The Sixth-Century CE Shipwreck at Marzamemi

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IN MEMORY OF SEBASTIANO TUSA

Between 2013 and 2019, collaborative survey and excavation were carried out on the sixth-century CE shipwreck at Marzamemi, in southeast Sicily, originally explored by Gerhard Kapitän in the 1960s. The vessel sank while carrying a primary cargo of nearly 100 tons of extensively prefabricated architectural materials, at least some intended for a church. New finds raise questions about the prevailing narrative of the wreck as emblematic of a stagnating Late Antique economy, revived only briefly by Justinian. Large but uneven numbers of worked stone elements complicate assumptions regarding their employment as a single set, while additional decorative materials suggest networks of artistry and agency that transcend a single journey. A smaller secondary cargo of amphoras, along with galley wares and other finds, reveals the extended commercial webs of this merchant vessel and its sailors. Considered together, the assemblage highlights the interdependence and blurring of boundaries between high-end and more mundane exchange. This report offers a new reading of the well-known Late Antique wreck and a more nuanced evaluation of the goods, people, and processes that tied together the Mediterranean during a transformative period toward the end of the Roman empire era.[1]

INTRODUCTION

The maritime transport of heavy stone is, as Fant remarked, "an improbable phenomenon."[2] As such, it is a particularly useful index of the connectivity

[1] This fieldwork and research have been supported by many organizations that deserve our deep appreciation: National Endowment for the Humanities (Collaborative Research Grant #RZ-249777), Loeb Classical Library Foundation, Institute of Nautical Archaeology, Archaeological Institute of America (Cotsen Excavation Grant), International Catacomb Society (Shohet Scholars Program), Honor Frost Foundation, Dumbarton Oaks, Stanford University (Department of Classics, Archaeology Center, Dean of Humanities and Sciences, Vice Provost for Undergraduate Education), Brock University, Loyola University Chicago, El Cachalote Diving, Sicania Chimica, and the Comune di Pachino. The professionals, students, and volunteers who contributed their efforts are too many to name here, but we single out Giuseppe Avola, Matteo Azzaro, Nick Bartos, Tiziana Fisichella, Andrea Gobbi, James Gross, Sheila Matthews, Asaf Oron, Rachel Stark, Ken Trethewey, and Sarah Wilker. Special thanks are owed to Sebastiano Tusa, Adriana Fresina, Valeria Li Vigni, Leopoldo Repola, Nicolò Bruno, Fabrizio Sgroi, Salvo Emma, and Calogero Rizzuto. We thank also Ian Freestone, Mark Hammond, Kaelin Jewell, Archer Martin, Scott Pike, Paul Reynolds, Ben Russell, Agnes Vokaer, and Marc Waelkens for discussion and analysis of materials, as well as the Editor-in-Chief Jane B. Carter and the anonymous reviewers for the *AJA* for their careful critique. Photographs are courtesy the Marzamemi Maritime Heritage Project unless otherwise noted; underwater images taken by Greene, Matthews, and Laura McPhie. All objects raised since 2014 are currently kept at the local museum in Marzamemi.

[2] Fant 1988, 147.

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achieved under Rome. Shipwreck cargoes, some of several hundred tons, are dramatic markers, and their concentration along the coast of southeast Sicily underscores the strategic role of these interregional movements in tying together the empire.[3] But these networks extended beyond the imperial monuments and elite tastes that first generated them to include, for example, marble-clad surfaces in Pompeian bars.[4] Viewed in the context of ebbing and flowing connectivity, the persistence of the stone trade well beyond the imperial heyday underscores the durability of networks into Late Antique centuries more often associated with fragmentation than integration. Cassiodorus describes the movements of new and spoliated marble, and sometimes also of stoneworkers, at the behest of Gothic rulers and other local elites.[5] The *Miracles of St. Demetrius* includes plausible details of the procurement of eastern marble by bishops in North Africa and Gaul.[6] These loads moved by ship and cart along with imperial officials, ecclesiastical envoys, armies, migrants, craftsmen, and merchants who connected the Mediterranean.[7]

With its cargo of extensively prefabricated columns, capitals, bases, and other decorative furnishings, the early sixth-century wreck at Marzamemi (fig. 1) stands as an usually late example in the history of such shipments.[8] From its discovery and initial presentation, the Marzamemi 2 wreck, also known as the Church Wreck, has been strongly associated with two key figures. The first is Gerhard Kapitän, a pioneer in the development of scientific underwater archaeology.[9] Alerted to the site's presence by local authorities, he undertook survey followed by intermittent excavations over several campaigns in the 1960s and early 1970s.[10] These investigations established the site's long-standing narrative. The cargo, he argued, originated in the Sea of Marmara and Thessaly and was destined for a sixth-century edifice in North Africa, perhaps the Central Church of Apollonia, a site well known to J.B. Ward-Perkins, who advised Kapitän on the architectural materials.[11]

Kapitän connected the Marzamemi 2 wreck with the second key figure, the emperor Justinian (r. 527–565 CE). The distinctive decorative motifs on certain panels led Kapitän to this association, as did the gray-streaked white Proconnesian marble that comprised the bulk of the cargo.[12] This material was strongly linked to Constantinople through the proximity of its quarries and its large-scale exploitation for imperial building campaigns locally and throughout the realm.[13] Thus an enduring narrative was born. To Kapitän, Justinian was "a most fruitful founder of churches, palaces and other buildings throughout the entire empire."[14] He magnified the empire's opulence by building and rebuilding churches and monasteries, according to Procopius, not only in the imperial capital but throughout the empire, including recently reconquered lands in North Africa.[15] Such extensive reconstruction meant that stone and workers skilled enough to shape it were in demand and on the move.[16] The shipwreck at Marzamemi offers a tangible reminder of the seaborne interaction this activity generated.

Kapitän's narrative not only connected the wreck to Justinian; his historical contextualization imagined it could be associated only with Justinian. Programmatic imperial rebuilding was considered the only possible impetus for bulk movement of high-value materials in an era essentially equated with decline and fall. Such conclusions are perhaps unsurprising for the 1960s and early 1970s. Excavation and study of the seventh-century Yassıada 1 vessel were still underway;[17] Brown's *The World of Late Antiquity*,

[3] E.g., the Marzamemi 1 wreck, which carried an early third-century CE cargo of ca. 200 tons of Aegean white marble blocks and columns; see Kapitän 1961, 289–300; 1971, 298–303; Parker 1992a, 266–67; and the Isola delle Correnti wreck, lost in the late third or early fourth century CE with ca. 350 tons of Proconnesian marble blocks; see Kapitän 1961, 282–88; 1971, 296–98; Parker 1992a, 219; see also Purpura 2008; Tusa 2015.

[4] Fant et al. 2013.

[5] E.g., Cassiod., *Var.* 1.28, 2.7, 3.9, 3.10, 3.19, 3.29–31, 3.49, 5.8, 9.16, 10.8.

[6] Anastasius the Librarian, *Miracula Sancti Demetrii* 9.

[7] McCormick 2001, 404–10; Bjornlie 2019, 2.

[8] On Late Antique stone shipments, see Russell 2013a, 354–56; Nantet 2016, 153–60.

[9] Kapitän 1969, 1980.

[10] Gargallo and Casson 1962, 196–97. Following Kapitän's investigations, brief campaigns were carried out by the University of Bristol (1992) and by the University of Catania together with the Soprintendenza di Siracusa and the Soprintendenza del Mare (2006, 2010); see Castagnino Berlinghieri and Pariben 2015, 1034.

[11] Harrison 1985.

[12] Kapitän 1969, 127–28.

[13] Asgari 1995, 263.

[14] Kapitän 1969, 128.

[15] Procop., *Aed.* 1, 6.5 (Carthage); Paul the Silentiary, *Descriptio S. Sophiae*; Alchernes 2005; Kaldellis 2013, 348.

[16] Haldon 2005, 32–33.

