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The Marzamemi Maritime Heritage Project: from the seabed to the museum and beyond

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Abstract

The Marzamemi Maritime Heritage Project is a collaborative excavation, survey and heritage management initiative along south-east Sicily focusing on long-term structures of human interaction from prehistory through classical antiquity and up to the present. Situated between west and east, south and north, this corner of the island provides a vantage point for varied material manifestations of connectivity across millennia. Between 2013 and 2019, the project launched new investigations of the 6th-century AD Marzamemi 2 wreck (also known as the 'church wreck'), which was originally explored by Gerhard Kapitän in the 1960s. The vessel sank while carrying perhaps 100 tonnes of prefabricated architectural elements – column shafts, capitals, bases and other decorative furnishings – in part intended to decorate a church. The project simultaneously aims to re-embed this and other local maritime heritage within the broader context of countless journeys along this shore. Through survey of historic maritime material culture alongside innovative museum development and immersive exhibits, we juxtapose ancient ships with still older and more recent heritage at the heart of this 'Middle Sea'. In doing so, we aim to broaden 21st-century maritime archaeology in a way that leverages the past for new and challenging engagement with contemporary mobility and human connectivity.

The Marzamemi Maritime Heritage Project brings together survey, excavation, documentation and valorisation of heritage along the shore of south-east Sicily. Spanning the underwater and coastal remains of the maritime past, this work focuses on long-term structures and dynamics of human interaction with and across the sea, from antiquity up to the present. By embracing a holistic view of the material record, the project aims to explore the interrelated facets of maritime lifeways within the context of an intensely connected but ever-changing Mediterranean world. Sicily's south-east corner provides a particularly useful vantage point for such examination and a microcosm of broader maritime phenomena. This broad remit reflects the inspiration of our major partner throughout most of the project, Sebastiano Tusa, who challenged archaeologists to engage more deeply and meaningfully with the entire maritime material record, but also to prioritise preservation and outreach alongside academic research, and to aid local communities as they build stronger connections to their maritime past. The project at Marzamemi represents an ongoing collaboration between Stanford University, the Soprintendenza del Mare and Università degli Studi Suor Orsola Benincasa di Napoli, with the support of Brock University in Canada, the Institute of Nautical Archaeology and several other local and international partners. Together, these organisations have provided the wide range of logistical, technical, scientific and financial assistance and expertise that made possible the growth and expansion of the project over the course of seven years of intensive archaeological and heritage fieldwork between 2013 and 2019.

On the seabed: excavating the Marzamemi 2 shipwreck

Situated at the crossroads of the central Mediterranean, linking north and south, east and west, the well-travelled coast around Marzamemi has been scientifically explored

by many different scholars whose contributions span more than six decades. The early work by Gerhard Kapitän and collaborators during the 1960s and early 1970s in particular helped bring to light the area's many wrecks and other submerged historical sites.[1] Over the long history of work, his and others' efforts have resulted in a large and still growing maritime archaeological dataset, especially for the trade in marble and other monumental building materials. With two large wrecks at Marzamemi dating to the Roman and late antique periods, and a third – among the largest ancient cargos in the Mediterranean – just a few kilometres away at Isola delle Correnti, this concentration offers an unusual opportunity to explore one of the most extraordinary achievements of maritime activity in the ancient world.[2]

Because of its potential to shed light on changing dynamics of the late phase of this trade in architectural stone, the famous 6th-century AD Marzamemi 2 shipwreck provided an initial focus for the project's annual fieldwork campaigns from 2013 (Plate 5.1). In his original explorations, Kapitän had recovered dozens of fragments from column shafts, capitals and bases, as well as other carved stone elements bearing the distinctive form of furnishings for an early Christian church.[3] It was from these finds, and especially the suggestion that they reflected an essentially complete decorative programme for a church, that the site earned its popular moniker as the 'church wreck'. The seductive narrative of a prefabricated church sent out at imperial behest for assembly somewhere in Justinian's (r. 527–565) recently re-conquered provinces of the west has long held appeal. It fits conveniently in the model of a disintegrating late Roman empire, one in which such a wealthy assemblage might only be possible through the direct and timely investment of the imperial centre. A standardised set of architectural components is then taken to signal not merely imperial investment and the promotion of political unity, but the imposition of prescribed liturgical practice tied to a standard architectural form.[4]

