two field seasons conducted in 2015 and 2016 focused on surveying the area of the shipwreck to understand its historical and archaeological significance, the wreck formation and the circumstances that caused the wreckage and to evaluate the most suitable areas for a test excavation. This excavation was the object of the 2022 field season, when investigations on the shipwreck were resumed after six years.

In the 2015 field season the team mapped the coral reef, georeferenced the position of the shipwreck and conducted its first 3D photogrammetry of the site. This season revealed the orientation of the ship, north-west south-east, with the bow facing the coral reef. The ship may have hit the reef, either as it was under sail or in a storm while

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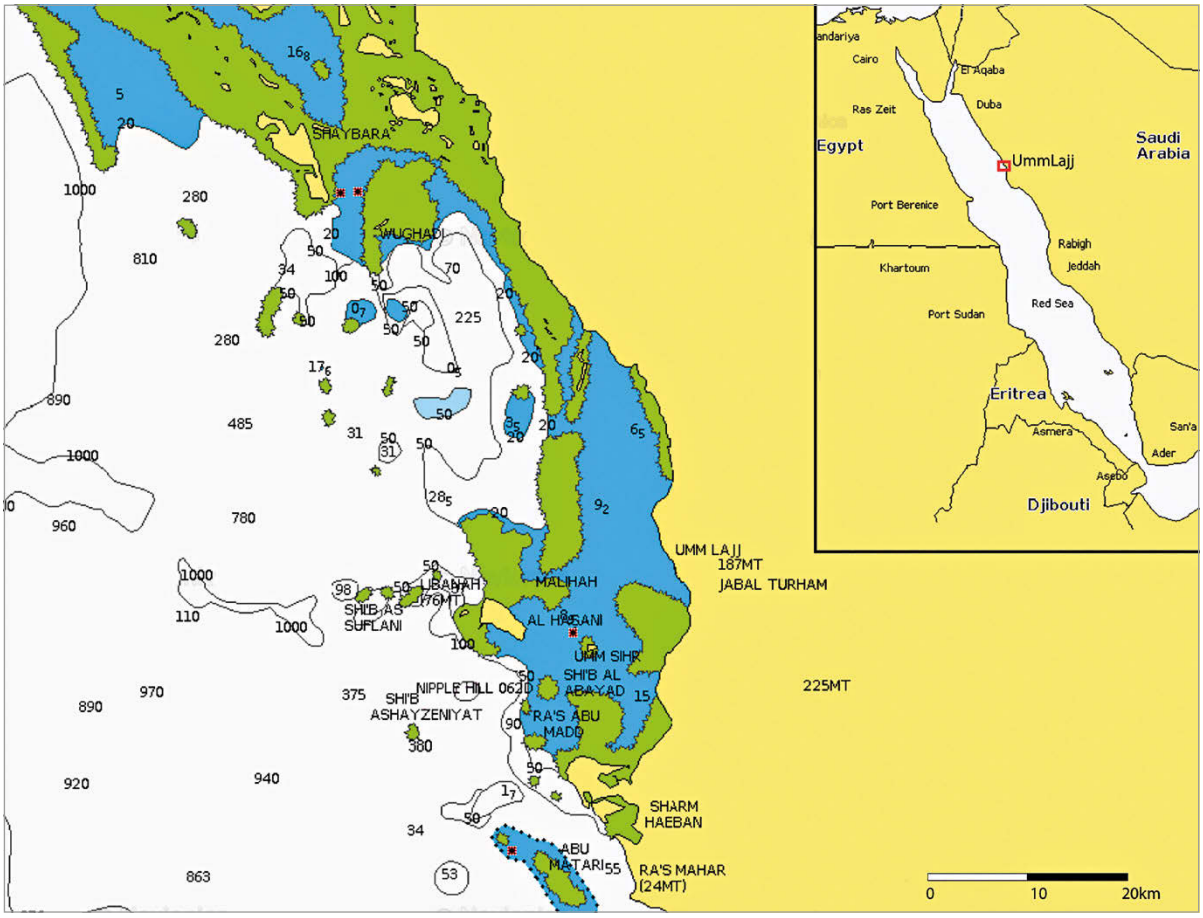

fig. 1 – Image showing the location of the shipwreck on the nautical chart; A: the reef in front of which the shipwreck lays; B: the illustration made by a diving center showing the location of the reef and the shipwreck (Chiara Zazzaro).

at anchor. The ship is likely to have at first sunk on its port side, considering that frames from the starboard side were found embedded in the corals, while those on the port side were not visible, and were covered by sand sediment. Most of the cargo escaped from this side and subsequently spread (Zazzaro, Loreto, Cocca 2016; Zazzaro, Loreto, Visconti 2017). To verify this hypothesis in 2016, the team opened a small test trench (1×1m) on the port side aft of the shipwreck and discovered a concentration of Chinese porcelain.
In 2016, the team improved the photogrammetric survey of the site and produced an elevation model. It then focused on the documentation of the cargo located in the stern area of the wreck, a mound, approximately 10 m in diameter, of up to 3000 earthenware jars of various size, shapes and decorations. The mound of jars was carefully cleaned with brushes and the different types of jars were tagged, described, and photographed. A detailed 3D photogrammetry of the mound was then conducted (Zazzaro, Loreto, Cocca 2016; Zazzaro, Loreto, Visconti 2017). Thanks to the high-resolution photogrammetry it was possible to conduct a detailed study of the mound of jars from the 3D model (Terminiello 2018).

C.Z., R.L.

1.2 *The 2022 Field Season*

The 2022 field season was made possible thanks to an agreement between the Saudi Ministry of Culture (MoC), King Abdelaziz University and King Abdullah University of Science and Technology (KAUST). Thus, work on the Umm Lajj shipwreck resumed after six years of interruption.
The team was enlarged to include five archaeologists from the MoC (Mozayen Waleed Badr A., Alsiwan Amar Abdulkarim D., Alhayiti Abdullah Salamah H., Algharni Mahdi Kasif, Altarib Abdulelah Khalaf F.), one from King Abdelaziz University

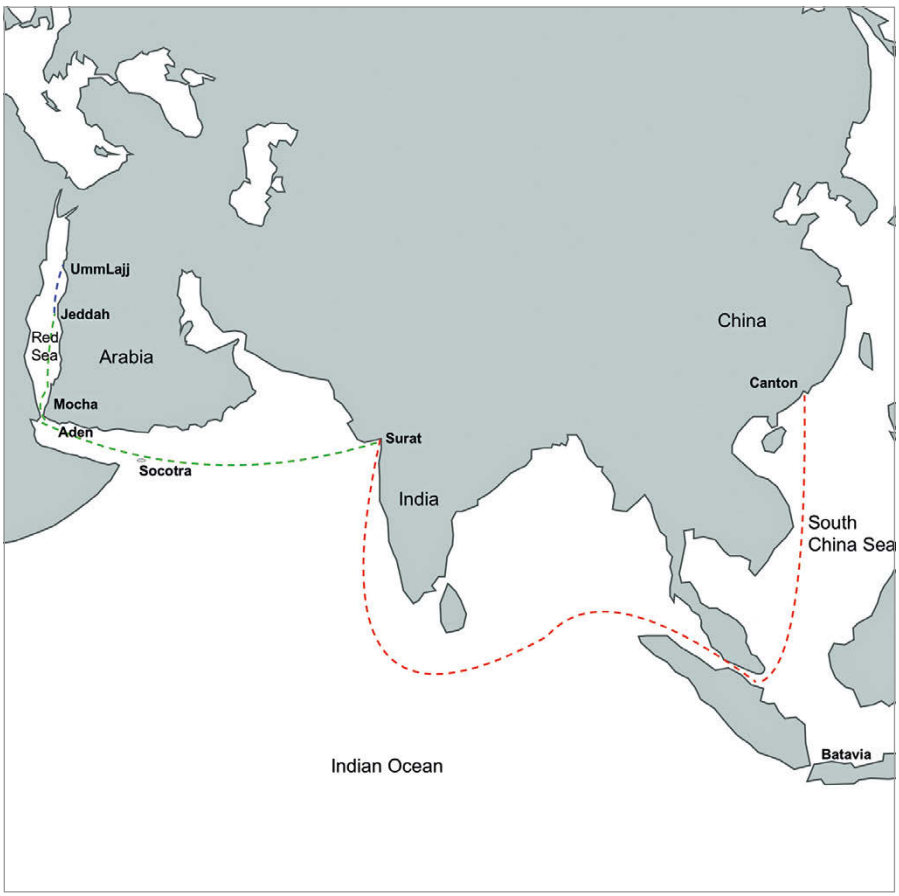

fig. 2 – The possible route of the shipwreck with the Red Sea waters (in blue) and the indirect route of the Chinese porcelain and other exotic products (in green) (Chiara Zazzaro).

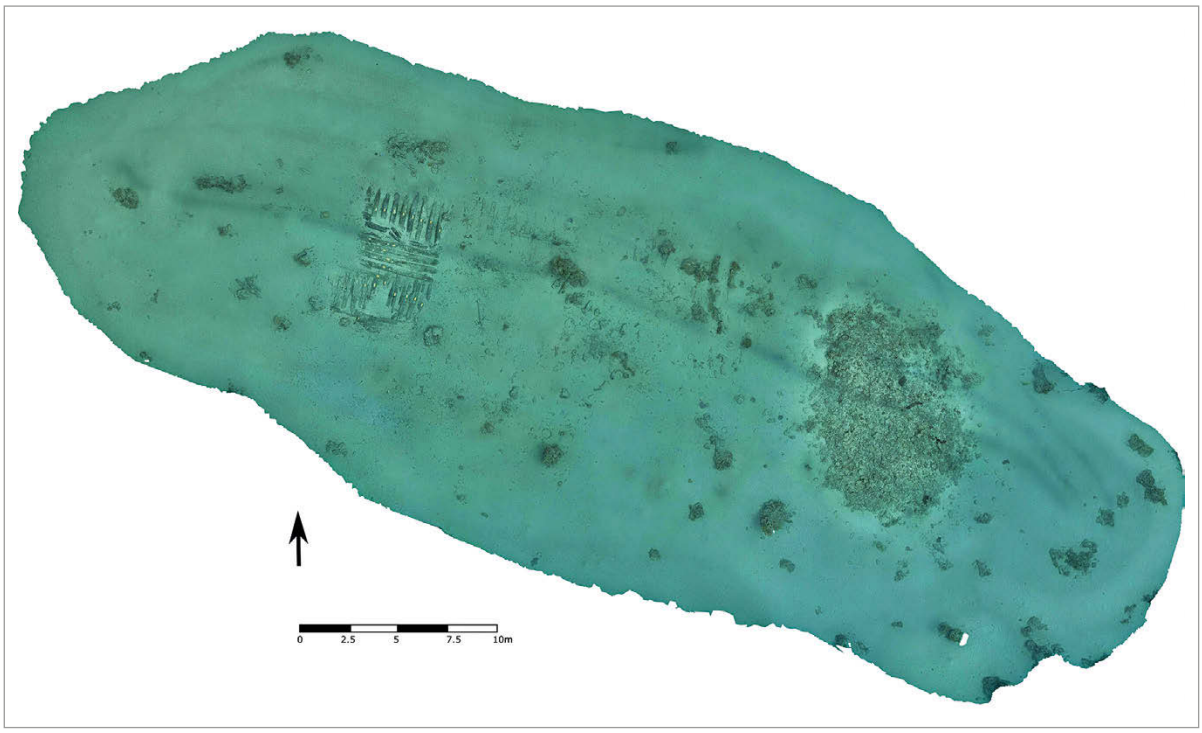

fig. 3 – Orthophoto of the site resulted from the photogrammetry (Mohamed Said Younis Ibrahim Salam).