[17] Bass and van Doorninck 1982; see van Doorninck 2015 for

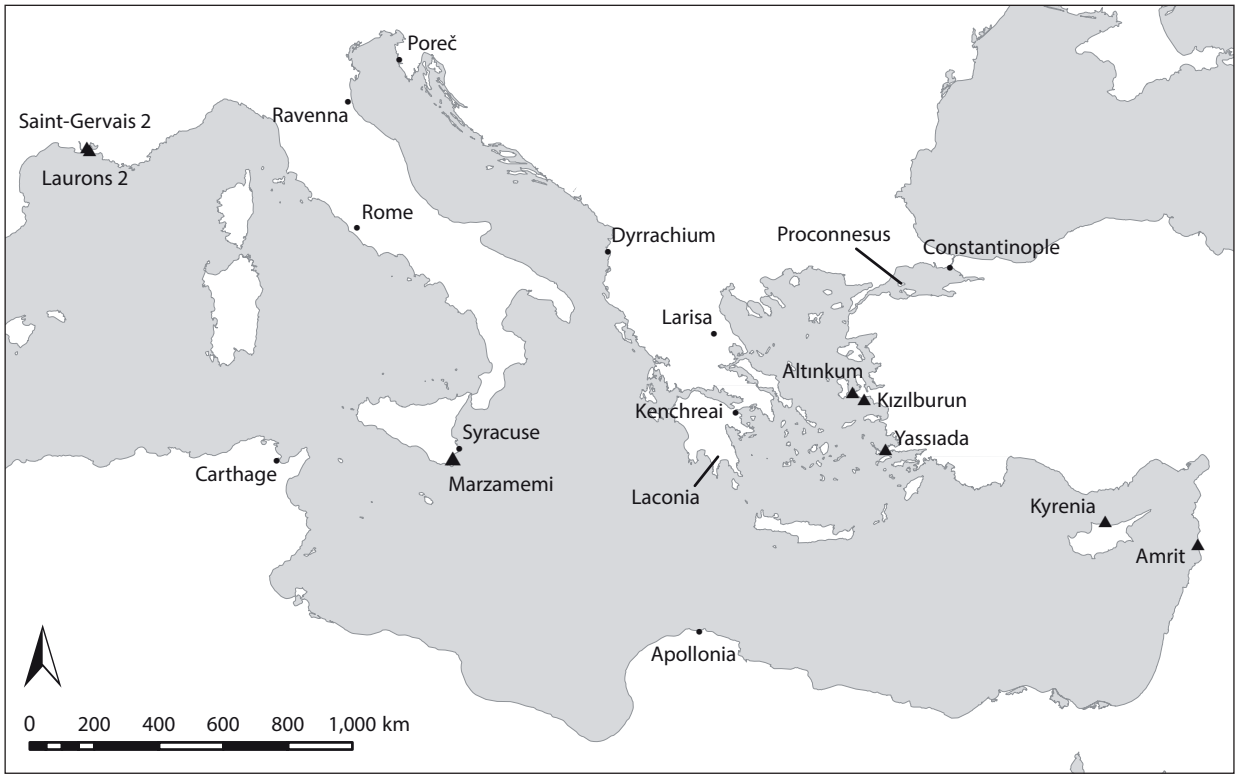

FIG. 1. Map of central and eastern Mediterranean region showing the location of the Marzamemi shipwreck as well as other wrecks and sites discussed in the text. ▲ = shipwreck.

with its holistic reassessment of the period, was only just being published;[18] and the idea of the period as one of transformation rather than decline was on a distant horizon.[19] Justinian was thought to represent a temporary arrest from a downward trajectory, and the Marzamemi wreck became the monumental exception that proved the rule. The ship's loss was a reified reminder of what Justinian tried, and failed, to do. In this ossified role, the wreck is cited with little questioning of the narrative into which it is so firmly tied.[20] Discussions have thus bulwarked old assumptions about centrality, patronage, and construction in the age of Justinian even as scholars envision more distributed agency, wealth, and interconnection across the Late Antique world beyond one imperial figure and reign.[21] The explosion of interest in connectivity's role in making and remaking the Mediterranean challenges us to assess this assemblage with fresh eyes, disembedded from the narrative that has long dominated the wreck's interpretation.[22]

To this end, new fieldwork on the Marzamemi 2 wreck commenced in 2013. This research sought not only to shed light on the famous stone architectural elements but also to situate this cargo beside the vessel and the mariners entrusted with its transport and to contextualize the entire assemblage within the broader economic, social, political, and religious world in which it operated. The project has revealed evidence for networks of seaborne interaction embedded in a thriving world of private commercial exchange that are more robust and varied than a singular connection to the imperial fisc. The stone cargo certainly included materials for a church, but the extent and patronage of the project are less clear, as is the long-presumed date within the reign of Justinian. Small finds, some mentioned by Kapitän but largely overlooked in his and

updated interpretations.

[18] Brown 1971; Wood 2013, 310–11.

[19] Pohl 1997; Ward-Perkins 2005 offers a critique, and Lizzi Testa 2017, an assessment.

[20] E.g., Durand 1999, 27.

[21] E.g., Agnello 1963; Castagnino Berlinghieri and Paribeni 2015; Castagnino Berlinghieri 2017.

[22] Horden and Purcell 2000; on late antiquity, see Wickham 2005.

subsequent discussions, reveal an assemblage that is more than simply a Church Wreck: amphoras containing processed agricultural goods for commercial sale, as well as raw glass, small stone fragments, and pigments, all hinting at decorative purchases yet to come. Marking robust links between east and west, this wreck need not symbolize a brief Justinianic reprieve from decline. Rather, it attests to a multifaceted economy that could still stimulate the large-scale movement of architectural stone along with other elite and mundane goods, and it offers a useful metric for the dynamics of Late Antique maritime connectivity.

THE 2013–2019 FIELD SEASONS

The shallowness of the seabed around southeast Sicily contributed to the complex nature of the site and the variable preservation of its material remains. It may also have enabled some degree of ancient salvage, particularly of smaller and more valuable objects.[23] Archival work by Castagnino Berlinghieri and Paribeni has revealed knowledge of the site as early as 1913; although plans to investigate it over the next decades went unrealized, awareness of the site may have led to casual intervention.[24] Stewardship by the local diving community in coordination with the Soprintendenza del Mare helped to protect the site, but the extent of illicit removal of objects cannot be fully known. The fortuitous recovery in late 2014 by local authorities of isolated marble panel fragments hundreds of meters to the west, toward shore, likely dropped or discarded after salvage, reveals the extent of ongoing interventions.[25] In response, between 2010 and 2012, plans were advanced for systematic survey and excavation. Work began in 2013 as a collaboration between the Soprintendenza del Mare and Stanford University, joined soon thereafter by Università degli Studi Suor Orsola Benincasa di Napoli (UNISOB). These seven fieldwork seasons (2013–2019) have benefited from research partnerships with Brock University and the Institute of Nautical Archaeology as well as financial and logistical support from a variety of other organizations.[26]

In open waters more than 1 km from shore, the depth of only 4–8 m also left the wreck exposed to the long-term dynamics of a powerful marine environment marked by routine wave action, northeast winds, and winter storms. Amid an uneven seabed of reef, rock, and sand, the site presents a field of dispersed artifacts extending over an area of approximately 60 by 45 m (fig. 2). Most of the architectural elements for which the assemblage is famous were found concentrated in and around a sandy depression at 7–8 m deep, the main lower site (see fig. 2, K5–K8/L5–L8) and focus of much of Kapitän's attention.[27] Aside from several large boulders, this central area is marked by loose coarse sand that shifted over the winter to fill in completed sectors following each excavation campaign (fig. 3). Such routine movement no doubt resulted in the redeposition of small artifacts, including many that seem to have trickled down to the underlying calcareous seabed. Objects came to rest in depressions within this topography, where they were continually uncovered and re-covered by sand and, in some cases, larger debris. Running north–south along the entire seaward (eastern) end of this main lower site is a long reef that rises to within 4.0–4.5 m of the surface (see fig. 2, G5–L5, and figs. 4, 5). This feature forms a vertical face along the east; at its north and south ends, falling reef and rock that buried or mixed with cultural material present a more gradual rise. Recent fractures may suggest tectonic activity. On the reef to the east and northeast lie several long gullies, narrow but sufficiently deep to preserve components of the cargo (see fig. 2, Rf1–Rf3, and fig. 6). Toward the west, the site opens onto a series of low reefs with patches of seagrass and sand, where some objects must have drifted from the main concentration.

The jumbled stratigraphy of rock and differentially preserved cultural materials attest to dynamic depositional and post-depositional processes. A new program of analysis of marble surface wear and concretion growth aims to shed light on the impact of the changing seabed.[28] On a larger scale, 3D imaging provides a baseline topography for dynamic environmental modeling across the site. Building on prior work in new technologies for heritage preservation and public engagement, Leopoldo Repola and his team from

[23] Tchernia 1988.

[24] Unpublished, but noted in Barsanti and Paribeni 2018, 46–47; Paribeni 2020, 222.

[25] Removal was also suspected during earlier investigations by Kapitän 1980, 97 n. 17, 117 n. 41.

[26] Preliminary reports have been published in *Archaeologia Maritima Mediterranea*; Leidwanger 2018 provides a summary of fieldwork through 2017.

[27] Kapitän 1980, 72–77, 73 fig. 1.

[28] Ricci et al. 2019.