The shaky foundation on which this longstanding narrative is built, however, has become evident thanks to new and more diverse finds from recent fieldwork campaigns.[5] In the process, new questions have been raised to recontextualise the wreck within a more nuanced understanding of the complex trajectories of change during late antiquity. Does the shipment reflect a complete architectural and decorative kit for the furnishing of a specific church? In other words, is the Marzamemi 2 assemblage best read as a 'church wreck' or a less complete and circumscribed shipment that contained some parts of a larger building programme? Should the cargo be understood within the context of rebuilding Justinian's empire or could it reflect local rather than imperial initiatives in the late Roman west? How was transport arranged, and what sort of ship and crew were charged with this expensive investment? Where does this wreck fit into broader models of routine human interaction with and across the sea? How can new methodologies of site recording and artefact modelling enhance our understanding of the objects and formation processes that mark this impressive assemblage? And how might we use the site's intriguing story, as well as its monumental cargo in physical and virtual form, to engage the public most effectively in understanding the Mediterranean's deep history of maritime connectivity from earliest antiquity to the present day?

Situated at a depth of only 4–8 m, the wreck site is easily accessible to divers and even snorkelers, a feature that would have facilitated salvage efforts following its untimely landing on the seabed as well as illicit interventions over the last century.[6] Through partnership between the Soprintendenza del Mare and local authorities and individuals, important efforts have been made in monitoring and protecting while also ensuring public access to such sites along this coast. The shallow depth also results in a dynamic seabed environment that has affected both the distribution and preservation of individual objects. Many artefacts toward the edges of the main central sandy area became deeply buried beneath rock and debris that fell from the surrounding reef; certain parts of the cargo that came to rest on this shallower reef feature to the east were pushed into several east–west gullies, and still other small finds were scattered and dispersed toward the west from the main concentration. Renewed investigations starting in 2013 took up from the central area that was the major focus of Kapitän's investigations, working over several seasons outward toward the reef ledge to the east, south and then north, as well as through the three major gullies atop this eastern reef. The results suggest that the ship may have run aground on this shallow feature, which was probably even closer to the water's surface in late antiquity, dropping some parts of the cargo before coming to rest just to the west. Excavations into sealed contexts along the southern limit of the main site provided evidence, in the form of metal concretions attributed to the hull, indicating that some part of the ship may have settled and disintegrated here. Survey around the site has identified scattered smaller artefacts in the wreck's immediate vicinity, particularly to the south-west and therefore likely shifted by the dynamic sea. No evidence has yet been uncovered for the jettison of cargo or the deployment of anchors in an effort to prevent running aground.[7]

These observations on formation processes and dynamics may be tested through reconstructions and environmental modelling based on a full 3D recording of the seabed. The ScubaLibre system developed at Università degli Studi Suor Orsola Benincasa di Napoli was adapted to the needs of the shipwreck investigation beginning in the 2015 season. This 3D underwater survey system involves stereophotogrammetry based on calibrated image capture from video using specially designed software that generates efficient and accurate recording ranging from the individual object to the large-area topography spanning the site and its

Figure 5.1. Fragmentary decorated panel from the ambo, modeled using 3D structured light scanning (Sheila Matthews).

surrounding environment.[8] Such modelling should allow more secure insights into the initial wreck deposition and subsequent long-term site dynamics, offer more detailed contextualisation of Kapitän's earlier interventions, and aid in physical and virtual reconstructions of the site's topography and material remains for interactive display (on which, see below).