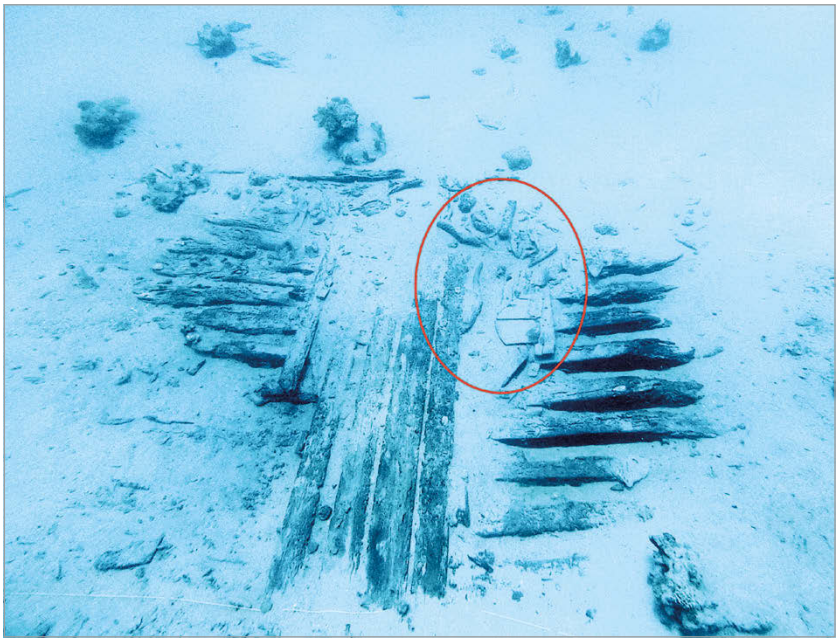

fig. 4 – The excavation area with dislocated wood remains appearing during the excavation of the first layer (Chiara Zazzaro, Romolo Loreto).

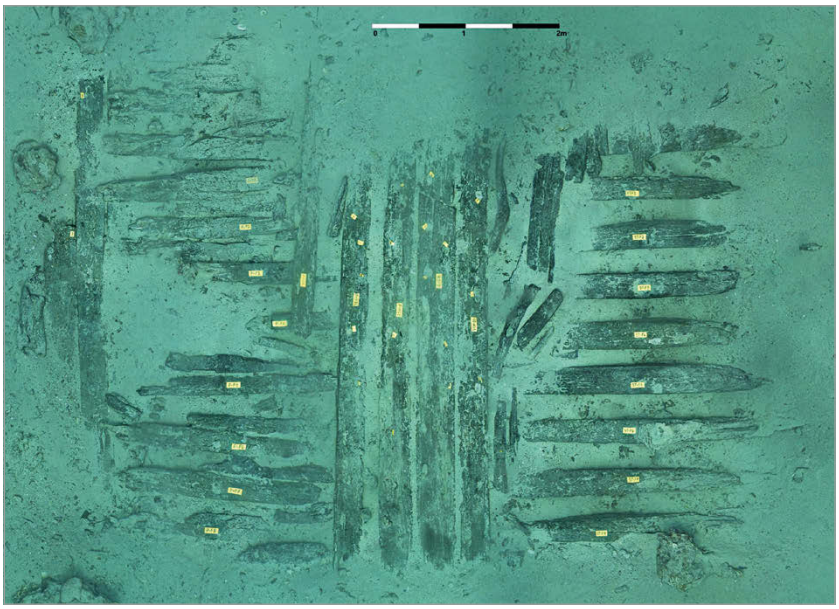

fig. 5 – Detail from the orthophoto showing the ship architecture in the excavated area (Mohamed Said Younis Ibrahim Salama).

(Abdulati Marwan Mohammed M), three from Alexandria University, Egypt (Emad Khalil Helmy Elsaied Khalil, Mohamed Said Younis Ibrahim Salama, Mohamed Ahmed Mohamed Ahmed Khedr), two from L'Orientale University, Napoli (Chiara Zazzaro, Romolo Loreto), and a photographer (Massimo Bicciato). The team was onboard the KAUST Al-Azizi ship from the 19th to the 28th of August[1].

After an examination of the condition of the site, the team opened a trench area of 10 by 4 m in the aft half of the shipwreck on the port side where a test trench had previously been excavated in 2016. The excavation was conducted by hand fanning and using an Airlift. The shipwreck's wooden architecture was covered by a first layer of loose sand

[1] The Al-Azizi ship and the team reached the site in around 35 hours from KAUST marina. The eleven-person crew on board Al-Azizi were: Kryshchuk Oleksiy, Kodithuwakku Kanishka Dias Edirisinghe, Mahairi Saeed Ameen Saeed, Katoshyn Oleksiy, Munasinghe Arachchige Nuwan Nandana Munasinghe, Kareem Elsayed Hamed Hassan Usmail, Hesham Ahmed Hassan Aly, Wahumpurage Lahiru Sandamal, Dolapihillegedara Chamika Anurudda Dolpihilla, Abdekghaffar Mahmoud Abdelmaboud Ahmed, Hengoda Chamod Kavinda De Silva.

(SU 1). This layer included several scattered wood fragments, disconnected from the main structure. Many of them were from the ship's architecture while others may have been part of the ship's superstructure and/or from barrels. These remains were carefully photographed and documented (see the wood artifact section below).
The second layer (SU 2) of sediment was more compact and finer, it extended between the frames and covered the hull planks, both organic and inorganic finds were included in it. Sediment in this layer was sampled for detailed analysis. The excavation of this second layer was not completed due to the high concentration of finds and the lack of time.
New photogrammetric surveys were conducted on the site to document the progress of the investigations (*figs.* 3 and 5).
At the end of the excavation the area was covered and protected by a layer of geotextile held in place by sandbags.

C.Z., R.L., E.K.

1.3 *Underwater excavation methods*

Over the course of the work at the Umm Lajj shipwreck, 134 dives were carried out, in a total of 154 hours. An integral part of the project was training the Saudi team from the MoC on several underwater archaeological techniques including the use of airlift, lifting bags and field conservation. The number of individuals in each diving group varied between 2 and 6 divers, according to the underwater tasks and the experience levels of divers.
Prior to any excavation work, the entire site was recorded using photogrammetry to develop a high-resolution three-dimensional image of the site. The 10×4 m trench was excavated at the aft shipwreck across both the port and starboard sides of the ship. The thick layer of sediment was removed using an airlift powered by a low-pressure compressor installed on the Al-Azizi ship's deck. Hand-fanning was used for finer sediment in association with fragile archaeological material. Archaeological objects were recovered using air-operated lifting bags. Once on the surface, the objects were cleaned, tagged based on their material and stored in water tanks for desalinisation.
Following the excavation, the 40 square metre trench was documented in detail using photogrammetry (*figs.* 3 and 5). 9,800 high-resolution photographs were captured, each image covering an area of ca. 2 m by 2 m, and with an overlap of 80% between each pair of consecutive images. The photographs were processed using Agisoft Metashape software to obtain a digital 3D model of the site. The Accuracy of the final model was up to 3 mm. In order to place the digital model of the site on geographic information systems, a number of reference points were positioned around the ship, in addition to those set in the previous years, which were still in place. The locations of the fixed reference points were determined connecting them to a line going up to the surface and using a GPS. Finally, the excavated area was covered using geotextile sheets secured with sandbags. Upon arrival in Jeddah, some of the finds were packed in water containers and transported to a specialised conservation laboratory in Riyadh.

E.K.

	Sharm el Sheikh (ca. 1730)	Umm Lajj (ca. 1730-1760)	Sadana (ca. 1765)
Hull length	ca. 35 m	ca. 36m	ca. 45 m
System of joint	nails and treenails	nailed	nailed
Frame dimension	ca. 20×20 cm	ca. 18×20 cm	ca. 22×26 cm
Frame spacing	-	ca. 38-55 cm	ca. 47-52 cm
Wood id	*Pinus silvestris* (ceiling planks, keel and frame) *Cupressus sempervirens* (tree-nail inserted in ceiling planks)	*Quercus* sp. (keelsons) *Pinus* sp. (frames)	-

tab. 1 – Comparisons among the construction characteristics of the three shipwrecks.

2. The shipwreck

During the 2015 and 2016 field season the team documented visible remains of the ship's architecture and took 6 wooden samples from the frames and keelsons (*tab.* 1). The architecture and measures of the ship is massive and resulted to be similar with those of the Sadana and Sharm el Sheik shipwrecks, respectively ranging from roughly 35 to 45 m in length (Raban 1971; Ward 2001) (see *tab.* 1). Wood analysis confirmed the use of oak for the keelsons and pine for the frames, both Mediterranean species (Zazzaro, Loreto, Visconti 2017), coherent with analyzed species in the Sharm el Sheik shipwreck (Liphschitz 2011). Both wood species analysis and the architecture suggest an indigenous construction similar to the Mediterranean style.

Starboard frames	Height	Width	Distance between
ST-F1	-	20	44
ST-F2	-	20	43
ST-F3	-	20	43
ST-F4	31	21	40
ST-F5	29	20	43
ST-F6	-	20	45
ST-F7	-	21	43
ST-F8	32	20	44
Port frames	Height	Width	Distance between
P-F1	-	20	38
P-F2	-	19	38
P-F3	-	18	43
P-F4	-	18	55
P-F5	-	15	-
P-F6	-	20	51
P-F7	-	21	41
P-F8	-	22	34
Keelsons	Thickness	Width	
KS-1	-	31	
P-KS1	-	23	
ST-KS1	-	24	

tab. 2 – Measurement of the ship architecture recorded in the excavated area. Each architectural elements with an alphanumeric code (only the frame alignment was named).

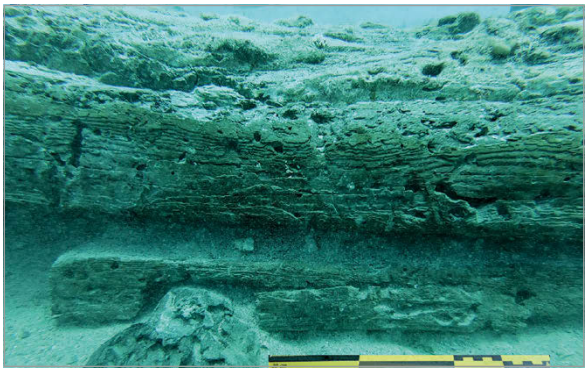

fig. 6 – Detail of the lower stringer notched on the frames (Chiara Zazzaro, Romolo Loreto).

During the 2022 field season the team documented the newly excavated parts of the shipwreck in more detail, tagged, measured and sampled them. The excavated portion is still too limited to permit more precise commentary on the architectural style (*fig.* 5).

2.1 *Observations, measurements and sampling*

The excavation of the first layer revealed many decayed wooden fragments of the ship architecture during and after the process of wreckage formation. At least three planks laying above the keelsons on the starboard side were not elements of the ship architecture. They were likely to be part of the ship furniture, decoration, or remains of barrels due to their shape, fastening and limited thickness (ca. 1.7 cm) (*fig.* 4).

The framing is characterised by floor timbers likely alternated to half frames, futtocks hook-scarfed to the frames and lateral reinforcing. The space between frames, from centre-to-centre, is from 38 to 55 cm. The sizes of the frames range from 32/28×20/18 cm. The central keelson is 31 cm wide and 15 cm thick, the port side sister keelson is 23 cm wide and 15 cm thick, the starboard side sister keelson is 24 cm wide and 15 cm thick. The stringers are ca. 24 cm wide and 4 cm thick. The planks are ca. 26 cm wide and 5 cm thick. Stringers were nailed to the frames with square nails 1×1 cm, as with the planks (*fig.* 5; see also *tab.* 2).

An additional plank was noticed below stringer P-S1A notched on frame P-F5 (*fig.* 6).

Each wooden architectural element was sampled with a knife in a non-visible area and limited in size (max 2×2 cm). Overall, 22 wood samples were collected for future analysis. 16 samples were taken from both port and starboard frames, 2 from the port stringers, 2 from port planks, and 1 from the keelson.

C.Z.

3. The finds

During the excavation, a large quantity of materials was discovered, including porcelain, earthenware, metal artefacts, wooden artefacts, beads and palaeobotanical remains.

Those finds have been classified as cargo items (such as porcelain, jars, coconuts, nutmeg, barrels, glass bottles, pipes), personal items (a spoon, a comb, a button, beads, gun bullet, coins), food consumption for the crew (sheep or goat bones, fish bones, hazelnuts, raisin seeds), and ship equipment/furniture (nails, metal sheets). The finds are described below arranged by material (porcelain, earthenware, wood, metal, beads etc..). Most finds were porcelain cups, either complete or fragmentary, carried as cargo.