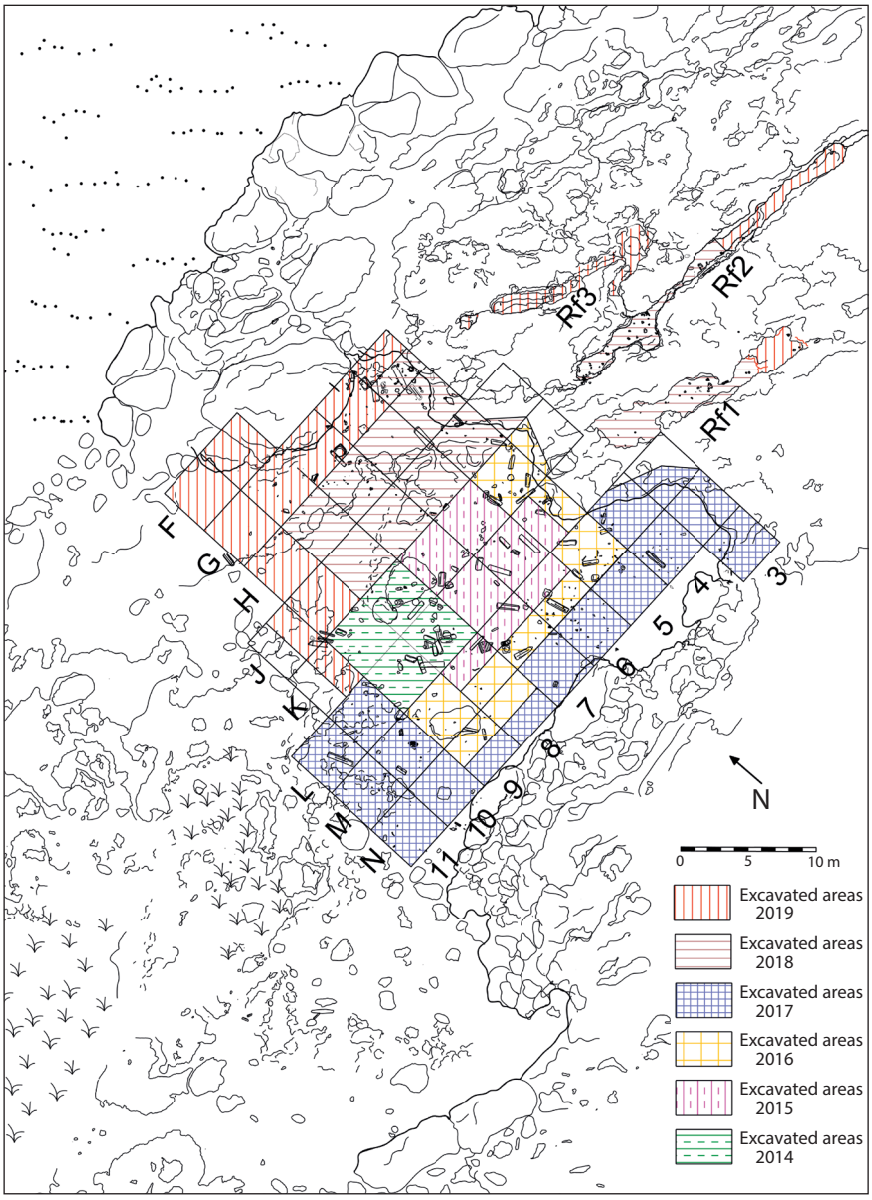

FIG. 2. Plan of the Marzamemi 2 site showing excavation grid and areas investigated by season.

UNISOB implemented a comprehensive program of stereo-photogrammetric mapping of the underwater site and its environs. Using video captured on two parallel and calibrated (GoPro) cameras and purpose-built software, this system offers an efficient and more precise alternative to mainstream underwater archaeological photogrammetry.[29] For the production of future exhibitions, the 3D data provides an essential resource for immersing the public virtually in the process of archaeology and the unique heritage of this site.

The project's initial field campaign in 2013 focused on defining the site's limits and mapping its major features and surface finds using a mix of 3D modeling, targeted photogrammetry, and traditional survey methods. Excavations from 2014 onward started in the central sandy area (K8–K9/L8–L9), proceeded across the main lower site (K6–K7/L5–L7), then moved toward the reef ledge along the east and finally to the south (M–N units) and then the north perimeters

[29] For details, see Repola et al. 2018.

FIG. 3. Excavation into the central sandy area of the main site (J6/K6) during the 2016 field season, revealing a decorated Proconnesian marble panel.

(H–J and F–G units). Work in 2018 and 2019 simultaneously covered the shallower reef areas to the east (Rf1–Rf3). The topography of the main lower site allowed a 4 m grid system to define excavation units, while a flexible baseline system suited better the irregular and sometimes restricted reef areas (see fig. 2). Back-to-back dives of 80 minutes or more each, and two staggered teams of generally 12 each ensured maximum productive time (averaging 64 work-hours daily on the seabed). As work scaled up, new infrastructure was required to accommodate a larger team in the water, and professional staff, using massive lift bags, undertook the technically demanding repositioning of rocks and boulders necessary to access different parts of the site. Over 6 to 8 weeks each season, this system allowed the team to cover more than 750 m^2 across the main lower site, as well as three areas in the reef totaling another 80 m^2. All excavated objects were taken to Marzamemi's nascent museum of the sea, established, just before the project's start, in the restored 19th-century winery, Palmento di Rudinì, that currently serves as a base for conservation and study and is being transformed into a focal point for collaborative initiatives supporting maritime heritage development.

The discrete contexts across the broad area provide various glimpses into how the ship may have been

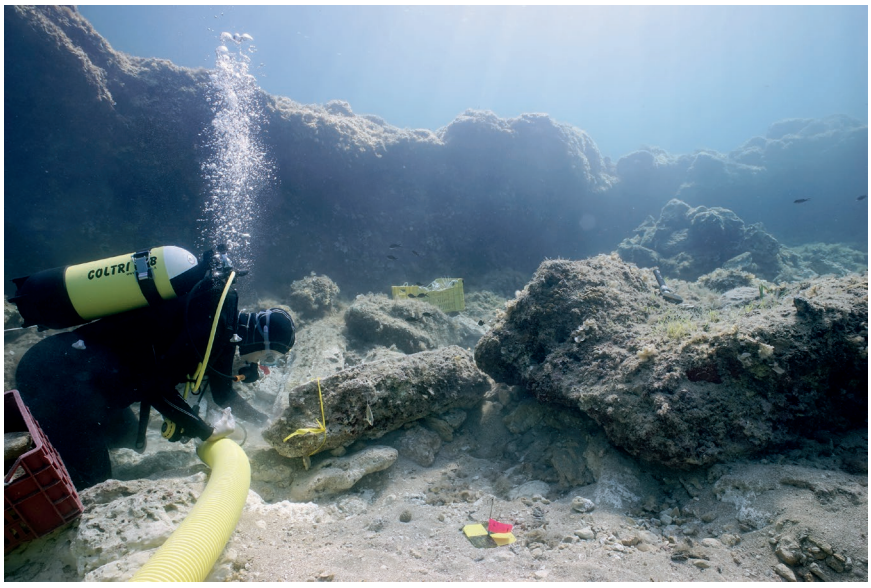

FIG. 4. Work in the southeast end of the main site (M4/M5) adjacent to the reef ledge.

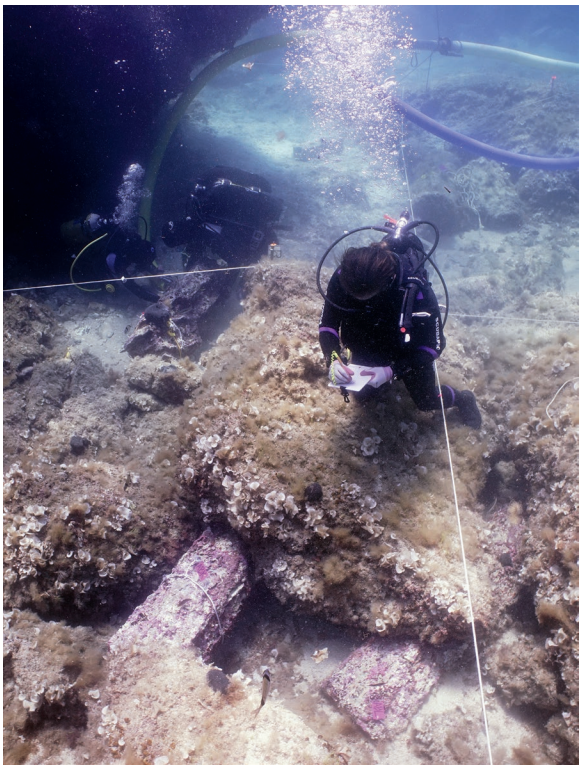

FIG. 5. Northeast corner of the main site (G5), where column shafts were buried under boulders and the overhanging eastern reef.

wrecked in this location and the subsequent processes, both natural and human, that have affected the shape of the site today. Excavating from the central area of the main site outward toward the edges served two purposes. First, it helped us gauge the nature and extent of earlier scientific investigations by Kapitän as well as possible other interventions so far not recorded. At the same time, it allowed exploration of new and likely better-preserved contexts along the edges that had remained buried under rock and were inaccessible to earlier work and casual visitors. The routine shifting of 0.3 m or more of coarse sand in the deeper areas (K8–K9/L8–L9) clearly resulted in redeposition of small sherds and chips of stone, including some larger (and occasionally intrusive) finds that worked their way down or became wedged beside more stable architectural elements (see fig. 4). From this central area of the main lower site, the seabed slopes gently up toward the east (K4–K5, L5), emerging from the sand to meet the overhanging reef ledge. Here, fallen debris had settled on top of cultural material (see fig. 5), and any finds not buried by overburden lay exposed or had been washed deep beneath the overhanging ledge (H5–J5). These were generally some of the more poorly preserved finds.