The vast majority of objects discovered on the site belong to column shafts, Corinthian capitals and bases produced in the distinctive grey-streaked white marble from the quarries on the island of Proconnesos near Constantinople.[9] Kapitän's counts of the more diagnostic capitals and bases led him to hypothesise 28 of each element, which he believed represented the materials for a colonnade c. 4.25 m high that lined the nave of a basilica-style church. His discovery of deeply carved elements in a mottled green stone – the famous Thessalian *verde antico* – pointed to a large ambo, or pulpit, composed of 20 major pieces bearing heavy and detailed borders framing crosses (Fig. 5.1). Perhaps a dozen thin white marble panels decorated with simple crosses, christograms, and ivy were matched by thin one-piece pier-colonnettes featuring stylised capitals; together these components were seemingly intended for assembly into a chancel barrier that separated the sanctuary from the nave.

Up from the depths: rethinking the Marzamemi 2 shipwreck

Recent discoveries of additional elements – especially new capitals and bases – do more than simply expand this dataset and cargo size, now accounting for perhaps 95 tonnes of stone; they force a new reckoning of the intended architectural project and, by extension, a rethinking of assumptions surrounding the shipment's economic, political and religious context. As many as 35 capitals and 32 bases reflect far more than could reasonably line the main nave of such a church, suggesting that the story behind this 'set' might not be so straightforward. Unfortunately, the dynamic marine environment has also resulted in breakage and erosion of the elements, making accurate counts of objects like the long column shafts and thin chancel screen panels impossible for the moment. This condition also complicates any attempt to determine whether all fragments ascribed to a basic category of element represent a single uniform set. For example, is there just one set of identical column shafts, or might they exhibit some variation in size that could indicate a second distinct group intended for a separate purpose like an upper gallery, a narthex or another project entirely? Slight differences in the placement and execution of borders and decorative motifs on the chancel screen panels are to be expected, but other hints at variation in their numbers and sizes may indicate a more complicated layout or another intended installation.

These differences among individual elements are mirrored in differences between groups of elements. The various architectural pieces were transported in different states of production, from the somewhat less carved shafts and bases to the rather advanced capitals and panels, and the nearly complete decorative surfaces on the components of the ambo.[10] Some limited amount of additional work beyond rote assembly was anticipated at the local building site, wherever local might have been. This would have involved trimming and fitting together of ambo pieces as well as the various panels and corresponding pier-colonnettes. Slight variations in the individual dimensions of shafts, bases and capitals likewise imply some trimming to ensure their (more-or-less) uniform total height in a series, but these elements were at least ready for installation upon arrival. Other 'finishing' work – final stages of smoothing and polishing, installation of revetment and flooring and other decorative programmes – would have depended on aesthetic and economic choices made by patron and builder, and perhaps required additional orders and shipments. Small finds from recent seasons may in fact suggest such decorative work was associated with later building phases. Small lumps of golden orpiment and red-orange realgar, related compounds of arsenic, stand out. These minerals were used regularly in pigments for late antique painting, but also for purification according to the Roman encyclopaedist Pliny the Elder (*NH* 34.56). Chunks of raw brown glass could have found any number of uses in a building programme, from inlay to lighting fixtures.[11] A pair of small and thin pieces of polished green porphyry (*serpentino*) likely served not as *opus sectile* inlays, as their shape would seem to indicate, but rather as

samples to aid the recipient in appreciating their aesthetic properties when considering plans for future adornment.

While this architectural and decorative cargo speaks for a shipment of goods destined for elite construction, recently excavated artefacts have begun to reveal the lives of sailors and perhaps their own private commercial initiatives. Kapitän's reports include some number of transport amphoras, which were then assumed to reflect crew provisions, loaded at the ship's point of origin and restocked as necessary along the final journey.[12] Larger numbers of these jars, however, are now evident, especially as a result of investigations deep within the crevices beneath debris and large rocks along the southern edge of the site. The vessels themselves are fragmentary, but well over 70 mostly intact lids belonging to Late Roman 2 (LR2) amphoras suggest that they contained not merely crew supplies but a secondary cargo of some processed agricultural good like oil or wine, probably from the Aegean. How this likely commercial load found its way on board a ship otherwise dedicated to the movement of stone for elite construction is perhaps best explained by opportunistic sailors who took advantage of the empty space and spare tonnage that must have been routine for vessels contracted as a whole to carry dense and heavy loads.[13] Their ability to take on board an additional cargo, perhaps *en route* during a call to port as the ship sailed around mainland Greece, speaks to the broader commercial worlds that intersected within this vessel and perhaps the need to think in more complex network terms when approaching how such assemblages are formed. Fragmentary glimpses of these individuals and their lives at sea appear in assorted storage vessels, cooking pots and serving wares brought to light in these recent campaigns. Remains of the galley assemblage suggest shared habits of food preparation and dining during this final journey, and once again a far-flung network of past interregional voyages by this and the many other ships that tied together the late antique Mediterranean.