3.1 *The porcelain*

During the 2022 excavation campaign, the team uncovered 134 complete or almost complete Chinese porcelain cups and 479 fragments. This assemblage enabled a classification of shapes and decorations and to reconstruct both, which had not always proved possible with the material collected in the previous season (*figs.* 7-9). In addition, an

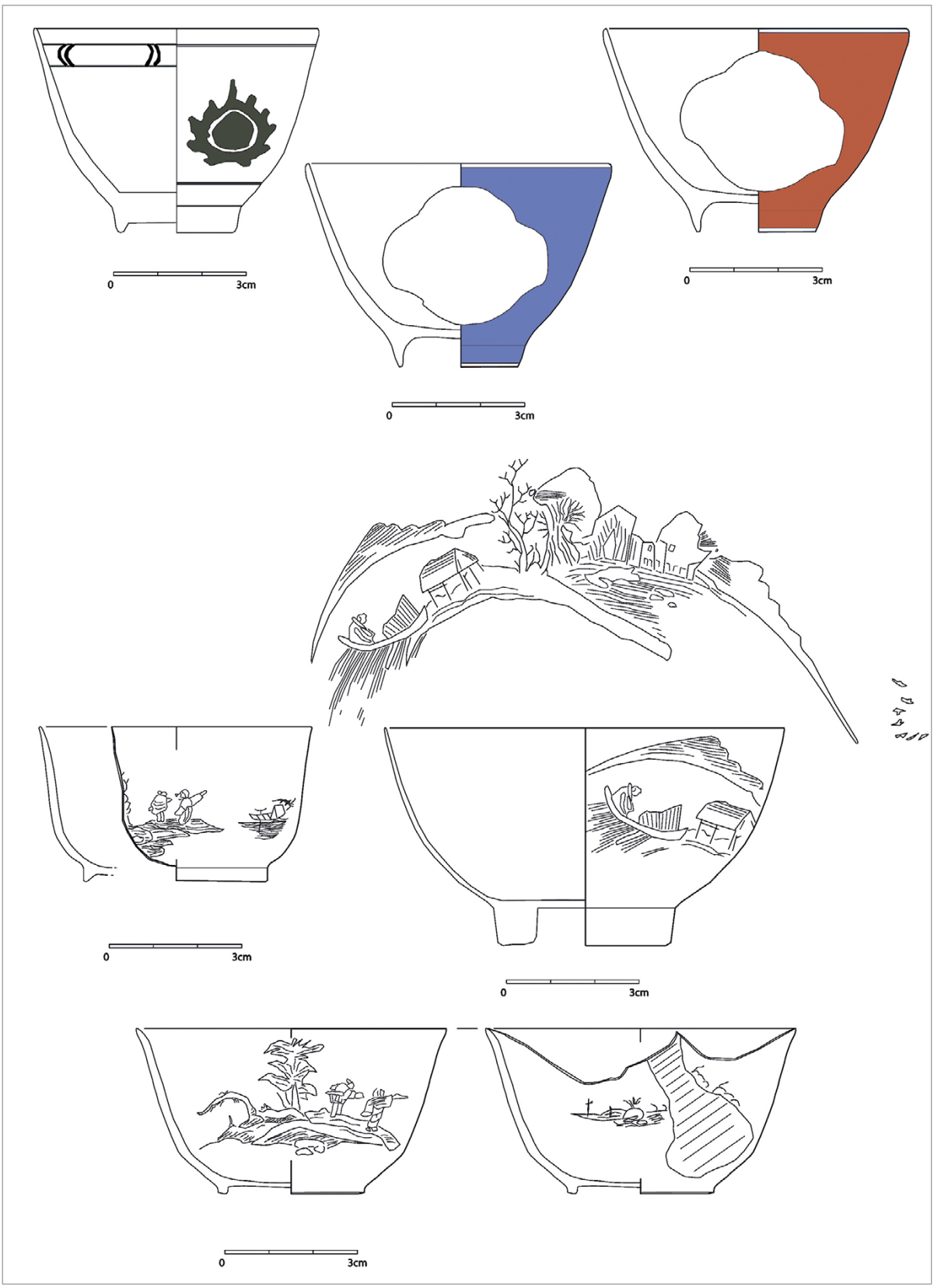

fig. 7 – Reconstruction drawings of selected Chinese porcelain cups and bowl (Romolo Loreto).

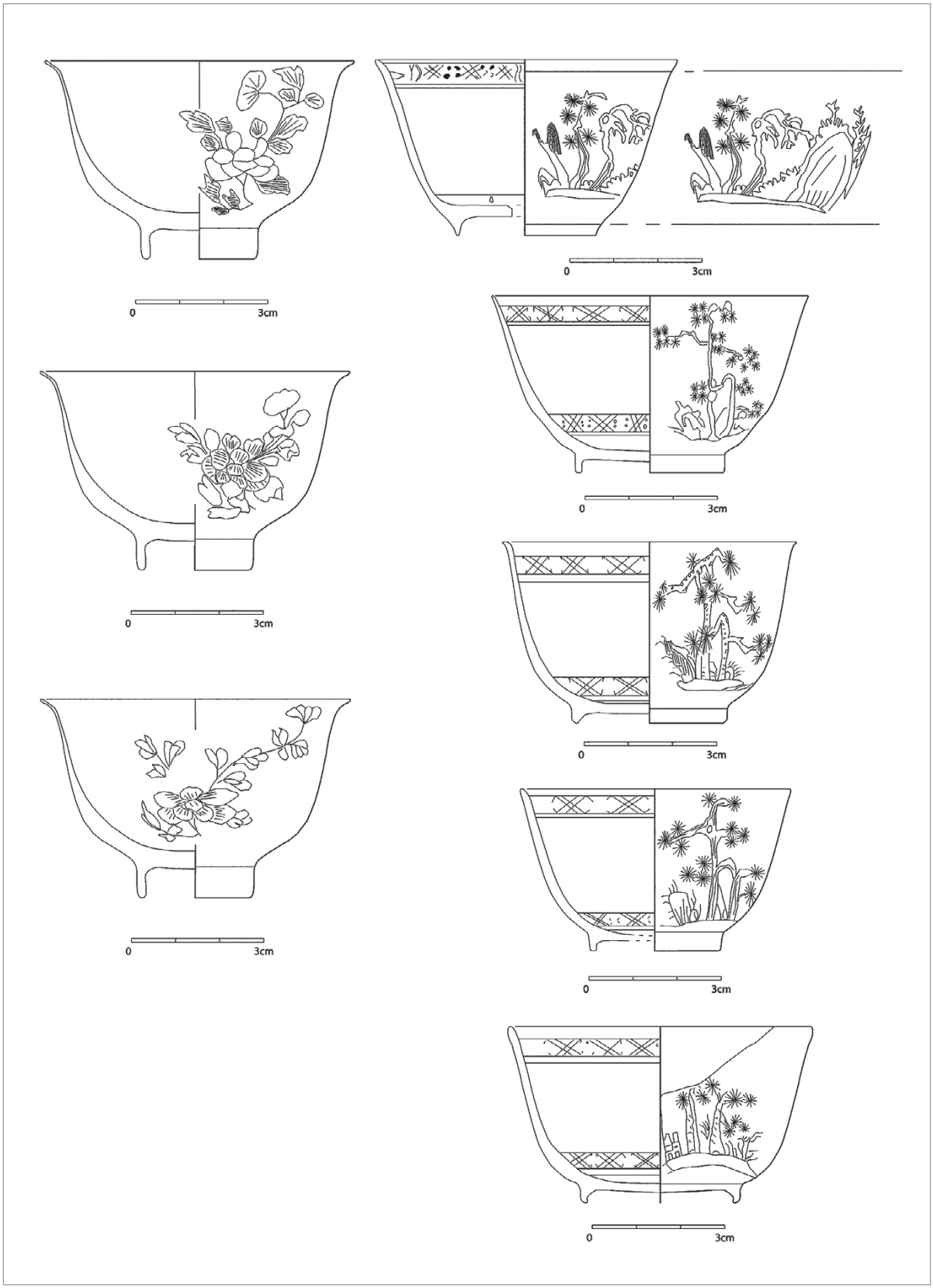

fig. 8 – Reconstruction drawings of selected Chinese porcelain cups and bowls (Romolo Loreto).

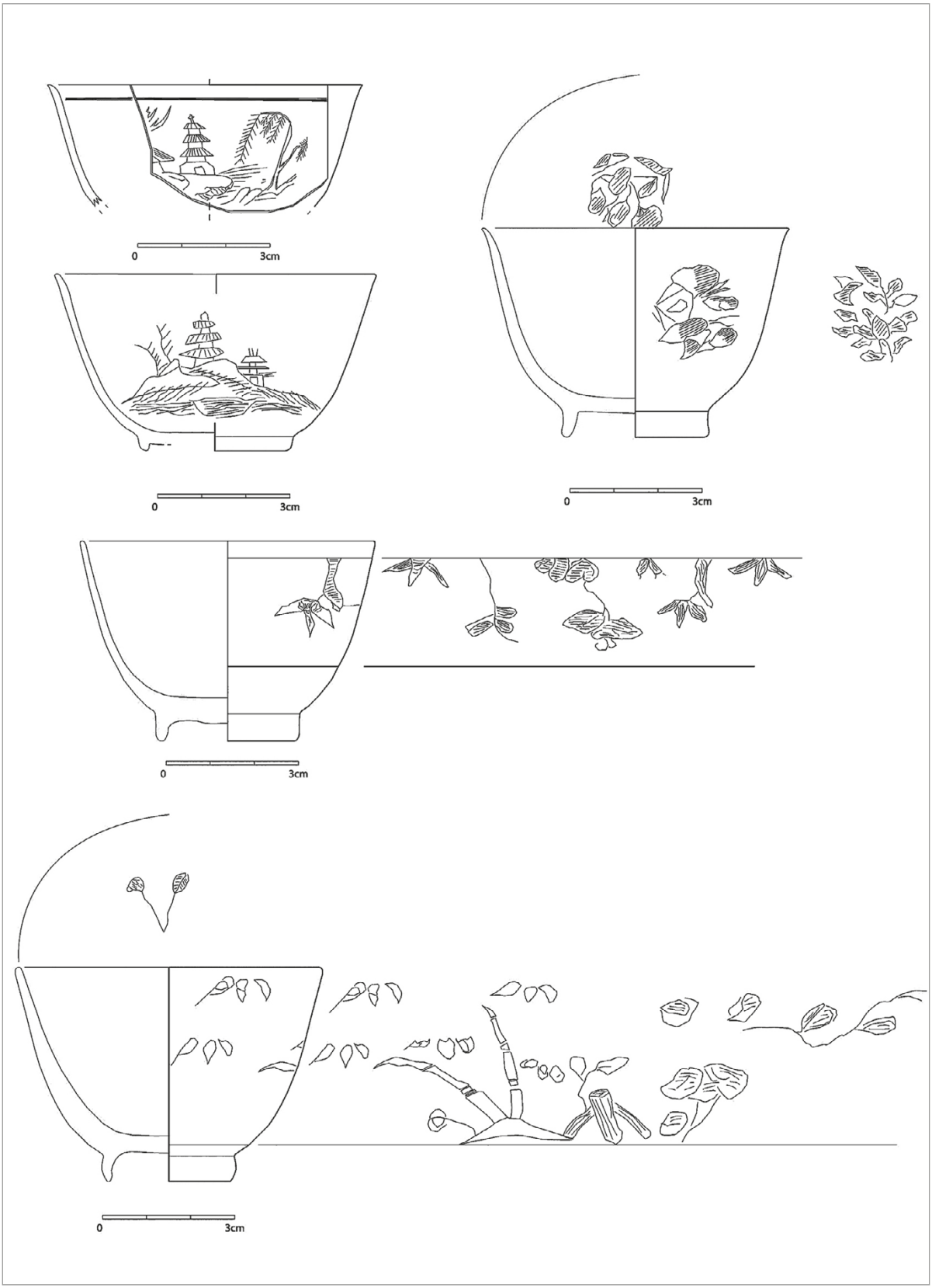

fig. 9 – Reconstruction drawings of selected Chinese porcelain cups and bowls (Romolo Loreto).