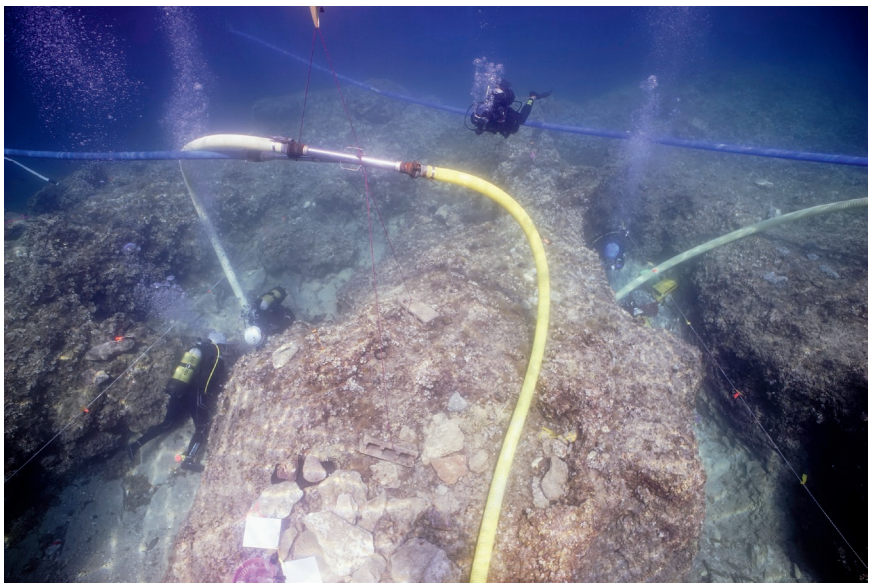

FIG. 6. View looking west across the gullies (Rf1 at left, Rf2 at right) in the east reef, with the main site below the ledge visible in the distance.

Excavations into the reef and associated debris to the north revealed a more complex topography and depositional sequence in an area entirely untouched by modern intervention. The removal of the rocky upper layer and larger boulders, often several meters in diameter, exposed sandy pockets and winding gullies with architectural stone finds. These crevices are marked by a deep stratigraphy, the excavation of which proceeded with practically no finds in the upper levels, after which cultural material was located 1.0–1.5 m down. At this depth and in the context of dense cobbles, pebbles, sand, and sediment, the major stone elements here represent some of the best-preserved architectural materials on the site (fig. 7). The excellent state and the stratigraphic context (e.g., H7–G7) suggest that these deep pockets filled rather soon after the ship was wrecked, while the worn ceramics and fragments of stone from the infill and layers above point to the gradual settling of loose and exposed materials that shifted across the site. Other finds worked their way between the larger boulders and overhanging ledge (G6–G7) before being sealed by additional falling debris from the north (fig. 8).

At the opposite end of the main lower site, systematic work southward from the sandy central area clarified the complex stratigraphy of mixed cultural material from the wreck and successive deposition of reef debris. The first few meters into this southern edge (M6–M8) brought to light ceramics, metal concretions, and both larger and smaller architectural stones. Moving south, however, the next couple of meters (N6–N8 north) contained no more large stone finds; instead, there were ceramics and small stone fragments throughout as well as metal concretions stuck to the underlying seabed. This contrasts with the situation recorded during the next campaign season a few meters still farther south (N6–N8 south), which yielded concretions only in the upper half of the stratigraphy; the lower half and underlying seabed, by contrast, were devoid of such metal finds, containing only a few ceramic sherds and small stone fragments that had trickled down into reef levels that predate the wreck. The clearest testimony of this general depositional sequence came in the form of an inverted capital under a massive flat boulder (fig. 9), below which was found no material other than the typical small fragments that found their way into crevices elsewhere. This stratigraphy draws attention to the expansive spread of artifacts, covering a larger area than identified by earlier explorations, as well as to the massive amounts of debris that subsequently buried parts of the assemblage. In contrast to the major architectural elements that dominate the central area and surrounding few meters, the density of metal concretions along this southern edge (M4–M9/N4–N9), which represent the vast majority on site, as well as related finds like small lead sheathing patches, would seem to reflect one location where part of the ship came to rest. With the accumulation of falling rock, the hull's disintegration left its more durable fasteners stuck between layers of rock and reef. Later smashed by the sea, the ceramics here worked their way around boulders and deep into the debris (fig. 10).

The last areas to be excavated were over the reef ledge in the shallower eastern part of the site, where the final two field seasons (2018–2019) focused part of their efforts (see figs. 6, 7). Three long gullies (Rf1–Rf3), each reaching up to 2 m deep and ranging from less than 1 m to several meters wide, run eastward for a distance of approximately 12 to 25 m. Investigations here allowed us to evaluate which archaeological materials came to rest at the site's seaward (eastern) edge, how they might relate to the overall cargo and shipboard assemblage, and whether their location and distribution can help us understand why the ship was wrecked. This work also aimed to provide insight into the extent and nature of earlier interventions, since certain of these deep areas in the reef (Rf1, Rf2) had drawn the attention of Kapitän in the 1960s.[30] A third area (Rf3) just to the north appears generally similar to the others. The most complete picture, though, is provided by the southernmost gulley (Rf1). Throughout this area, loose sand and larger rocks cover a thick layer of finer sand mixed with pebbles, some rock, and artifacts; the largest archaeological finds sit directly on the calcareous bottom, which lies 2 m or more below the surrounding reef's surface.

The three reef areas contained large proportions of verde antico (green breccia) fragments from one architectural furnishing, with very few ceramics or metal concretions. These concentrations seem to indicate that one part of the assemblage was originally deposited on this shallow (4.0–4.5 m) expanse. Strong

[30] The year 1965 is indicated on the plan in Kapitän 1969, 126; 1964 appears in Kapitän 1980, 73 fig. 1. Explorations were carried out in 1964, but excavation seemingly proved impossible until the following year: Kapitän 1969, 125; 1980, 74–76.

FIG. 7. Crevice near the north edge (G7), where well-preserved artifacts were found deep within the sand and debris among boulders; large base in front, and small capital and lower part of a pier-colonnette in back.

FIG. 8. Inverted base found wedged beneath the reef ledge along the north boundary of the main site (G6) following excavation of debris.

FIG. 9. Excavation of a capital (center left) buried in debris and under boulders along the south edge (N7).

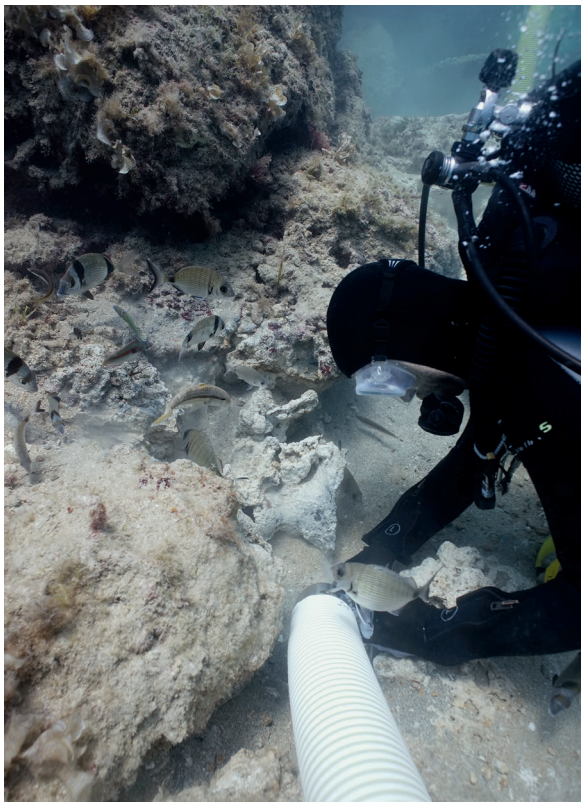

FIG. 10. LR2 amphora top and other sherds concentrated in the southern reef edge (N6).

and sometimes violent east-to-west movement of the sea then allowed these exposed objects to work their way into the three deeper gullies, where they became lodged. The ship probably struck the reef in this area, an easy misstep for a heavily laden vessel in rough waters, especially as local sea-level change suggests the reef was even shallower at the time.[31] Having deposited some of its marble cargo on the reef, the vessel then came to rest some meters to the west, where the bulk of the load fell in and around the sandy depression; some part of the ship settled along the southern edge of this main site, where it disintegrated and was buried by debris. Whether the ship and crew were deliberately heading toward shore or driven against their will may never be known.

ARCHITECTURAL AND DECORATIVE CARGO

Over the half century that separated its initial and new investigations, the Marzamemi 2 wreck became synonymous with its rich assemblage of religious architectural elements. Yet the stones decorated with distinctive Christian iconography are overshadowed by the cargo's largest component by number and volume: column shafts, bases, and capitals. These all appear to have been produced in marble from the island of Proconnesus, an identification supported through recent stable isotope analysis, although the carving itself was more likely undertaken in a nearby workshop center.[32] This stone has deteriorated underwater, with exposed surfaces extensively eroded and pitted from marine life. By contrast, elements buried beyond the loose sand, either deep within sediment toward the south and north or with surfaces embedded into the soft seabed, often retain better preserved features (see, e.g., figs. 3, 7).