The ship charged with carrying this massive cargo has long been associated with the elusive *navis lapidaria* mentioned by Petronius (117.12), imagined as a heavily built vessel specifically designed to transport stone cargoes.[14] But the scant preserved evidence suggests that this hull was not dissimilar to the routine vessels that carried any other goods around the late antique Mediterranean. The shallow and dynamic environment resulted in poor preservation of hull remains, and even in the 1960s Kapitän recorded just disarticulated 'splinters' of wood from the site.[15] But indirect clues are provided by the concreted shells of hundreds of iron nails and other fasteners. Larger concretions suggestive of bolts in multiple sizes may have attached the keel, frames and external wales. Clenched nails sheared at a generally consistent length offer proxy evidence for the planking thickness of a vessel that compares well with construction features and proportions of other large ships of approximately 30 m in length. The persistent challenge of shipworm (*teredo navalis*) is evident in patches of lead sheathing secured with small tacks, and in the scant wooden fragments riddled with worm casings. Such patching indicates that this final journey was the last of many, in which the ship had probably carried cargos of not only stone but other routine goods as well.

No single object or class of objects can fully define the ship, its final voyage or its place in the broader socioeconomic world of late antiquity, nor does the archaeological record preserve the complete story. Nonetheless, the wider array of clues now available outline the narrative of a ship and crew with a long and busy life on the sea before they and their monumental stone cargo met misfortunate off this Sicilian coast. Their broader – direct and indirect – networks extended from around the Aegean and Sea of Marmara to Cilicia or Cyprus, the Levant and Egypt, and across to the central Mediterranean including North Africa. In the last voyage, undertaken during the early 6th century, these networks most likely converged on Constantinople, where a group of profit-minded sailors with the right-sized ship accepted a contract to carry nearly 100 tonnes of decorative stone bound for a centre of some size and wealth in the west.

To the museum: narrating the maritime past in new ways

Situating the Marzamemi ship in a broader context of diachronic regional connections has been a key concern of the project since its inception; indeed, this goal was conceptualised in part as a means of bringing not just one shipwreck but the entire rich archaeological heritage of this distinctly maritime corner of Sicily into deeper and more meaningful contact with local residents and tourists alike. Through ongoing conservation and research on the artefacts from this site alongside innovative approaches to engagement in diverse public venues from traditional museum venues to pop-up exhibits and underwater heritage trails, the wreck becomes just one centrepiece for highlighting Marzamemi's deep historical ties to the sea and the peoples beyond.

Research and laboratory work on the site take place at the Palmento di Rudinì, a restored late 19th-century winery perched on a bluff set back from Marzamemi's town center (Fig. 5.2). This community space has been designated as a local Museum of the Sea, creating a centre for display of the ancient and historical maritime past of south-east Sicily. The building's slow transformation over the years has nonetheless allowed it to retain its identity as a local gathering place – for receptions, talks and small events – while also permitting the bottom-up assembly of collections representing the varied material remains of everyday life here since antiquity. Not surprisingly, the maritime dimensions are particularly evident in basket-shaped fishing traps and ceramic amphoras, the latter covered with marine concretion from

Figure 5.2. Central hall of the restored Palmento di Rudinì (Ken Trethewey).

centuries beneath the sea. Where machinery and vats once held the Palmento's vintages, archaeological objects are now displayed in a mix of vignettes into the multi-layered past of the town where even the export-driven wine industry was focused on connections across the sea. Along the side aisles, ceramics, stone and other materials from the wreck undergo conservation, 3D scanning, cataloguing and analytical work. Local partnerships have allowed the concreted metal finds to be imaged, and new analyses of degradation of the stone materials can help us to understand the depositional and post-depositional processes that affected them and to plan for their long-term conservation.[16]