attempt was made to obtain a statistical quantity of each preserved type to hypothesise the composition of the cargo, at least in this area of the ship.
As previously noted (Zazzaro, Loreto, Visconti 2017; Visconti 2018), the cargo shows minimal morphological variety. In fact, all the fragments retrieved belong to small bowls and cups with footring and straight or slightly everted rims. With a height ranging between 4 and 5 cm, they were mainly used for the consumption of tea or coffee. The only exception is the bowl in *fig.* 10, larger in size, and with a broad foot rim, similar to, though taller than, what is known in the Chinese literature on the subject as a *bi*-disc foot, and unusual for 18th century export pottery.
The morphological composition of the cargo could have several explanations. One of them is related to the destination of the goods: in general, small cups and bowls were the most exported shapes for the Indian and West Asian markets during the period in question, and, contrary to the porcelain destined for Europe, they were not accompanied by the corresponding saucers (Visconti 2018). For instance, shipping lists of VOC vessels bound for Surat, one of India's main trading posts, confirm this as they are comprised of cups alone in practically all cases (Barendse 2009, vol. 2, pp. 841-842; see, for example, that of the Vrijburg, again dating to the mid-18th century; Jörg 1986, pp. 35-36), but also 18th century assemblages at West Asian sites that have yielded Chinese ceramics offer similar evidence[2].
Another hypothesis is that the, so far, minimal morphological variety may simply be related to the sector of the ship investigated: indeed, the cups and bowls were found on the bow port side, where they were stacked for transport. It cannot be ruled out that other forms may have been stowed in different sectors yet to be investigated. The Sadana Island shipwreck, found off the Egyptian Red Sea coast and dated to roughly coeval with the Umm Lajj wreck, shows, for example, a more composite cargo of imported Chinese porcelain (Ward 2001). Investigation of other areas of the wreck may make it possible to reach a definitive conclusion.
As for decorative techniques, most pieces (59 complete or almost complete specimens and 299 sherds) belong to small cups in which a monochrome blue high-temperature glaze was used in association with enamels applied in a second

[2] See, for example, the Chinese porcelain attributable to the latest period of the site of al-Balīd, Oman (Visconti 2021).

*fig. 10 – Chinese blue and white (*qinghua*) porcelain bowl (Chiara Zazzaro).*

fig. 11 – Chinese porcelain cup with blue glaze and overglaze enamels (now lost) (Chiara Zazzaro).

firing (*fig.* 11). The interior of these cups is plain white, while the exterior has three reserved quatrefoil panels on a blue background, which were originally intended to be decorated with overglazed polychrome enamels which have disappeared due to long immersion in seawater. In some cases, the imprint left by the decorative motif is visible when observing the object from a specific angle and suggests a spray of flowers.
Associated with these are café-au-lait glazed cups with lobed reserves and overglazed enamel decoration, now lost (*fig.* 12). Although represented in much smaller numbers (7 complete or nearly complete items and 12 fragments), these latter cups, generally known as 'Batavia' after the Dutch East India Company port city of Jakarta/Batavia,

fig. 12 – Fragments of Chinese porcelain with brown glaze and overglaze enamels (now lost) (Chiara Zazzaro).

fig. 13 – Chinese blue and white (qinghua) *porcelain bowl (Chiara Zazzaro).*

through which they were shipped in large quantities to the West, are substantially the same as those described above in shape, size, and design of the reserve panels. The prominence of this decorative scheme within the cargo is not surprising: wares of this hybrid character had wide distribution in Western Asia throughout most of the first half of the 18th century (Krahl, Ayers 1986, vol. 3, pp. 1255-1257).

All other cups brought to light belong to the decorative class known as 'blue and white' (*qinghua*), i.e. with decorations in cobalt ores under a lime-alkaline glaze.

The materials collected during the 2022 excavation campaign made it possible to expand and reconstruct the repertoire of decorative motifs and to observe how, despite these were serial productions, they still show considerable variety. In some cases the decorative pattern was likely to have been completed with polychrome overglazed enamels and gold, again lost due to the corrosive action of the saltwater.

A total of 11 different decorative motifs were reconstructed or partially reconstructed, each of which was reproduced with more or less marked differences in execution on a number of cups. The patterns can be roughly divided into three groups: floral or tree motifs, landscape motifs, and symbolic or ornamental motifs (*figs.* 7-9).

Cups with floral motifs are by far the most numerous find and show the greatest variety of decorative patterns. Except for those previously described and only partially reconstructible, the most numerous (26 complete or almost complete and 67 sherds) among the porcelain brought to light are small bowls with an everted rim and a rather high ring foot, decorated with peony vines (*fig.* 13). Small bowls decorated with flower shoots arranged in circular motifs on the outer wall and inner base also belong to this group (*fig.* 14).

*fig. 14 – Chinese blue and white (*qinghua*) porcelain fragments (Chiara Zazzaro).*

fig. 15 – Chinese porcelain cup with underglaze blue decoration and overglaze enamels (now lost) (Chiara Zazzaro).

Some straight-rimmed cups show a decoration in which the motifs painted in underglaze blue were completed with polychrome enamels and probably gold. Two decorative patterns were distinguished in these cases: the first, characterised by bamboo stems and leaves, was found on 10 complete or almost complete cups and on 20 fragments (*fig.* 15). In the second, defined by two thin lines, some leaves and flower buds can be distinguished (*fig.* 9). The latter motif was found on 8 cups and 16 sherds sampled. As with the previous pattern motif, there are fairly close comparisons with some objects that were part of the cargo of the Geldermalsen, the VOC merchantman that sank in 1752 off Bintan island, Indonesia (*Christie's Amsterdam* 1986, lots 4501-4509; Jörg 1986, p. 92).

As observed in the 2015 and 2016 surveys, a more precise comparison is possible for the decorative motif characterised by the gnarled trunk of a pine tree (Visconti 2018). This subject was reproduced on thousands of cups and saucers from the cargo of the Geldermalsen (Sheaf, Kilburn 1988, p. 106, pl. 140 and 111) and is depicted on some cups from the Umm Lajj wreck, also featuring the same diaper bands along the inner rim and base (*fig.* 16). During the 2022 excavation campaign, the motif was sampled and with some differences in the execution and size of the cups was identified on 6 complete specimens and 35 fragments.

The bowls and cups with landscape motifs are fewer in number. Three different decorative patterns were identified that were reproduced on a total of 1 bowl, 8 more or less complete cups and 8 sherds. The larger bowl mentioned at the beginning of this paragraph was a single specimen. It is painted with a continuous landscape of hills and rivers, where a man is boating towards a thatched hut on the bank (*fig.* 7, below). The presence of the human figure and a similar conventional landscape can also be observed on some cup fragments. In this case, the

*fig. 16 – Chinese blue and white (*qinghua*) porcelain bowls (Chiara Zazzaro).*

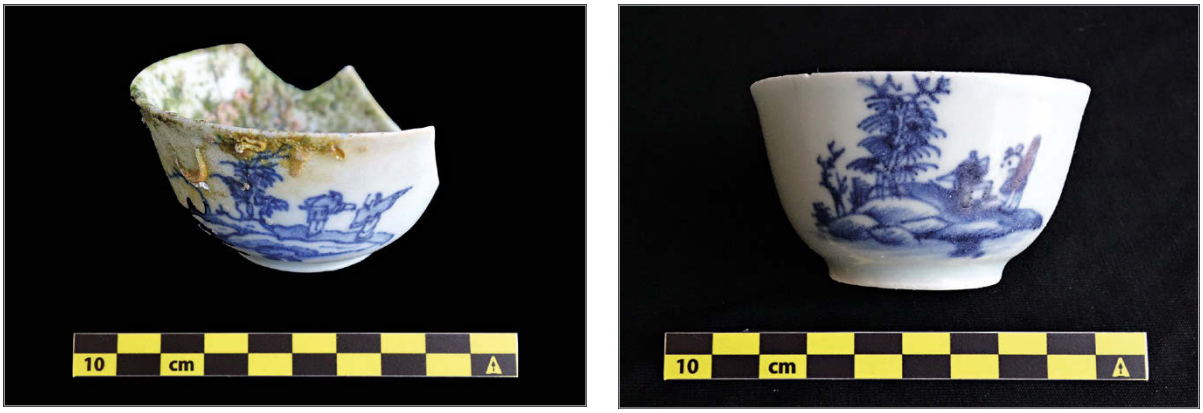

*fig. 17 a-b – Chinese blue and white (*qinghua*) porcelain bowls with the same decorative motif but differences in execution (Chiara Zazzaro).*

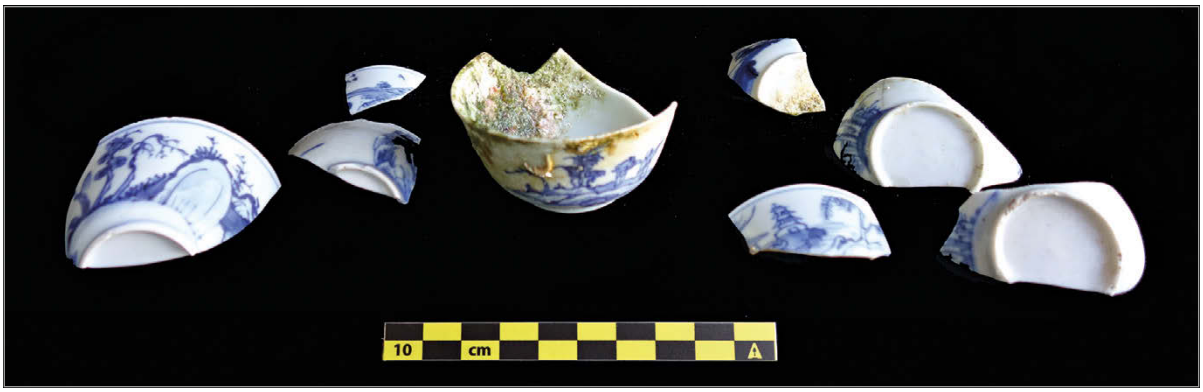

*fig. 18 – Chinese blue and white (*qinghua*) porcelain fragments (Chiara Zazzaro).*

decorative motif, painted with striking differences in the quality of execution, is arranged in three distinct sections: two figures, a scholar and his attendant, conversing in the shade of a tree, a boat glimpsed among the rocks, and a pagoda standing on rocky ground (*figs.* 17a-b). A third landscape pattern, characterised by trees and rocks and again by the presence of a pagoda, was observed on some sherds but could not be reconstructed in its entirety (*fig.* 18). Landscapes such as these, which offered an idealised image of the Chinese world, were very common on 18th century export porcelain. Once again, interesting and timely comparisons can be found in Geldermalsen's porcelain cargo (*Christie's*

*fig. 19 – Chinese blue and white (*qinghua*) porcelain cup (Chiara Zazzaro).*

Amsterdam 1986, lots 2702-2764, 3041-3125; Jörg 1986, p. 72; Visconti 2018).
Finally, the last decorative pattern identified and classified consists of a stylised flaming-wheel motif, which is repeated on 10 complete cups and 22 fragments (*fig.* 19). This motif is observed on many cups in the Ottoman Topkapi collection, all dating from the late 17th to the first half of the 18th century (Krahl, Ayers 1986, vol. 3, p. 983, nos 2068 and 2070, and p. 1229, nos 3088 and 3088a). This was a very popular decorative motif in porcelain in similar forms to the Umm Lajj shipwreck cups or more elaborate versions, destined for the Islamic world and repeated in local ceramic productions (Visconti 2018, p. 105).
Although only a very limited area of the shipwreck has been investigated, the analysis of the Chinese porcelain cargo already allows us to outline some conclusions, albeit preliminary ones. The corpus is attributable to mass production for export, showing, at the least for the time being, very little morphological variety. Indeed, all the fragments can be traced back to bowls and cups for the consumption of tea or coffee.
The rather standardised decorative motifs were not expressly intended for the Islamic market, but were designed and produced to be traded in different contexts, evident from the presence of the human figure in some patterns. This feature does not imply that the porcelain was not saleable on the West Asian market, despite common opinion to the contrary[3].

[3] Persuasive evidence of this is to be seen in the mid-18th century Chinese holy water bottle displaying figurative decoration and a form based on Islamic prototypes in the Topkapi Saray collection, Istanbul (Krahl, Ayers 1986, vol. 3, p. 1108, no. 2573).