Although fragmentary, the column shafts remain the most imposing features on the seabed. They were carved as single pieces, but only one apparently survived intact to its full length of nearly 3.4 m as confirmed by semifinished ends marked by collars.[33] Many additional fragments, however, provide supporting evidence for their diameters, which taper from about 0.50 m (with collar), presumably corresponding to the lower section, to 0.43 m (with collar) at the top. Concentrated around the site's sandy central area, they rarely appear in any meaningful arrangement. These shafts were cut at a horizontal orientation from the quarry face, with the result that the banding—and now deep erosion—runs lengthwise (fig. 11).[34] Where the ends are well preserved, traces of a collar can often be found, generally 1 cm thick and about 10 cm high, although whether all ends featured such collars remains unclear at this stage. This feature perhaps served as a protective measure during shipment or a convenient

[31] Scicchitano et al. 2008; Lambeck et al. 2011.

[32] Scott Pike of Willamette University is undertaking compositional study of the Marzamemi stone cargo using stable isotope analysis and petrography; see Leidwanger et al. 2018, 295–96. For an initial identification, see Kapitän 1980, 78 n. 6.

[33] Kapitän (1980, 78) describes "one of the longest and most complete" columns, which measured 3.38 m but broke later in transit; recent re-evaluation of its pieces confirmed this length. This work also revealed a square recess of unknown purpose in the poorly preserved end of one fragment, seemingly at or near the bottom, given the shaft diameter; see also Adam 1994, 48–49.

[34] Asgari 1992, 73; 1995, 267–69; Adam 1994, 24–25; Marano 2014, 418. Larger columns in Proconnesian marble were produced as drums extracted upright in order to keep this banding horizontal; on Kızılburun, see Carlson and Aylward 2010, 147–50; Aylward and Carlson 2017.

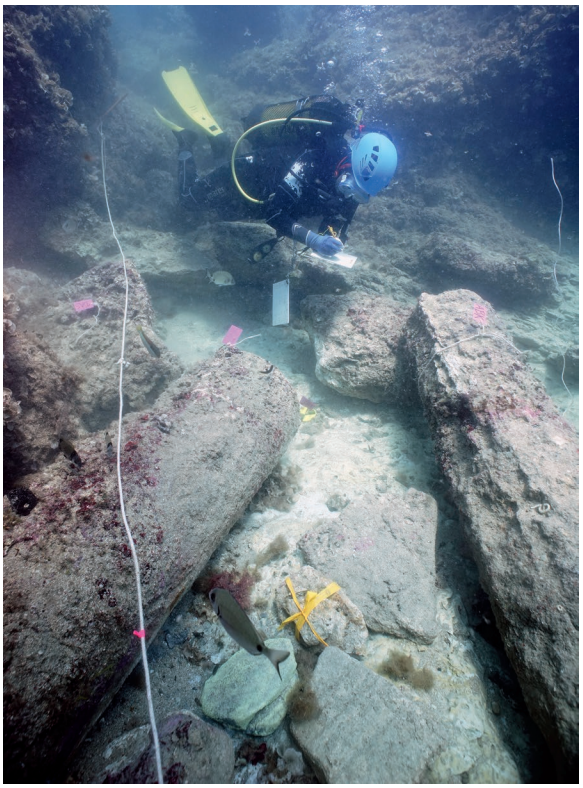

FIG. 11. Two column shafts (also visible in fig. 5) along with several panel fragments (between the columns) and a base (partially under the far end of the right column) following removal of the boulders (G5).

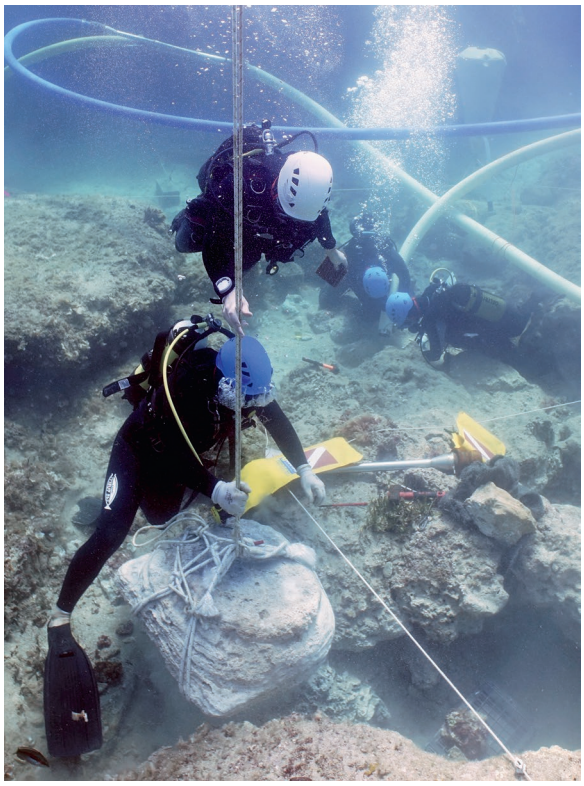

FIG. 12. Base being raised from a crevice in the north of the main site (G7).

aid in lifting, and it was generally finished thereafter as a molding.[35] Column shafts probably account for the majority of Proconnesian marble fragments on the seabed, but their extensive breakage means that no reasonable independent count can yet be offered.

The column shafts are accompanied by bases and capitals. The simple bases are generally consistent in their shape and features but nonetheless vary in certain profile details and overall dimensions (fig. 12).[36] Above the square plinth is a low torus with a generally quadrant profile that transitions to a short cylinder from which the upper decorative parts perhaps would later have been carved. The best-preserved examples from recent excavation were recovered deep within the debris along the northern edge of the site (see figs. 7, 8). While worn on some edges and marked by concretion growth, these preserve their overall dimensions: approximately 0.73 m to a side for the plinth, 0.56 m in diameter on the upper surface, and 0.29 m in height overall.[37] The base for which Kapitän gives individual dimensions—presumably one of the best preserved—exhibits a plinth of 0.72 m to a side, 0.56 m in upper diameter, and 0.28 m in total height.[38] He reports some variation in shape and especially overall height, with ranges from 0.21 to 0.30 m on 11 examples for which drawings were made. One base was reportedly left on the seabed, while 27 were recovered during this earlier work.[39] Recent excavations have uncovered five, which presumably include the one already known a half-century ago, bringing the total to at least 32. The identification was made solely from dimensions in one particularly eroded case. We cannot exclude the

[35] Günsenin 1998, 299 fig. 1; Fant 2001, 176; Russell 2013b, 216.

[36] Asgari 1992, 74–75, 78 fig. 8.

[37] The heights of the three components of the base appear generally consistent, with the plinth accounting for a slightly greater share (ca. 0.12–0.13 m), though it is sometimes difficult to define these features clearly, particularly at the juncture of the plinth and torus.

[38] Kapitän 1980, 79.

[39] Kapitän 1980, 78 and n. 7.

possibility of a few additional bases, given their limited diagnostic attributes and deterioration, among the finds.

Most distinctive are the carved Corinthian capitals. These, too, are marked by variable preservation, from some that retain sharp chisel marks to others bearing only faint traces of the acanthus leaves and volutes, and a few only discernable through their basic dimensions (see figs. 9, 13). They appear similar in shape and features, which are consistent with the widespread Kautzsch VII type.[40] Their measurements again range slightly: 0.54–0.58 m in height, 0.40–0.45 m in lower diameter, and 0.67–0.70 m along the abacus.[41] Kapitän's work resulted in the recovery of 24 (fig. 14). He reports an additional four left behind or found later,[42] which are presumably among the 11 recovered by the recent campaigns, bringing the total to probably 35. For two of these, nearly all diagnostic features are obscured, but their proportions are consistent with capitals. Marine growth and erosion make it difficult to tell whether the capitals were all carved to the same stage or if some were shipped in a more advanced state, perhaps as models for completing the others.[43] Such finer distinctions are presently impossible to evaluate. Four of the best-preserved examples, all from the previous excavations, retain marks comprised of two to three letters each: ΠΤΟ (or possibly ΠΡΟ) on two examples, ΠΟ together with ΒΟ in one instance, and what may again be ΠΟ alone (only the first letter is fully preserved) on the fourth.[44] Such marks were likely inscribed at workshops in the Sea of Marmara area and are common from around the mid fifth to the mid sixth century, especially on capitals.[45] The Marzamemi examples appear primarily just under the boss between the volutes. On one capital with Π[Ο] in the usual

FIG. 13. Capital raised by Kapitän, now in the Archaeological Park of Neapolis in Siracusa, modeled using 3D structured light scanning.

place, the letters ΒΟ are carved into the upper surface of the abacus and may indicate a production history involving multiple makers, stages, or workshops.[46] Poor preservation would have precluded identification of similar marks on many capitals, but it is also probable that not all examples were marked; some better-preserved surfaces on others bear no traces of letters.