Nearly all of the major architectural elements raised in recent campaigns on the site have been recorded using an Artec Eva structured light scanner, which rapidly collects data from which accurate, textured 3D models can be generated for study with far greater ease than a one-tonne column, whether in or out of the field (Fig. 5.1). Moreover, when extended to the architectural finds raised in the previous work by Kapitän and now stored in the Archaeological Park of Neapolis in Siracusa, this analytical modelling allows us to reunite virtually, and to view as a whole, this assemblage which has been apart for a half century.[17] The approach offers an opportunity to explore critical questions within the architectural cargo from new angles. For example, systematic comparison of models of fragmentary chancel screen panels, which exhibit certain differences in dimensions and placement of decoration, might help to determine whether these reflect the expected variation within a large set produced by many workshop hands or might be better assigned to multiple sets or features. Digital manipulation of large and small column fragments provides a convenient path toward reassembling these puzzle pieces to determine questions of standardisation in form and decoration as well as production techniques. The 3D models can help detect levels of carving and surface preservation, aiding in conservation planning as well as interpretations of the changing seabed over the centuries. They likewise provide the raw data for virtual – and eventually perhaps also real – reassembly of elements into their intended architectural and decorative features.

The Palmento offers countless possibilities for incorporating these 3D models into museum display and public engagement. The starting point lies in the Marzamemi wreck assemblage, and already the space has provided opportunities for outreach to tourists and student groups, including a vibrant locally run archaeological summer camp that challenges youths to gain first-hand experience exploring and documenting Sicily's rich marine resources as a path toward preservation.[18] The conservation and analysis of finds from an underwater context reflects a long and slow process. We have therefore been engaged in the development and implementation of several small-scale exhibits that can more immediately bring to the public themes and finds from the wreck: for example, the carved Corinthian capitals could provide a framework for telling the story of the cargo's assembly, transport and loss. Recreated virtual environments surrounding a series of capitals might recall the voyage of a single object from its quarry on Proconnesus or workshop in Constantinople, to its loading on a merchant ship, to its loss on this shallow seabed, archaeological recovery and preservation, and imagined assembly in a basilica structure had it reached its final destination. Even such basic and preliminary staging allows the complex stories of this shipwreck to become immediate and powerful tools for public engagement and local investment in maritime heritage.

But the potential for innovative storytelling about the site goes further than individual objects. Survey in 3D of the Palmento's ground floor and cavernous underground has allowed us to generate polygonal and NURBS models to support future immersive digital installations drawing on the features and environments of these many spaces. The eventual exhibition design for the architectural elements from the 'church wreck' will be carried out using parametric modelling procedures, through which various possible solutions can be easily proposed and modified (Plate 5.2). Display might integrate typological details from known basilicas

(such as those around the Adriatic and in North Africa), marble elements preserved from the shipwreck site, digital models of scanned column shafts, capitals and bases, and the existing layout of the Palmento, itself having a basilica form with central nave and side aisles. These approaches allow us to present to the public different possibilities of the architectural cargo and facets of the shipwreck story. Beneath the central display area, in the underground tunnels that once stored wine, visitors might fully 'immerse' themselves in the site as if descending into the underwater environment to join in the virtual exploration of the textures, colours and sounds of the sea floor first during the shipwreck event and later as part of its archaeological recovery. Such possible new experiences extend also to the real underwater environment, where we aim eventually to utilise the detailed scans of the site topography and individual objects to stage full-scale replicas of some major architectural elements on the seabed. The fostering of a new resource for recreation and tourism – part of the ongoing 'open museum' of local dive trails for which Italy is well known – reflects not only the imperative to give back to a community of divers and snorkelers that has strongly supported protection and welcomed scientific investigations of underwater cultural heritage through its partnership;[19] it offers an opportunity as well to promote sustainable local economic development around this vital maritime heritage.[20]