Comparison with the materials of the Geldermalsen proved essential both for dating the porcelain, and the Umm Lajj shipwreck in general, and for advancing some hypotheses on the trade routes and dynamics that led to the formation of the cargo. Regarding the first aspect, a dating to the mid-18th century is to be considered more than reliable and confirmed from previous studies. For the second aspect, the starting point of the discussion can be traced back to the arrival of the Geldermalsen in Surat in the spring of 1751 (Jörg 1986), where we can assume that some porcelain from the same stock as that found in the wreck of the merchantman, which sank the following year, was unloaded.[4] From here, together with other Chinese export porcelain of similar dating sold at the Gujarat marketplace, they may have found their way to the Red Sea. While the status of Gujarat as a commercial hub along the mercantile network between East and West Asia is widely acknowledged, it would certainly be interesting and useful to have a deeper archaeological understanding of the area, which could shed more light on the patterns of the segmented trade along the Indian Ocean routes in the 18th century.

C.V.

3.2 *Earthenware*

A large mound of jars, sealed in the calcium carbonate, is located at the stern end of the shipwreck, perhaps slightly shifted towards that side given the fact that the sea bottom slops down from 20 to 22.8 m. The mound is ca. 10 m in diameter and ca. 2 m high (*fig.* 3). During the 2015 and 2016 field seasons the mound was carefully cleaned and a detailed photogrammetry was conducted in order to study the different typology of jars included in the mound.
In the overall 1359 jars were counted and other 2000, or more, are estimated to compose the rest of the mound which is not visible. 292 different types of jars were identified on the basis of their shape, and incised or molded decorations, they were grouped by Lisa Terminiello in 8 main groups including 75% of *qulāl* (including 6 subtypes), 19% of *doraq* and 8% of jars (*figs.* 20 and 21) (Terminiello 2018).
The *qulāl* are water jars of medium size, estimated between 25-32 cm, characterized by an ovoidal

[4] This hypothesis was discussed in more detail in the 2018 article (Visconti 2018).

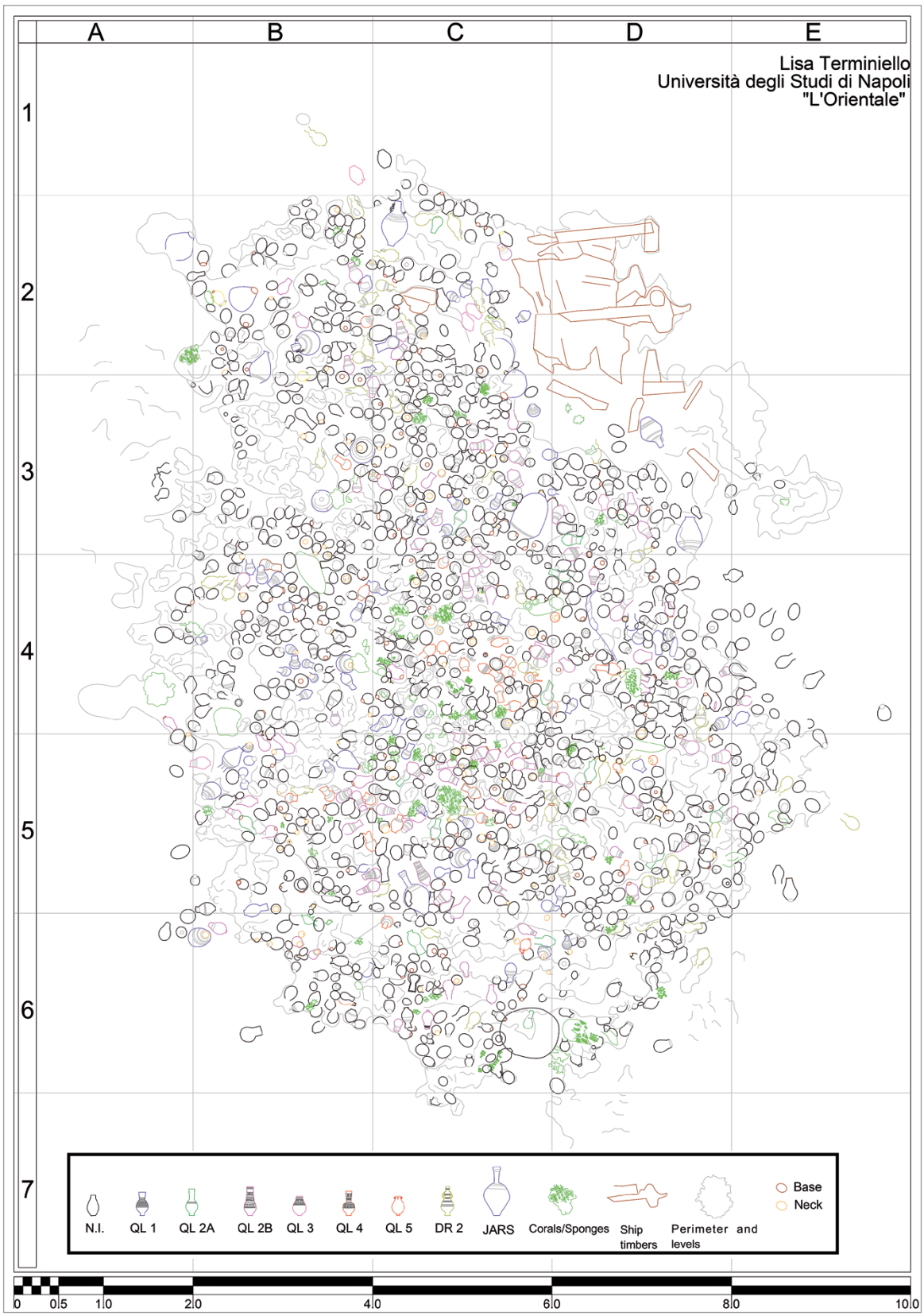

fig. 20 – Drawing of the jars mound, the different types of jars are distinguished using different colours (Lisa Terminiello).

body, long neck – flared or cylindrical – with the presence of a filter placed in the joint between the body and the neck, and with a ring or truncated cone base. The shape of the *doraq* corresponds to that of bottles, whose morphology is characterized by ovoidal and ellipsoidal bodies and a long neck with a narrow mouth. The jars, are larger containers used for storage, with pyriform body, with or without handles and spout, narrow flared neck, ring base.
The corpus of this class of ceramics includes forms and types characterized by high standardization, certainly due to a mass production aimed at marketing. They are comparable to those found in the Sadana and Sharm el Sheik shipwrecks (Braun 2005; Raban 1971) but there are no other information about the maritime trade of such common pottery in the 18th century. This class of pottery usually falls in the general macro category of common unglazed ceramic. Despite scholars had so far paid very little attention to this class of ceramic, it often constitutes the most attested corpus in land archaeological excavations of Islamic and Ottoman contexts in Egypt, in the Arabian Peninsula and in Syria (Terminiello 2018). This arise the question why such common jars were transported from Arabia to Egypt, a region which also had a wide production of this same type. It is possible that on the trip back merchants would fill the ship with any type of cargo which could have guaranteed a profit. Large storage basin called *zila*' were also identified at amidship and are similar to those identified in the Sadana shipwreck (Ward 2001, 2002).
Other ceramics, probably used for cooking purposes, were found on board during the 2022 field season. This collection of ca. 20 earthenware bowl and pot fragments is characterised by thin walls and fragile consistency. It is possible these were part of the ship's kitchen. Noteworthy among these finds is the presence of 4 lids (*figs.* 22a and 22b) and 1 brick fragment.

C.Z.

3.3 *Pipes*

Overall, since the 2015 field season 15 *chibouks* (in Turkish, Simpson 2002, p. 159) have been discovered in the Umm Lajj shipwreck, specifically 10 fragments and 5 intact pipes. No stem[5] or mouthpiece has yet been identified in the cargo, but only pipe heads have been collected. They are

[5] The terminology was extrapolated from Simpson 1990.

fig. 21 – Four different types of jars recovered from the area around the jars mound including, from left to right: a large jar with spout, two qulāl*, one doraq (Chiara Zazzaro).*

heavily degraded, with marine encrustations due to the long deposition in the seabed (*fig.* 23).
Their presence onboard suggested that part of the crew was either Turkish or from a region under the Ottoman influence (Zazzaro, Loreto, Cocca 2016, p. 70; Zazzaro, Loreto, Visconti 2017, p. 257).
Although no signs of manufacture have been identified from the documentation, it is likely that the pipes were mould-made, no wheel-made pipes have been recognised. They are all elbow-shaped, and may be rounded-bowl or lily-shaped.
All the pipes in the corpus are morphologically extremely similar (*figs.* 24-25) the bowl is irregular globular or pseudo-globular, the rim (corresponding to the chimney) is vertical or slightly splayed upward, the tubular shank tends to be short, always conical – except for Pipe 1 (*fig.* 24), where it is cylindrical with bulging termination. The internal profile of the sections tends to be homogeneous, with the exception of Pipe 4 (*fig.* 25c), which has a U-shaped bowl and a splayed shank, with a joint at the keel point free of asymmetries, indentations and bulges.
The surfaces of all the pipes are bare, devoid of any clay or vitreous coating, and are characterised by different decorative motifs made using homogeneous techniques: mould and cogwheel impression. The notched cogwheel impression is the most recurrent element. The decorations are concentrated on the bowl and the rim. The end of the rim seems to be devoid of ornamentation, as are the junctions between bowl and keel. None of the pipes have trademarks, which is consistent with the dating of the shipwreck, considering that they only appear on pipes from the 19th century onwards (Ward, Baram 2006, p. 11).
The pipes have homogenous dimensions, ranging from 4.2 to 4.9 cm in height and 5.4 to 5.8 cm in

fig. 22 – Earthenware and other cooking pot fragments and lids (Chiara Zazzaro).

fig. 23 – A selection pipes from the Umm Lajj corpus: A-D: nearly intact pipes; E: a pipe fragment (Chiara Zazzaro).

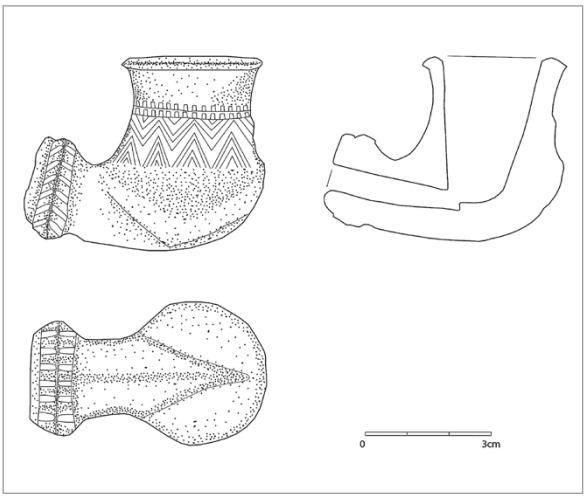

fig. 24 – Pipe 1 (Romolo Loreto).

length. The (inner) rim diameter ranges from 2.3 to 2.5 cm, and the terminations between 0.7 and 1.2 cm. The largest find is Pipe 3 (*fig.* 25b), the smallest is Pipe 4 (*fig.* 25c).

Considering the stylistic classification proposed by Gosse (unpublished, p. 10), the pipes of Umm Lajj could be defined as Turkish due to their ellipsoidal bowls, high hems and v-shaped conjunction between keel and bowl, or Syrian due to their spherical bowls and deep impressions.