The extensively prefabricated Corinthian capitals provide some of the most diagnostic elements. Both Kapitän and others drew connections to dated materials that generally fell in the first half of the sixth century, often in the second quarter.[47] Yet capitals (and bases) strikingly similar to those from Marzamemi were used in the circular macellum-forum at Dyrrachium as part of a monumental rebuilding program that can probably be attributed to the final years of the fifth or very beginning of the sixth century under Anastasius (r. 491–518 CE).[48] A contemporary set of matched columns from S. Apollinare Nuovo in Ravenna, built by Theoderic (r. 493–526 CE) around the turn of the sixth century, reveals variation in height

[40] Kautzsch 1936, 61–62, pl. 15 nos. 199, 203; see also Asgari 1988; 1995, 275–81; Barsanti 1989, 111–18; Barsanti and Guiglia 2010, 85–86.

[41] Kapitän (1980, 83) seemingly erroneously gives the height of "un capitello particolarmente ben conservato" at 0.91 m; recent recording in Siracusa revealed no capitals approaching this height.

[42] Kapitän 1980, 82.

[43] Castagnino Berlinghieri and Paribeni (2015, 1035) suggest that four capitals may have been carved to a more advanced state.

[44] Kapitän 1980, 83–84; see also Marsili 2015, 371.

[45] Asgari and Drew-Bear 2002. On Late Antique marking practices, see, generally, Marsili 2019.

[46] Marsili 2015, 372.

[47] E.g., Betsch (1977, 142–45, 221) supports a Justinianic date.

[48] Hoti et al. 2008, 374–76, 394–95; Pensabene and Barsanti 2008, 470–71, 472 fig. 19; see also Hoti 1997, 328. For similar carving on an undated capital at the Topkapı Palace in Istanbul, see Zollt 1994, 143, pl. 39 no. 387.

FIG. 14. Capitals atop bases from Kapitän's investigations, now in the Archaeological Park of Neapolis in Siracusa.

similar to that found in the Marzamemi assemblage.[49] That the cargo's shafts, bases, and capitals represent matching components remains quite probable. The height of the combined capital, shaft, and base comes to around 4.25 m (fig. 15, at the left), nearly identical—overall and in individual proportions—to the columns at Dyrrachium.[50] At roughly twice the height of the bases, the capitals represent 13% of the total height of the architectural order.

The discrepancy between Kapitän's proposed 28 matching sets of column shafts, capitals, and bases and the higher numbers now recorded can be explained by the shift in fieldwork approach and emphasis (table 1). New architectural finds were recovered primarily buried along the site's periphery (see, e.g., figs. 7–9) rather than in its central sandy area where Kapitän concentrated his efforts. He asserted: "Considerando le proporzioni dei capitelli è poco probabile che sotto la sabbia si trovino altri pezzi. . . . Si può pertanto supporre che il numero dei capitelli finora accertati corrisponda a quello dei capitelli caricati per il trasporto" (Considering the proportions of the capitals, it is improbable that other pieces will be found under the sand. . . . It can therefore be assumed that the number of capitals found thus far corresponds to that of the capitals loaded for transport).[51] The difficulty in matching recent finds with those Kapitän left on the seabed precludes easy evaluation of this statement, but excavations toward the south and north offer both a better reckoning of minimum numbers and more detail on their distribution. Major architectural elements missed by the earlier campaigns, when integrated into interpretations of the assemblage, complicate the neat and long-dominant picture of the wreck. The slightly lower number of bases in comparison with capitals may simply reflect the greater difficulty of identifying bases in a fragmentary state. Yet the easier—and probably the better—reading may be the obvious one: these components were shipped in different numbers. Even if the shafts, bases, and capitals correspond in their proportional dimensions, there is no strong rationale for assuming that they were transported in equivalent quantities as some even number of complete sets. An independent reliable accounting of column shafts would eventually help, but this will require more thorough examination of the entire fragmentary group. Whatever the case, more elements than the 28 sets initially suggested should be accounted for in any revised interpretation of the assemblage.

Although comparatively smaller by volume, the assemblage of decorative stone elements bearing Christian iconography has become central to the story of the Marzamemi wreck. Bits of Latin crosses

[49] Deichmann 1974, 131–34; see also Barsanti and Guiglia 2010, 85.

[50] Kapitän 1980, 80 fig. 5; Baronio 2018, 347–49, fig. 7a.

[51] Kapitän 1980, 82–83.

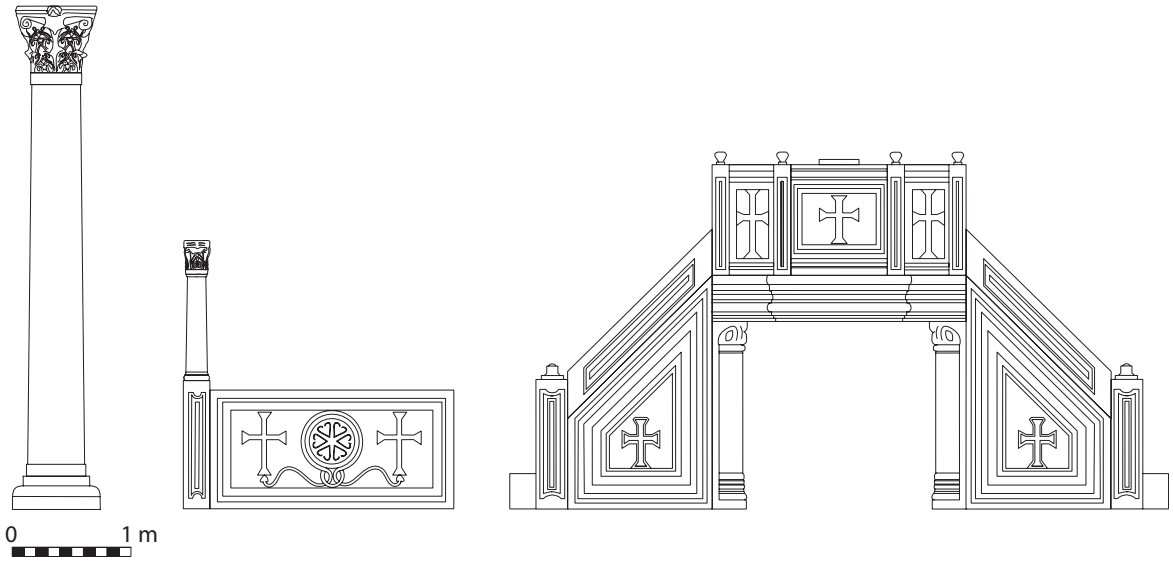

FIG. 15. Possible reconstructions of the architectural elements: left to right, an assembled column, a hypothetical chancel screen segment (panel and pier-colonnette), and the ambo (drawing by S. Matthews, M. Peterson, and A. Hernandez; ambo reconstruction adapted from Kapitän 1969, courtesy Archaeological Institute of America and *Archaeology* magazine).

TABLE 1. Numbers of column elements from the Marzamemi 2 architectural assemblage from previous and recent investigations.

	Raised by Kapitän	Totals Suggested by Kapitän	Newly Raised	Revised Totals
Shafts	–	28	–	–
Bases	27	28	5	32
Capitals	24	28	11	35

FIG. 16. Fragments of panels attributed to a chancel screen (scale = 10 cm).

and christograms mark fragments of worn slabs that belong to some number of rectangular panels analytically matching Proconnesian marble (see figs. 3, 16).[52] These range in thickness between 6 and 7 cm, in overall height up to about 1 m, and in width up to about 1.65 m, and seemingly also differ in the proportions and placement of their decorations. Both sides feature concentric rectangular frames, with the simpler surface incorporating a single cross inside a circle. The second, more ornate side features a christogram wreathed in a ribbon that turns upward toward the sides, where either end terminates in a heart-shaped (ivy leaf?) support for a Latin cross (see figs. 15, 16).[53] These motifs, often appearing on screen panels with broadly similar dimensions, are common in churches of the first half of the sixth century, while the heart-shaped spaces between the christogram's six arms have been linked to the beginning of that century.[54] The panels are complemented by a series of one-piece pier-colonnettes that terminate in narrow stylized Corinthian capitals (see figs. 7, 17). Each appears to have been carved from a single piece of Proconnesian marble measuring about 2.25 m tall and 0.22 m to a side, which reflects their maximum dimensions at both the

[52] For analysis, see supra n. 32. Further sampling is necessary to determine whether all such pieces were in Proconnesian marble or if some, as demonstrated at Latrun, might have been in Thasian marble; see Attanasio et al. 2008.

[53] See also Terry 1988, 36 no. 2, fig. 63; Pensabene and Barsanti 2008, 470, 472 fig. 17.

[54] See discussion in Kapitän 1980, 86–89, including n. 14, as well as comparanda on 88–89 n. 13.