And beyond: engaging a broader and more challenging maritime heritage

Even with this more complex story and varied spaces for engagement, the lost stone cargo of the 'church wreck' reflects just one facet of a longer and deeper maritime past of south-east Sicily. Large-scale survey and targeted semi-structured interviews with local residents and visitors underscore the more flexible perception and multifaceted nature of maritime heritage captured best in the mixed assortment of objects of daily life that have come to fill the Palmento. These objects and the public consciousness of past seafaring connections go far beyond just the traditional archaeological focus on ceramic amphoras and the commercial networks they illustrate.[21]

Locals point to the appeal of sandy beaches, nature preserves and fish restaurants that pull tourists to this still comparatively quiet corner of Sicily, while also recognising the enduring power of the sea. They recall Athenian vases found across the island, with stories that depict Homeric heroes who venture from Asia Minor to Sicily in the aftermath of the Trojan War. Historical conflicts that set the course for the rising and falling empires of the Athenians, Carthaginians, Romans, Arabs and Bourbons remain similarly present in the local consciousness: from imagined rams of Athenian triremes off Siracusa – like the warship prows celebrated in their recovery off the Egadi Islands[22] – to the cannons of early modern naval engagements and the aging gas masks, grenades and other memorabilia from Second World War landings. For three millennia migrating tuna offered a critical economic resource, now visible in the fish-salting factories (*tonnare*) of Hellenistic, Roman, Early Modern and recent times at Vendicari, Marzamemi and Portopalo di Capo Passero.[23] Artisanal tuna products recall the town's most recent ventures, even if few of the distinctive wooden fishing boats from the traditional trap fishery (*mattanza*) remain. The future of this historic link between the town and its seasonal offshore tuna stocks has become less certain with each generation since the expansion of mechanised fleets. The boats arriving ashore today tell a darker chapter in this ongoing Mediterranean maritime story, as political, social and economic upheavals have displaced hundreds of thousands, leading them to embark upon perilous voyages. South-east Sicily is once again central, as it has been in each of these earlier connections, bearing witness to the continual remaking of the Mediterranean through the movements of its peoples.

This most recent manifestation of movements across the sea can be viewed within the same maritime context of continual connections that gave rise to the ancient shipwrecks of commerce and the industrial facilities of tuna fishing, each of which provides an easier fit with popular notions of 'heritage'. Taking a long-term perspective on the ideation of the maritime landscape provides a challenge and opportunity for public engagement with the complexity of the central Mediterranean story. As a first step in this direction of broadening maritime cultural heritage, we staged in 2018 and 2019 a series of interactive temporary multimedia exhibits in and around the town squares of Marzamemi and Portopalo di Capo Passero during the busy summer evenings from late July through early August (Fig. 5.3).[24] Under the title of *Attraverso il Mediterraneo|Through the Mediterranean*, this exhibit brought visitors aboard stylised boats that recalled the 'church wreck', a vessel of prehistoric exploration and a fishing boat from the *mattanza*. Augmented with sound and video as well as a purpose-designed app, each boat's immersive journey evoked a particularised maritime experience; the 'church wreck' featured excavation and research processes using video of the underwater site, images and models of objects, and the sounds of early Byzantine chant interspersed with stone quarrying, stormy seas and excavation dives. This 'pop-up' approach offers a new framework for engaging a broad sector of casual visitors in a deeper dialogue about the sea and its human connections, from antiquity through the present day.

With excavation now completed on the ancient shipwreck that helped to launch the project, our archaeological efforts have shifted to consider this larger trajectory of maritime heritage and seaborne interaction, and especially the more recent histories of fishing and migration that continue to leave their local mark. In 2019 we were able to begin recording, using laser scanning and photogrammetry, of

Figure 5.3. Community discussion at one of the 2019 pop-up exhibits in Portopalo di Capo Passero (Elizabeth S. Greene).

the *tonnare* and their associated wooden fishing vessels at Marzamemi and Portopalo di Capo Passero. We are now gathering stories and images from interviews and archives of the last practitioners of the *mattanza* in an effort to bring these spaces and histories back to life, as a tool and resource for local stakeholders aiming to preserve and revive traditional sustainable techniques of fishing and dining.[25] At the same time, a complete programme of photography, laser scanning and archaeological documentation aims to preserve a digital record of human experiences as well as the public reception and curation of controversial heritage surrounding recent migration. In these ways, local maritime heritage can reflect not one distant or privileged or comfortable past, but the many different connections with the sea that have made south-east Sicily central to the Mediterranean's complex human story.