The pipes from Umm Lajj suggest a variety of comparisons especially related to conceptual affinities in morphology and decorations – as in the case of the pipes from Izmir (Uçar 2019), or Pomegues (Gosse unpublished). The pipes are certainly similar, but no precise and punctual comparisons have been identified with what has been published. Pipe 3 (*fig.* 25b) seems to be the one that presents more comparisons, as its morphology is distinctive as well as easily recognisable. For the others, however, although the morphology is similar, no identical decoration could be found. The most comparable decorative element of the Umm Lajj pipes is the cogwheel, evidently extremely common, revealing

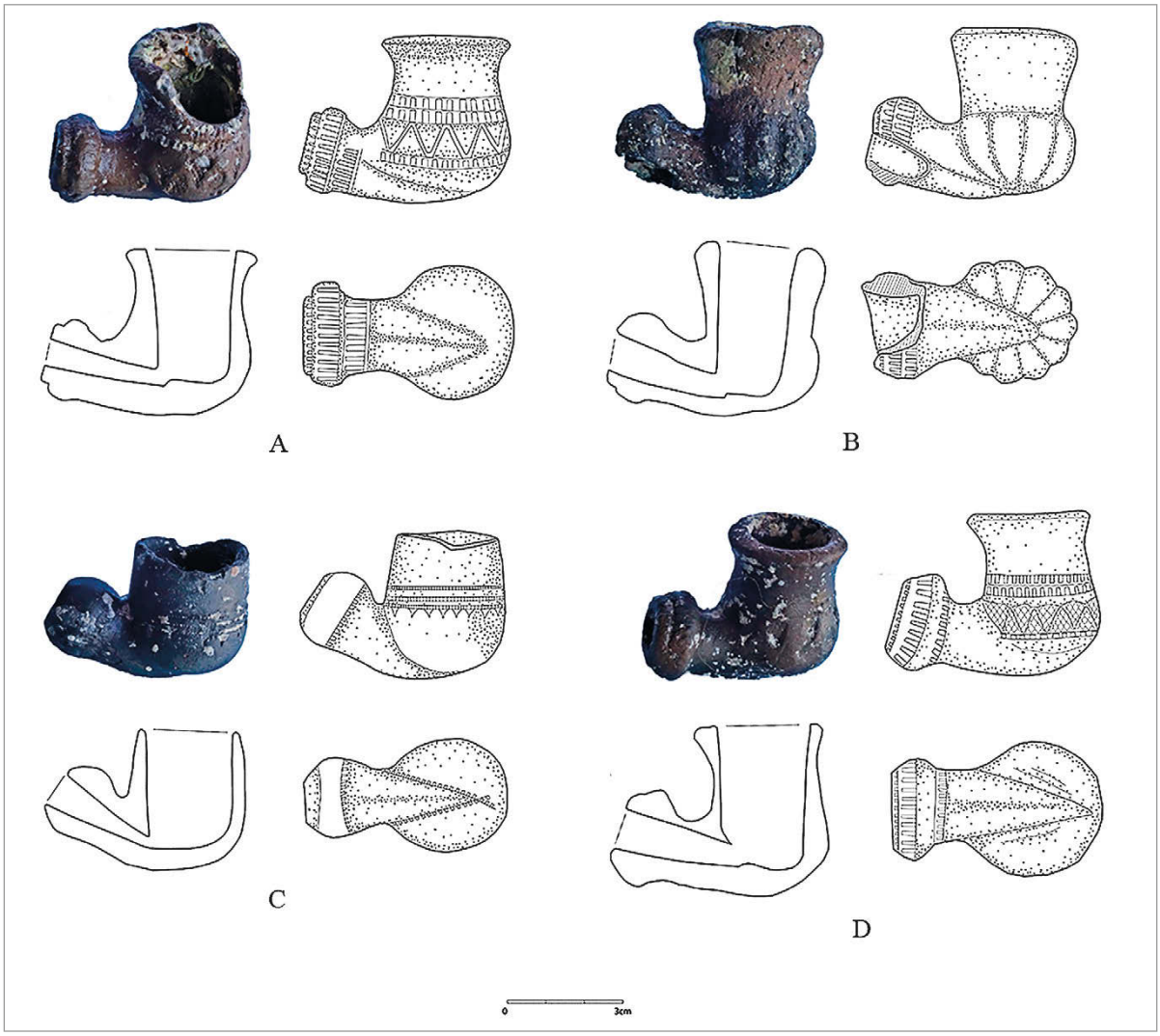

fig. 25 – a. Pipe 2; b. Pipe 3; c. Pipe 4; d. Pipe 5 (Romolo Loreto).

that it is an indispensable type of decoration for Ottoman pipes. Indeed, it was utilised in several production centres in the kingdom between the 18th and 19th centuries (Uçar 2019, p. 125).
There are two comparisons that are most pertinent as they involve material from wrecks in the same area. The first is from Sharm el-Shaik (Raban 1971), where twenty pipes were found. However, there are only four photos in the publication, the description is reduced, and no specific chronological proposal is made. The second – of greater significance – is the wreck of Sadana (Ward 2001) in which a cargo was found, defined as disproportionately large by Ward and Baram (2006, p. 9). It consists of 21 pipes, classified according to a system that mainly emphasises the morphology of the internal profile of the chimney, rim and stem (Ward, Baram 2006, p. 12). In general, the pipes from Umm Lajj are slightly shorter than those from the Sadana wreck (4.9/5.2 cm, *ibid.*, pp. 13-14, fig. 4.a-b) and at present, the only comparison identified is with Pipe 3 (*fig.* 25b; Raban 1971, p. 152, fig. 8.h, Barq-514-56).
The comparisons to terrestrial sites in Saudi Arabia show how research is still in its early stage. In fact, an all-encompassing systematic study of pipes is lacking and the only works carried out are those of Bouzigard (2010) and Saidel (Bouzigard, Saidel 2012). The publications reveal that just 12 pipes (Bouzigard 2010, pp. 61-62) – roughly documented (Bouzigard, Saidel 2012, p. 123) – have been uncovered from ephemeral and built sites (Bouzigard 2010, p. 87) and they are mainly concentrated on the west coast, due to topo-

graphical and geographical issues and due to the distribution of *hajj* routes (Bouzigard 2010, pp. 91-97). Of these 12 pipes, only two can be dated to the 18th century (*ibid.*, p. 75). The comparison of the Saudi material with the one from Umm Lajj shows that the pipes have no points of contact with those found in the Taif region (Zarins *et al.* 1980, p. 29, plates 26.17, 26.18) or with the one identified during the survey carried out between Mecca and Medina (Killick *et al.* 2001, p. 54, plate 53.21). A slight morphological affinity can be glimpsed with the pipes found in the Northern regions (Gilmore, al-Ibrahim, Murad 2002, pp. 19-21, plates 33.7, 33.8); the decorative technique is also the same, however they differ in the decorative motif and the fabric (fine grey or well-polished red).

It has been possible to identify similar but not identical finds to Pipe 3 (*fig.* 25b) and Pipe 4 (*figs.* 25c) in Egyptian territory: these are elbow-shaped pipes with a polylobate bowl or a simple morphology, in the Egyptian case unadorned (Pradines 2004, figs. 8a, 8h).

Shifting our attention to the Near East, there seem to be few elements of comparison so far and they are mainly related to decoration. Specifically, there seem to be almost no comparisons with the pipes from Jerusalem (Simpson 2008) which are often wheel-made and englobed. Simpson's Group 1 pipes are Cypress tree impressed, with pattern and decorative element unmistakably recalling the predominant ornamentation of Pipes 2 (*fig.* 25a) and 5 (*fig.* 25d). However, Umm Lajj's pipes are less richly impressed: these decorations are only arranged in two parallel rows, not three, and furthermore the terminations are not affected by this decorative motif.

Finally, points of contact are discernible with the Izmir pipes (Uçar 2019, figs. 3d, 3m, 3o, 4m, 6). This concerns all pipes from Umm Lajj, except Pipe 5 (*fig.* 25d). The differences mainly concern the colour of the fabric and the thickness of the walls.

In conclusion, *chibouks* are of primary importance, as they can be considered some of the most frequently used materials in everyday life in every corner of the Ottoman Empire for at least 300 years (Uçar 2019, p. 127). Moreover, these are the archaeological materials that fall across wide-ranging circuits and show significant points of contact

fig. 26 – Two fragments of a comb (Chiara Zazzaro).

fig. 28 – A wooden button or a pendant (Chiara Zazzaro).

fig. 27 – A wooden spoon (Chiara Zazzaro).

with various territories adjacent to the Arabian Peninsula and beyond, with a mechanism of pattern transfer about which little is known so far.
The pipes of Umm Lajj represent a small, coherent finding group datable to the mid-18th century, both in terms of their intrinsic characteristics and of the dating of the wreck. Nothing can be said about the centre(s) of production.
Giving the small number of pipes, it could be assumed that these were personal items used on board by sailors (Zazzaro, Loreto, Visconti 2017, p. 257) rather than elements of the cargo *strictu senso.* However, no traces of charcoal were found on the inner surface to confirm their use, as was the case in other contexts (*e.g.* Ward, Baram 2006, p. 14), perhaps also due to the poor state of preservation. In addition, there is a complete lack of other artefacts associated with tobacco consumption on board the ship.
Much remains to be done on this material class from Umm Lajj in the future. There is need a systematic study of the complete *corpus* of all the pipes collected and documented in the different years of excavation; a detailed study of the fabrics and a more comprehensive analysis of the fragments are planned.

S.B.

3.4 *Other artifacts*

Among the wooden artefacts are mainly personal items, such as two fragments of the same comb, one spoon and one button or pendant (*figs.* 26, 27, 28).
The remains of a possible barrel and other possible elements of the ship furniture were found on the top of the keelson in the excavated trench. The barrel has been recognised by the rounded shape of the wood and by the presence of many nails. The barrel may have contained commodities exported on board or may have been used for storage.
Among metal finds most interesting is a pile of four coins concretised and not currently recognisable (*fig.* 29). Despite that, the thickness and the diameter of the coins is detectable: it is ca. 3.9 cm in diameter and 0.2 cm in thickness. These dimensions correspond to the dimension of the Maria Theresa thaler. The Maria Theresa thaler is a silver bullion coin used in world trade continuously since 1741. It is named after Maria Theresa who ruled Austria, Hungary, and Bohemia from 1740 to 1780 (Sample 2005). The restoration process of the coins will help in identifying the coin more precisely.
A gun bullet in lead was also found. It may belong to a gun carried on board for security (*fig.* 30).
In addition to the above-mentioned finds, seven nails were also uncovered, they were all mostly used for the assemblage of the ship and have similar dimensions, despite the concretion, they are squared in section 1×1cm (*fig.* 31).
Three beads were found, roughly in the same context and may be part of the same necklace, considered personal items rather than export products. One of the beads is made of agata, it is orange on one side and grey on the other side. Two glass beads, one transparent and one green were also found (*fig.* 32).
Only one fragment of a rim and neck of a green glass bottle was found during this field season (*fig.* 33).
An assemblage of resin was found on the port side of the excavated portion of the shipwreck. The samples collected will be analysed in the future to understand the composition and origin (*fig.* 34).

C.Z.

3.5 *Archaeobotanical study*

A preliminary archaeobotanical investigation was planned in 2022 with the general goals to obtain some first insights into the perishable cargoes and the plant-based diet of sailors of this eighteenth-century merchantman.

Methods and materials

During the archaeological excavations of the shipwreck, two soil samples from a compact layer (SU 1) below the surface layer were collected randomly. Additionally, five visible seed and fruit remains were retrieved by sieving the soil from SU 2 on the field.
One soil sample and plant material were investigated in Italy at the archaeobotanical laboratory of the University Museum System of the L'Orientale with the permission of the Saudi MoC. A small soil sample of 0.25 litre was carefully wet-sieved in nested sieves (2, 1.25, 0.8 mm) so that three fractions were obtained. Plant remains were sorted from these three fractions, and seed and fruit remain retrieved by hand picking were analysed with the aid of a low-power stereomicroscope at x8-35 (Leica EZ4 W). Images were acquired using the integrated 5-megapixel CMOS camera and a computer equipped with Leica Acquire software. Large fruit remains were documented through photographs (Canon EOD 250D, EF-S 18-55 mm

fig. 29 – Possible coins (Chiara Zazzaro).

fig. 30 – A possible bullet (Chiara Zazzaro).

fig. 31 – Nails most likely from the ship fastening (Chiara Zazzaro).

f/3.5-5.6 III). Multiple digital images obtained by stereomicroscope and photo camera were processed by Helicon Focus 8.1.0 software. The plant remains and the wet-sieved fractions from the sample were stored in airtight plastic containers with water and kept in the dark to prevent damage. The identification was achieved by comparison with photo-

fig. 32 – Beads (Chiara Zazzaro).

fig. 33 – Glass bottle (Chiara Zazzaro).

fig. 34 – Resin (Chiara Zazzaro).