FIG. 17. Small capital from a pier-colonnette, modeled using 3D structured light scanning.

lower pier and the capital's upper abacus.[55] Given their slender shape, which thins to only about 0.15 m near the top of the colonnette shaft, it is hardly surprising they do not survive intact, yet their shape can be reconstructed from the many fragments. Just under half of the height reflects the pier component (1.08 m); the colonnette with capital and base (1.18 m) comprises the remainder. The decoration on the best-preserved example recently excavated shows a common motif, on opposite sides of the pier, of concentric elongated rectangles with concave short ends.[56]

The opposing decorated sides on these panels and pier-colonnettes suggest a partitioning function, likely as a chancel screen that separated the bema from the nave, although other barriers, too, could integrate such components (see fig. 15).[57] The specific layout of these elements could only be hypothesized with an accurate count of the pieces, which remains unclear especially in the case of the thin and highly fragmentary panels.[58] Kapitän, who believed the pier-colonnettes were produced as two separate pieces (i.e., pier and colonnette), reports recovering eight full (or nearly full) piers with sufficient parts for perhaps two others and leaving two additional piers on the seabed.[59] Of the two examples discovered during recent campaigns, one was deeply buried and clearly not among this early count. Until the various possible fragments can be analyzed and reconstructed into complete pier-colonnettes, the original suggestion of 12 is still the most reasonable conservative estimate. Slight differences in certain dimensions and the placement of decorative motifs and concentric borders should not be surprising in light of similar variations in the column components and the often compromised surfaces. Some tolerance within a set is also to be expected, and the pieces could have been further shaped or reduced at the building site. Even so, the possibility that these components were destined for multiple structures or furnishings cannot be dismissed without a more accurate count and detailed comparative analysis. If these pieces belonged to a chancel barrier, no traces of an architrave carried on the pier-colonnettes have been identified.[60] Surfaces on the best-preserved elements reveal that their basic decorative carving was largely complete, leaving only those details required for installation (e.g., recessing the pier-colonnettes to receive the panels).[61]

Perhaps the most impressive investment was the ambo or pulpit, carved in distinctive Thessalian verde antico, a mottled green breccia from Atrax near Larisa (figs. 18, 19).[62] These quarries saw their busiest activity between the mid fifth and mid sixth centuries, when the material was used for church furnishings, sarcophagi, and other monuments.[63] The ambo seems to have been composed of 20 major pieces, many of

[55] Cf. Kapitän (1980, 92–95), who discusses and treats the pier and colonnette as separate parts; the fragmentary examples of these elements led to the assumption that they represented separate elements. See discussion of the long-presumed ciborium below.

[56] Particularly good parallels appear among the materials from Poreč; see Terry 1988, 33–35, 39–43, figs. 88–109. See below for similar decoration on the ambo piers.

[57] Matthews 1971, 122–25; Peschlow 2006.

[58] On the layout of this feature, see also Sodini 1989, 167–68. Several additional panel fragments removed from the wreck are discussed in Castagnino Berlinghieri and Guzzardi 2014, 49 figs. 1, 2; Castagnino Berlinghieri and Paribeni 2015, 1035.

[59] Kapitän 1980, 92, 119–20 n. 43.

[60] Xydis 1947, 9–11; Terry 1988, 33.

[61] Russell and Leidwanger forthcoming. The method used to join panels is demonstrated in the cut recesses of the pier-colonnettes preserved at the mid sixth-century Basilica of Euphrasius at Poreč; see Terry 1988, 31–35.

[62] Jakobs 1987; Heid 2017.

[63] Karagiorgou 2001a, 175–87; Melfos 2008.

FIG. 18. Partial column base in verde antico from the ambo, in front of an overturned capital covered with marine growth (M7).

FIG. 19. Fragmentary panel from the ambo, modeled using 3D structured light scanning.

which are sufficiently intact to assert that they belong to a single feature. Their preservation enables reliable reconstruction of the intended design, and the form proposed by Kapitän remains supported by recent finds.[64] Its type, often associated with Constantinople, features opposing staircases leading up to a rectangular platform supporting a convex parapet and resting on engaged columns with stylized capitals (see fig. 15).[65] At perhaps 5.12 m in length, 2.89 m in height (not including finials), and 1.22 m (at its narrowest) to nearly 1.70 m (on the central platform) in width, the ambo would have presented an imposing feature.[66] The pilasters, moldings, and engaged columns are deeply carved and would have required only basic finishing and joining at their destination.[67] Crosses decorate the panels, while the piers at the bases of the staircases feature concentric rectangles with concave short ends (similar to the pier-colonnettes). A large christogram is situated in the circular recess on the underside of the raised platform.

Similar ambos have been found, often in contexts of the sixth century, in materials ranging from Proconnesian marble to Docimaean pavonazzetto (from central western Asia Minor).[68] In the case of the ambo from Marzamemi, the stone represented one of the more costly and visually striking options.[69] The strong focal point for liturgical practice provided by the ambo could have warranted special treatment. While the overall amount of material, about 3 m^3, was dramatically less than that of the Proconnesian colonnade, the sections of the ambo's raised platform likely

[64] For other details on the motifs and measurements of the ambo's components, see Kapitän 1980, 98–118. The small finials atop certain panels are not included within these 20 pieces.

[65] Jakobs 1987, 44–46; Barsanti 1989, 192–97; Nicolaou 2013, 160.

[66] Dimensions of the intended ambo, especially the overall length, range slightly depending on how individual elements would have been trimmed.

[67] Russell and Leidwanger forthcoming; see also Barsanti and Paribeni 2018, 47–48; Paribeni 2020, 224.

[68] E.g., Michaelides 2001; Flaminio 2010, 69–73.

[69] The reference point for relative costs of ancient stone is the *Edict of Diocletian*, but this source is hardly straightforward; see Erim and Reynolds 1970. The edict (33.1) gives the cost of verde antico at 150 denarii per square or cubic Roman foot, compared to only 40 denarii for Proconnesian marble. Among the various other challenges is the interpretation of pricing that may reflect not merely the difficulty of transport but also the intended uses of different stones, often as veneer. For discussion, see Corcoran and DeLaine 1994; Russell 2013b, 33–36; Long 2017.

represented the heaviest objects within the cargo, a further indication of the lavishness of this feature.[70] Its individual pieces, however, vary widely in their preservation; the brecciated composition has completely disintegrated in some, while others retain a smooth finish and sharp edges to the deep molding.[71] The extensive prefabrication of the ambo may indicate specialization, perhaps because of the comparative difficulty of working in this material or the rarity and expense of furnishings produced from it.[72]

Smaller stone fragments hinting at other decorative components provide a critical window into the cargo assemblage as a whole. Several fragments of pure, translucent, white marble may be attributed to an altar table, approximately 1.5 cm thick with a raised ledge, as Kapitän suggested years ago.[73] Although this stone's origin remains unclear, a source separate from the Proconnesian and verde antico stones would underscore the symbolism of this furnishing too as a focal point for liturgical practice.[74] A related feature that has long been central to the Marzamemi wreck narrative, the ciborium or altar canopy, merits more skepticism. The identification rests on Kapitän's discovery of a pier-colonnette that apparently lacked decoration and was deemed slightly smaller than those he identified as belonging to a chancel screen. His assumption that the screen's piers and colonnettes were separate elements may have prompted this confusion when he found a one-piece pier-colonnette.[75] This object is, in fact, similar in size to the other pier-colonnettes, and slight variation in their dimensions or missing and worn surface decoration should not be surprising.

A program of 3D documentation was initiated in 2015 in order to estimate total numbers of different elements based on the fragments, to assess questions of prefabrication and matching sets, and to gauge the intended architectural forms.[76] After field trials of both photogrammetry and structured light scanning, a commercial Artec Eva system[77] proved effective at capturing the fine details of shape and surface texture that will support formal analysis and systematic comparison. More than 140 recently excavated finds have been scanned, as have more than 60 major architectural elements recovered by Kapitän (see figs. 13, 17, 19).[78] The resulting digital archive of the complete architectural data set will offer not only analytical capacity but also a powerful tool for conservation planning, virtual and physical reconstructions, and interactive public outreach.

Recent finds of a different nature shed new light on this architectural cargo. Two small and thin (0.8 and 1.2 cm thick) pieces of green Laconian porphyry (*serpentino*; fig. 20) offer a striking contrast to the other stone materials. They are well preserved, cut into distinct shapes (one an arrow, the other a trapezoid) and exhibit mostly polished major surfaces; one retains faint traces of probable sawing. Such details suggest *opus sectile*, but their number is far too limited (nothing similar is reported by Kapitän) even considering modern interventions on the site. More likely they were cut for such a decoration but then repurposed, perhaps as samples, allowing potential consumers to appreciate the stone's visual properties for veneers or inlays. The rarity of green decorative stones and the difficulty of working this one made it a costly and prized embellishment.[79]

It is possible to view in a similar light recently recovered lumps of orpiment and realgar and perhaps also raw glass. Orpiment and realgar, both arsenic sulfide minerals, were used for a variety of purposes but often

[70] For calculations of volumes within the cargo, see Kapitän 1980, 119–20 n. 43; Russell and Leidwanger forthcoming.