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Notes

1 Among the many reports on investigations along this coast, see generally Gargallo 1958–1959; Gargallo and Casson 1962; Kapitän 1965; Throckmorton and Kapitän 1968; Throckmorton and Throckmorton 1973; McWilliams *et al.* 1977; Parker 1979a; 1979b; 1980; 1981; 1985; also below n. 2. Most recently see Felici *et al.* 2020 for remains of activities along the shore related to marine resources.

2 Kapitän 1961; 1971; Parker 1981, 317–320; 1992, 219, 266–267; Russell 2013b, inv. 28, 44, 46.

3 See generally Kapitän 1969; 1980.

4 *E.g.*, Parker 1992, 267; van Doorninck 2002, 899; Castagnino Berlinghieri and Paribeni 2015, 1035–1036.

5 Russell and Leidwanger 2020; Leidwanger *et al.* forthcoming.

6 In evaluating the completeness of the architectural assemblage, it is important to note the difficulty of casually raising heavy stone objects, particularly larger finds like column shafts. Even so, the numbers of stone elements recorded by Kapitän and our own investigations should be understood as minimums, which do not account for any finds potentially removed in antiquity or more recently: Kapitän 1980, 97 n. 17 and 117 n. 41; Leidwanger and Tusa 2016, 130. See also Barsanti and Paribeni 2018, 46–47; Paribeni 2020, 222–223; and more generally Parker 1979a.

7 On jettison and the Lex Rhodia, see Mataix Ferrándiz 2017; Hirschfeld 1990 discusses the normal practice of ships carrying multiple anchors and the dropping of anchors to prevent shipwreck.

8 Repola *et al.* 2015; 2018.

9 Leidwanger *et al.* 2018. Scott Pike of Willamette University is responsible for compositional analysis of the stone cargo.

10 For descriptions of the stages of work, see Russell and Leidwanger 2020.

11 Analysis of the glass is being undertaken by Ian Freestone of the University College London Institute of Archaeology.
12 Kapitän 1969, 133; 1980, 123.
13 Fant 2012. On extra space, see Throckmorton 1972, 76; Russell 2013a, 130.
14 Beltrame and Vittorio 2012; Russell 2013a, 129–131; Tusa 2015; Nantet 2016, 189–190.
15 Kapitän 1969, 132–133; 1980, 118–119, n. 42.
16 Diagnostic X-ray, fluoroscopy, and CT scan imaging were kindly undertaken by the Radiology Unit of the Fondazione G. Giglio of Cefalù, to which many thanks are owed.
17 We are grateful to the late Calogero Rizzuto, then director of the Archaeological Park of Neapolis in Siracusa, for permission to undertake 3D scanning and analysis of the Marzamemi materials from the Kapitän investigations, which were initiated in February and March 2020.
18 The highly successful program 'Un' estate da Archeologo' is run by archaeologist Laura Falesi.
19 Melotti 2007; Alves 2008; see also the Soprintendenza del Mare's 'Itinerari e siti archeologici subacquei': http://www.regione.sicilia.it/beniculturali/archeologiasottomarina/itinerari.htm.
20 MacKintosh 2019.
21 Surveys were conducted in collaboration with Alessandro Arangio, who also undertook interpretation of the results. Madeleine Ota undertook interviews as part of research toward an honors thesis at Stanford University. We are grateful to both for their efforts on this aspect of the project.
22 Cf. Tusa and Royal 2012; Royal and Tusa 2019.
23 Li Vigni 2008; Felici 2012; 2018; Felici *et al.* 2020; Repola *et al.* 2020.
24 The Whiting Foundation, in the form of a Public Engagement Fellowship, provided support for this unconventional project to be developed and implemented.
25 Repola *et al.* 2020.

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