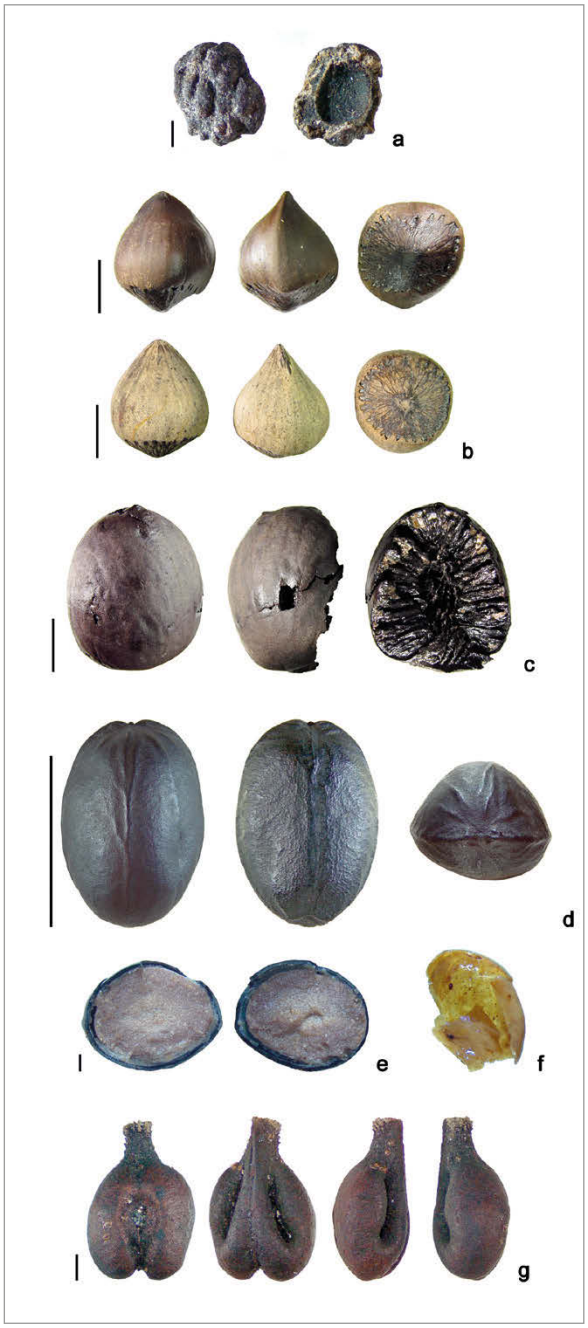

fig. 35 – a. Fruit-stone (endocarp) fragments of jujube (Ziziphus sp.) – Scale bar equal 1 mm; b. Whole hazelnuts (Corylus sp.) – Scale bar equal 1 cm. c. Seed fragment of nutmeg (Myristica fragrans Houtt.) – Scale bar equal 1 cm. d-f. Coffee (Coffea arabica). d. Endocarp (parchment) – Scale bar equal 1 cm; e. Sections of endocarp (parchment), silver skin, and seed; f. Silver skin fragment – Scale bar equal 1 mm; g. Grape pips (Vitis vinifera L.) – Scale bar equal 1 mm (Matteo Delle Donne).

graphs, drawings, and descriptions from literature. Botanical nomenclature follows the International Plant Names Index. All material was waterlogged and, in some instances, fragmentary.

fig. 36 – Coconut (Chiara Zazzaro).

Sample	Recovery technique	Type of remains	Taxa	Common name
1	Wet sieving of a 0.2 litre sample from SU 2	Fruit-stone (endocarp) fragments	*Ziziphus* sp.	Jujube
2	Retrieved by sieving the soil from SU 2 on board the expedition ship	Whole fruits and pericarp fragments	*Corylus* sp.	Hazelnut
3	Retrieved by sieving the soil from SU 2 on board the expedition ship	Seed fragment	*Myristica fragrans* Houtt.	Nutmeg
4	Retrieved by sieving the soil from SU 2 on board the expedition ship	Endocarp; endocarp fragments; silver skin fragments	*Coffea arabica* L.	Coffee
5	Retrieved by sieving the soil from SU 2 on board the expedition ship	Pips	*Vitis vinifera* L.	Grapevine
6	Retrieved by sieving the soil from SU 2 on board the expedition ship	Fruit (esocarp and endocarp)	*Cocos nucifera* L.	Coconut

tab. 3 – Preliminary results of archaeobotanical analysis of waterlogged plant remains from the Umm Lajj shipwreck.

Results and preliminary remarks

The sorting of the sieved fractions yielded one fragment of endocarp of jujube (*Ziziphus* sp.). The analysis of the plant remains retrieved during sieving operations of soil from SU 2 allowed the identification of whole fruits and pericarp fragments of hazelnut (*Corylus* sp.), a seed fragment of nutmeg (*Myristica fragrans* L.), an endocarp (parchment), endocarp fragments, and silver skin fragments of coffee (*Coffea arabica* L.), a grape pip (*Vitis vinifera* L.) (*fig.* 35), and a fruit of coconut (*Cocos nucifera* L.) (*fig.* 36) (*tab.* 3).

The location of the Umm Lajj shipwreck along a maritime spice route suggests that nutmegs and coconuts, coming from South-East Asia, coffee beans stored with the parchment retained, coming from South Arabia or South and South-East Asia, and hazelnuts, from a wider natural distribution, usually the temperate zone of the northern hemisphere, could have been part of the ship's cargo. Jujubes, native to South Asia, South Arabia and Africa, and grapes or raisins from the Mediterranean region could have also made up part of the crew's food supplies.
These preliminary results contributed to obtaining a first glimpse of the wide potential of archaeobotanical analysis to better understand the type of cargo and, in particular, the diverse nature of the plant cargo transported on the ship.

M.D.D.

3.6 *Archaeozoological study*

A small assemblage of animal bones was recovered from the Umm Lajj shipwreck. It comprises 6 bones for a total weight of 65.7 g, namely 4 mammal bones (52.7 g) and 2 fish bones (13 g), see *tab.* 4.

Materials and methods

The identification of the remains was performed by direct observation. The osteological collection of the Museum of Natural History of Geneva, Switzerland (MHNG) was used as reference. Magnifying lenses 10×and 20×were used to observe bone surface. Measurements were performed with a sliding calliper and follow von den Driesch 1976 and Morales, Rosenlung 1979 standards. To describe bone fragmentation the following ranges are used in the description: complete (91-100% of the complete bone preserved), nearly complete (51-90%), half (21-50%) and small fragment (1-20%). In long bones, the denser diaphysis is well preserved, whereas cancellous portions are less well represented. The state of preservation is described following Fernández-Jalvo, Andrews 2016. Most remains are well preserved despite the underwater context of retrieval.

Taxon	Number	Weight (g)
Sheep/goat	3	52
ind. mammal Fish	1	0.7
Fish	2	13
Total	6	65.7

tab. 4 – Quantification of faunal remains.

Results and preliminary remarks

The mammal remains include 3 sheep or goat remains and 1 undetermined fragment:
– 1 sheep/goat left femur diaphysis (26 g; *fig.* 37a); nearly complete; white bony surface with a greenish area on the caudal aspect; moderate to heavy abrasion observed on edges and on shaft, slightly corroded, cracks and small incrustations are present;
– 1 sheep/goat left metacarpal diaphysis (16 g; *fig.* 37b); nearly complete; light abrasion of the edges; bone colour light brown; carnivore gnawing marks visible on its proximal metaphysis (scores and molar pits, *fig.* 37c); a black well-delimited spot present on the cranial aspect of the shaft;
– 1 sheep/goat right coxal bone (portion of acetabulum and ischium; 10 g; *fig.* 37d); fragmentation scored as half; homogeneously brown both on surface and in fracture;
– 1 undetermined long bone fragment attributed to a medium-sized mammal (0.7 g); small fragment; dark brown colour.
The 2 fish remains are:
– 1 caudal vertebra (7 g; *fig.* 37e); *Serranidae* cf. family; nearly complete; dark brown in colour; the metrical data of the specimen (see *tab.* 5) point to a fish measuring approximately 0.70-1 m (based on the specimens of the MHNG collection); an anthropic trace observed on the lateral aspect of the vertebral corpus: a cut mark that caused the detachment of a bone flake.
– 1 unidentified opercular bone fragment from the grill cover (6 g) of a large individual; small fragment; dark brown in colour; ancient and recent fragmentation observed.
The better preservation of shafts compared to the poor preservation or non-preservation of the less resistant cancellous bone is a diagenetical process typically observed. It is also due to the effect of water on spongious tissues (Fernández-Jalvo, Andrews 2016).
Based on taphonomic observations, three different aspects are found. The state of preservation of the bony surface of the sheep/goat femur stands

Taxon	Anatomy	Measurements (mm)		
Sheep/goat	femur	SD 14.2		
Sheep/goat	coxal	SH isch. 14		
Sheep/goat	metacarpal	SD 12		
Serranidae cf.	caud. *vertebra*	v.ce.gr.h. 19.9	v.ce.gr.b. 19.6	v.ce.gr.l. 20.2
Fish	*operculum*	op.gr.b.a.s. 14	op.gr.h.a.s. 19	

tab. 5 – Measurements of faunal remains (mm) after von den Driesch 1976 and Morales, Rosenlung 1979.

fig. 37 – Faunal remains: a. sheep/goat left femur, caudal view; b. sheep/goat left metacarpal, cranial view; c. sheep/goat metacarpal, medial view with carnivore gnaws marks on proximal metaphysis; d. sheep/goat right coxal bone, lateral view; e. fish caudal vertebra, lateral view with cut mark on the vertebral corpus (Laura Strolin).

out in terms of abrasion, corrosion, cracking and colour. Abrasion features are related to the effect of sand and movement of the bone. Differential coloration suggests inhomogeneous burial conditions (for instance this could have been produced by movement of the bone, partial coverage by sand or slow sediment deposition…). The green coloration and incrustations are indicative that the bone was in contact with water for a significant time. The white colour suggests that the bone was subject to different post-depositional conditions compared to the rest of the assemblage. As such, this bone may be intrusive.

The sheep/goat metacarpal is light brown and slightly abraded, whereas the sheep/goat coxal bone and the undetermined fragment, are close to the dark brown of the fish remains. For all these specimens, bone surface preservation indicates scarce attrition processes and supports the hypothesis that the bones were not exposed to significant post-depositional movements into the sediment. The metacarpal probably had a slightly different path of incorporation in the assemblage (in terms of spatial distribution or timing or other factors) whereas the other remains present a closely comparable aspect.

Excluding the sheep/goat femur, the homogeneity of the colour observed on the other bones suggests a relatively fast integration in the deposit and stable post-depositional conditions. Brown colour is typical of long submerged materials. However, the marked darkness of the fish remains and the coxal could also be the result of contamination by the sediment or by substances present in the shipwreck cargo or, before deposition, by anthropogenic agents through heating of some specific culinary preparation (e.g. Desse, Desse-Berset 2000a). Brown colour stain is indeed also produced by organic materials (Fernández-Jalvo, Andrews 2016). It is worth noting that organic materials have been found as part of the cargo (see the palaeobotany section above). The dark spot observed on the metacarpal is superficial and delimited, and therefore seems more likely stained by sedimentary minerals (burning traces would present different features, see).

The identification of sheep/goat remains is consistent with locally distributed fauna and common

alimentary habits at the time in this geographic area. Moreover, sheep/goat remains were found in other shipwrecks from different periods (e.g. the Sadana shipwreck, Ward 2001 and 2002).
As for anatomical representation, only limb bones are represented (both hind limb and front limb). The hindlimb portions are of dietary interest in terms of meat. The metacarpal is not a meat-bearing element but can also be consumed for its alimentary value, such as marrow content.
As for age, no precise data are available as diagnostic portions are not preserved. However, based on the compactness of the bone tissue and on bone size, no juveniles (that is animals in the first months of life) are present.
The type, features and location of the carnivore gnaw marks observed on the sheep/goat metacarpal are consistent with dog gnawing habits. Therefore, also taking into account anatomy, it is possible to consider this bone as the leftover of food preparation and consumption that became accessible to a dog. If the specimen is part of the shipwreck, it was not discarded outside the ship and so entered the archaeological assemblage. The assemblage suggests that sheep/goat meat may have been consumed by the people of the ship. Preserved meat is a possibility but it is also possible that it was prepared and consumed fresh. Sheep/goat meat was regularly consumed in the area and is a traditional gastronomic choice. In addition, based on the gnaw marks, if the bone was part of the ship, the presence of a dog onboard cannot be excluded. It is noteworthy that in the Red Sea, due to the proximity of the coastline, the consumption of fresh food must have been more viable compared to offshore navigation.
Regarding fish remains, *Serranidae* (groupers and sea bass) are a carnivore marine reef fish family made up of many species widely distributed (Red Sea, Mediterranean, Gulf…, see the website FishBase; Randall 1983; Field 2005). Individuals can reach important dimensions (up to 3 m). These fish are locally present in the area, historically traded and consumed (e.g. Studer 2016) up to the present day.
The presence of the cut mark on the fish vertebra is indicative of an anthropic origin for its incorporation in the archaeological assemblage. The vertebra is a meaty portion, and the cut mark is related to meat filleting and so to a dietary use. As such, the specimen is associated with food consumption, as food refuse of fresh fish or as preserved fish (dry, salted, cured…). Fish preparations are historically and ethnographically documented (e.g. Desse, Desse-Berset 2000a and 2000b; Van Neer *et al.* 2013). Namely, large fishes are frequently segmented in pieces. The significant dimensions of the recovered fishes would be consistent with preparation for a large number of persons, for preservation and for trade.
Considering the good state of preservation of the remains and the conditions of the archaeological context, further excavations present a very high potential for recovering a significant faunal assemblage that will provide data for better exploring animal-related questions regarding trade across the Red Sea.

L.S.

4. Other shipwrecks in the Saudi Arabian waters of the Red Sea

4.1 *The Sharm Yanbu shipwreck*

A shipwreck identified over 50 years ago in the area of Sharm Yanbu shows very similar characteristics to the cargoes of the Umm Lajj, Sadana and Sharm el Sheik shipwrecks and can be associated to them for the type of cargo (porcelain, *qulāl* jars and resins). Two cannons were also found on the Sharm Yanbu shipwreck which is interesting because it testifies that the ship may have sailed in non-safe waters, perhaps beyond the limits of the Ottoman maritime control in the Red Sea.
Unfortunately, the location of the site is unknown, the information about these shipwrecks derives from a conversation with Dr Cheryl Ward, who was previously informed about this shipwreck by John De Bry. De Bry surveyed the shipwreck in 1979, he produced a photographic documentation of the finds and preliminary analysis of the porcelain and the resins, still unpublished.

C.Z.

4.2 *The al Jadir shipwreck*

During the 2022 field season the team was invited by two marine biologists of The Red Sea Development Company (TRSDC), Jacob Asher and Sander den Haring to visit a site that they had discovered in the area of the Al Wajh bank/lagoon during their surveying activities. The archaeological site has been named the Al Jadir shipwreck and it consists of some visible frames and longitudinal architectural elements of a shipwreck with scattered water jars, similar to the *qulāl* type, and also lids.

The site is located in correspondence of a channel in the coral reef connecting the open water to the al Wajh lagoon. The current in this area is very strong pushing from open water towards the lagoon. It is for this reason that we believe that part of the shipwreck and its cargo has drifted and spread across the channel.
The ship structure seems to be quite large, wooden frames are englobed in metal sheets. The overall length of the shipwreck may have been around 25 m. The team collected a wood sample to seek to identify the provenance of the ship.
The associated *qulāl* jars and the presence of the metal sheets covering the hull point to date the shipwreck possibly around the 19th century. The shipwreck could be Ottoman in origin.

C.Z., E.K.

5. Discussion

By the late 18th century, the growth of international markets and consumption extended beyond regional trading routes, creating a trade system that spanned half the globe. Situated at the crossroads of the Mediterranean and the Indian Ocean, Egypt's foreign trade was divided into the African and Eastern spheres, on one hand, and the Mediterranean sphere on the other. Luxury goods from the western and eastern Indian Ocean were obtained at a deficit in the ports of the southern Red Sea, to be re-exported in the markets of Alexandria to Western Mediterranean countries, the Balkans, Turkey, the Near East, and the Maghreb. This reinvestment helped maintain balance in the national account (McGowan 1994). During this period, Ottoman authority restricted direct European access to Red Sea ports and tightly controlled ship traffic through this sea to counter European appropriation of traditional Eastern market products such as spices, coffee, and textiles through the circumnavigation of Africa. In this context, Egypt remained prominent in global connections until the late 1700s when Europeans began sailing regularly to Suez (Raymond 1974, p. 154). However, according to our current understanding, the Ottomans are largely unaccounted for in the 18th-century Indian Ocean. Nevertheless, they remained prominent figures on the political stage, both as leaders of the umma and through the endeavors of the diaspora. It is likely, however, that they refrained from engaging in trading ventures in the Indian Ocean, a domain primarily navigated by Indian merchants (Peacock 2018).
The Sharm al-Shaikh, Sadana, and Umm Lajj shipwrecks testify to the trading of products from Africa and the East destined for Alexandria's markets (Ward 2001). What they were carrying on the route from Egypt to the southern Red Sea is attested in official Ottoman documents, which confirm the constant traffic of ships departing from Egypt to supply the Hijāz with grain and other food provisions in the 18th century. These ships were owned by Egyptian merchants, the Ottoman government, or religious institutions for donations (*awqaf*), they are described as expensive and time consuming in construction: at least five years were necessary to build them. The timbers were transported from the forests of Rhodes and Köyceğiz to the port of Alexandria for approximately 380 miles (BOA. C.BH. 81.3897; C.BH. 152.7240; MM. 6:270). Subsequently, the supply materials for the construction were sent to the port of Reshid at the mouth of the Nile and to the Suez shipyards through an overland trip of some 70 miles across the desert (Altıntaş 2018). They are further described as «poorly built», «long and deep» (900-1000 tons), «difficult to manoeuvre», and «nearly impossible to tack». Many of them wrecked: from a number of 50, attested in the 17th century, they were reduced to 15 in the 18th century. They were «[…] destroyed by calamity in the port of Suez due to the strength of the winds», or because they were overloaded when there were not a sufficient number of ships in port to supply the Hijāz, or because the urgent demands from Mecca and Medina forced ships to enter and sail through open seas, far from shore out of sailing season, increasing the risk of storm-related accidents. Among the reasons of the wreckages, incompetence of mariners appointed as captain to *mîrî* ships is also mentioned (Altıntaş 2022).
A document, dating to 1777, reports that some of these ships had been wrecked and it was therefore necessary their rapid replacement by purchasing ships that had already been built to guarantee provisions for the Hijāz. They were replaced with smaller Indian ships (200 tons) that were more convenient: «[…] a solid and reliable unit from the Indian ships present at the port of Suez should be bought […] In the case that a ready ship is not found in the said place, after consultation with the governor of Jiddah, one should be bought from the Indian ships available at the port of Jiddah» (Altıntaş 2022; Wick 2012, pp. 411-412). The

presence of both local and Indian ships in the Red Sea in the 18th century is depicted in a Gujarati map (Sheikh 2009) and in the illustration of the Jiddah coastline in Carsten Niebuhr's book (see Niebuhr 1994). European or European-controlled ships could sail to China and India but could only reach the southern part of the Red Sea up to Mocha (Tuchscherer 1997; Ward, Baram 2006, pp. 137-139). The archaeological evidence of the Sharm al-Shaikh, Sadana, and Umm Lajj shipwrecks attests the large variety of products they were carrying, an indirect trading which involved three continents and included both mass products (water jars and tobacco pipes) and products that were more competitive on the market, such as porcelain and spices, which guaranteed high profits (*fig.* 2).

6. Conclusion

Archaeological findings from the Umm Lajj shipwreck indicate that the vessel likely struck the reef accidentally while navigating or during a stopover in unfavorable weather conditions, seeking shelter from the prevailing north and northwest winds that dominate this area of the Red Sea for much of the year. The ship subsequently capsized onto its port side, as evidenced by the concentration of porcelain cargo and other materials on this side, along with the emergence of frames on the starboard side, now encrusted with corals and sponges.

The ship's architecture appears robust, resembling Mediterranean designs, consistent with those observed in the Sadana and Sharm el Sheik shipwrecks. Among the artifacts recovered from the wreckage are a diverse array of personal items, remnants of consumed food, porcelain imports from China, and exotic goods from the Indian Ocean, alongside coffee beans and earthenware water jars likely originating from southern Arabia. Given the limited excavation area thus far, further archaeological exploration of the shipwreck is expected to shed more light on Egyptian/Ottoman trade in the Red Sea and provide insights into life aboard the vessel. Together with the Sharm al-Shaikh and Sadana shipwrecks, the Umm Lajj site offers a unique glimpse into Ottoman trading in the Red Sea prior to the construction of the Suez Canal. Further investigations on other shipwreck sites identified in the Red Sea would also contribute to a better understanding of the development or decline of Ottoman trade in the Red Sea.

C.Z.

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ARCHEOLOGIA POSTMEDIEVALE

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ARCHEOLOGIA POSTMEDIEVALE

In continuation of a consolidated tradition of this publication, issue number 28 (2024) presents innovative aspects, like an increase in the internationalization which is represented by the essays on important underwater and land sites in Saudi Arabia (the Red Sea), Albania (Durres) and Spain (Roses-Catalogna) and state-of-the-art methodological themes concerning the protection of the post-Medieval archeological heritage.

This issue of APM contains innovations related to geographical areas which are dealt with here for the first time, but also for certain subjects like the archeology of post-Medieval transhumance, the archeology of the air, ^{14}C applied to post-medieval finds, an 18th century shipwreck in Saudi Arabia which demonstrates the existence of international trade between the Indian Ocean and the West.

The numismatic evidence from the military fortress at Rosas in Catalonia proves that the coins belonging to the military personnel were the same as those used by the local economy system in which foreign soldiers (French) had been completely integrated.

One of the essays is dedicated to a collection of bronze weights and measures dated from 1613 to 1781, preserved in the Genoese area and passed down from one generation to the next which includes an interesting oral memoir.

The production of bricks at Trevi (Umbria) is analysed using a specific source which is the Register of taxes paid by the kilns during the period from 1592-1797.

The section dedicated to *Conflict Archaeology* covers a wide chronological range from 1503 to the First and Second World Wars with an initial essay dedicated to a cannon attributed to Louis XIII of France and extends to the archeological approach at the Altopiano dei Sette Comuni (Vicenza) for the study of the First World War sites and then to the results of the 2023 research campaign conducted in the areas of some of the Austro-Hungarian prisoner of war camps on the island of Asinara.

The article on the wrecks of aircraft from the Second World War which crashed on the Maiella (National Park, Abruzzo) in this publication (and not only this one) opens the subject of the archeology of air, in particular in relation to the Second World War.

Along with the occasional scientific initiative (which are subjected to the same ministerial authorizations as the prehistoric, classical and medieval sites) the archeological sector of the First and Second World Wars is polluted at a national level by the uncontrolled universe of treasure hunters, memorabilia seekers, and metal detector enthusiasts who subtract from the collective heritage materials which are removed from their context and end up in private collections. This is a scourge which, in order to be eliminated, requires an increased awareness of the archeological importance of this historical evidence which rarely and only formally, receives recognition as part of the national archeological heritage (*and paradoxically, only when the intention to deal with it using archeological research methods are expressed explicitly!*).

The Roman amphitheatre at Durres has all of the potential for information of the monumental areas of classical antiquity in the centuries following the Roman era. The paper dedicated to the epigraphical aspects of the complex of Santa Maria di Betlem in Sassari demonstrates how the wall surfaces represent palimpsests of graffiti that are extremely informative.

The Calabrian territory of Briatico (Vibo Valentia) has been studied with a diachronic, global approach, while one of the other articles analyses the complex of post-medieval rock graffiti in the Val Brembana (Carona, Bergamo), which documents the history of transhumance from the Po River valley to the Orobie Alps.

The last paper in the review highlights the way in which ^{14}C, even in post-medieval chronologies can represent a decisive component in the dating process.

The liveliness of the thematic and methodological approaches opens innovative new pathways for research and consolidates and broadens the areas of research (*Conflict Archaeology*) that are recent and less recent (Urban and Territorial Archeology) with a broad European and intercontinental perspective and with this issue establishes a new and significant stage of growth and development for post-medieval archeology in Italy.