[71] Kapitän 1980, 101.

[72] The difficulty of carving this breccia for effective use in freestanding furnishings, given the varying hardness of different components in its matrix, is discussed in Karagiorgou 2001a, 176–77.

[73] Kapitän 1980, 96–98, fig. 16. The reading (98) of a poorly preserved column fragment as an altar support is not impossible, but it is more likely that this piece belongs to a pier-colonnette; see also Kapitän 1969, 128–29. No additional fragments have been identified recently, even as new parts of the altar table itself have come to light.

[74] Reasonable suggestions of an origin in Asia Minor, Attica, or Paros have been made, but without analytical testing, e.g., Sodini 1989, 168; Marano 2014, 422 n. 87.

[75] Kapitän himself (1969, 128) notes: "Of this element of the architecture, only a few pieces have been found." On this confusion, see also Terry 1988, 33 n. 102.

[76] Leopoldo Repola organized this documentation, while Sheila Matthews and others carried it out through the following seasons.

[77] See www.artec3d.com/hardware/artec-eva/.

[78] The 3D scanning of Kapitän's finds in the Archaeological Park of Neapolis in Siracusa was initiated in February 2020 with the permission of then-director Calogero Rizzuto.

[79] See, generally, Zezza and Lazzarini 2002; Lazzarini 2007, 45–69.

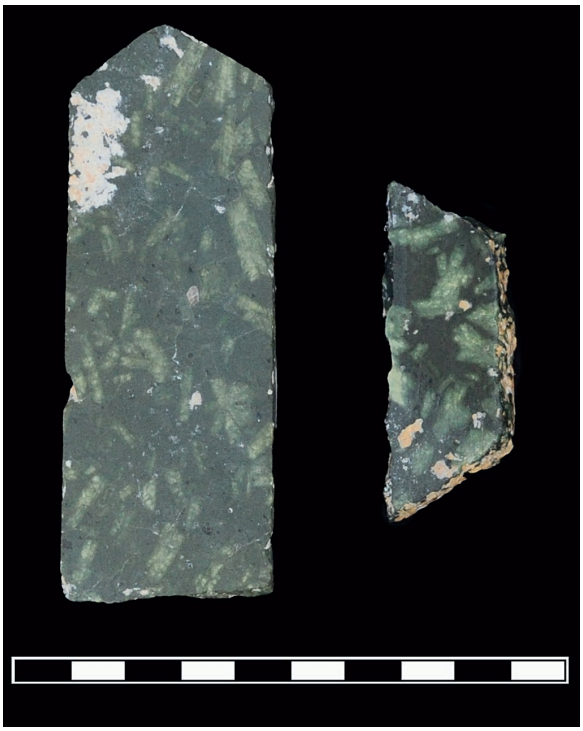

FIG. 20. Laconian porphyry fragments found among the ship's decorative materials (scale = 10 cm).

as pigments to achieve the gold and deep red colors esteemed in ancient painting (fig. 21).[80] Pliny notes orpiment produced in Syria, among other sources.[81] The raw brown glass, likely from Egypt, could have been put to a variety of decorative uses ranging from inlay and mosaic to vessels or lamps (fig. 22).[82] Small quantities of these materials were dispersed throughout the main site, although such rare discoveries may represent a fraction of the original total in such a dynamic context. Even in small amounts, though, they may hint

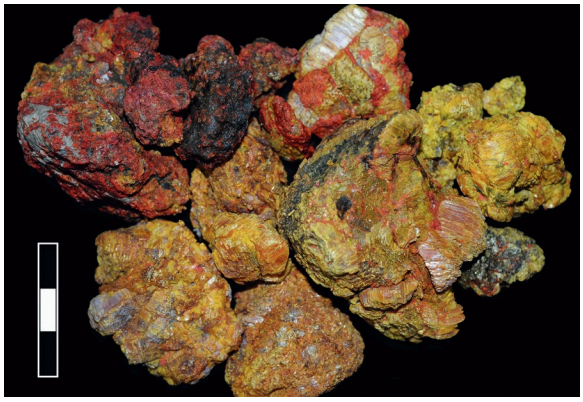

FIG. 21. Orpiment and realgar possibly pointing to a decorative cargo (scale = 3 cm).

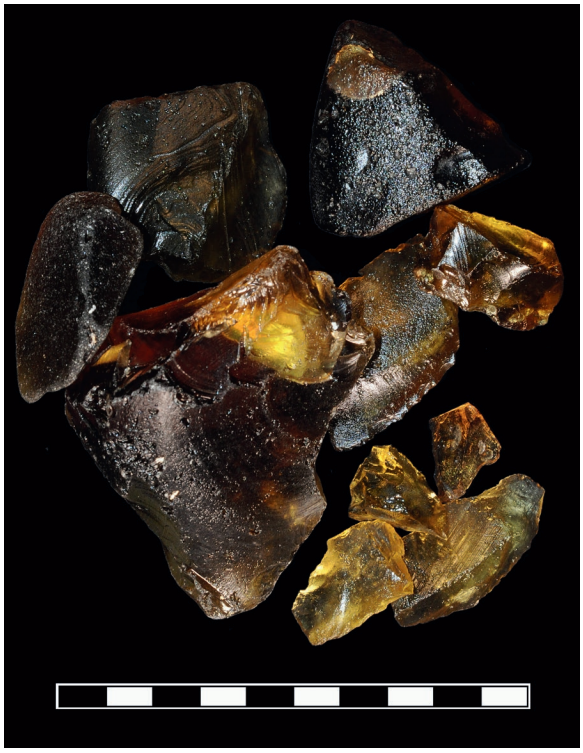

FIG. 22. Raw brown glass from the wreck's decorative cargo (scale = 10 cm).

at decorative choices to come and future journeys to fulfill them.

OTHER CARGO

Decorative stone formed the bulk of the Marzamemi cargo by weight, and surely also its overwhelming value in antiquity, yet it seems to have traveled along with a consignment of processed agricultural goods

[80] Plin., *HN* 34.56; Lee and Quirke 2000, 114–16; Rapp 2009, 215–16. For uses of orpiment as pigments or for personal grooming on board, see Bass 2004, 280–81 (Serçe Limanı); Pulak 2008, 294 (Uluburun). Several lumps of sulfur brought to light may also be cargo; although sulfur's widespread availability and many uses complicate interpretation, it is worth noting that the mineral was produced in bulk on Sicily, the only possible link thus far to the island. Pliny (*HN* 35.50) discusses uses of sulfur.

[81] Plin., *HN* 33.22, 35.12, 35.31.

[82] Cholakova et al. 2015. Analysis of the glass is being undertaken by Ian Freestone of the University College London Institute of Archaeology.

in transport amphoras. Kapitän briefly notes "numerous fragments of common pottery which must have belonged to the ship's galley," later qualifying these as mostly amphoras and cooking vessels.[83] In its dispersed and fragmentary state, the ceramic assemblage was easily viewed as the routine assortment of wares and supplies carried by a seagoing ship, but the numbers discovered through recent excavations support an alternative interpretation of most of these amphoras as cargo. Amphora sherds were recovered in nearly all contexts, but the greatest concentrations by far were toward the south edge of the site (M and N units) (see fig. 2), where they had come to rest in the rocky crevices and beneath overburden.

The most prevalent type is the distinctive Late Roman 2 (LR2) amphora that exhibits a conical neck and spherical body with a solid band of combing on the shoulder that usually starts around or just below the handle-body join; examples from the wreck belong within Pieri's variant A, produced around the Aegean region throughout the fifth and into the mid sixth century (fig. 23a).[84] Among the three amphora fabric groups identified to date, the largest (comprising more than 70% of the diagnostic LR2 sherds) appears similar to that associated with the southern Argolid.[85] Diagnostic fragments amount to only a couple of dozen examples, but the large quantity and weight of sherds exhibiting LR2 body combing would suggest higher numbers. Fragments of additional jars recovered during Kapitän's campaigns have not been relocated and are therefore impossible to quantify, but archival photographs demonstrate the prevalence of such distinctively combed sherds.

A better reckoning of the total LR2 amphora assemblage comes from the ceramic lids or stoppers used to seal them (fig. 24). These are circular with an upturned rim and small pinched knob handle. More than 70 have been discovered in recent campaigns, nearly all intact, concentrated almost exclusively in the southern part of the site among amphora sherds. Their small size and robust shape may have allowed them to work their way quickly into the shifting sands and crevices. Lids also appear in the archival photos of Kapitän but without numbers, details, or discussion. Their connection to the LR2 jars is apparent from their fit: at 8.2 cm in diameter on average, they sit firmly (albeit at slightly different heights) within the tall and outward flaring rims (about 12 cm diam.) of the jars. The link is also attested by fabric: the sole fabric of the lids is identical to that of the largest group of LR2 jars. The lack of pry marks along their edges could indicate that the lids or stoppers were still sealed in place with some perishable material when the ship sank.[86] Similar to examples at

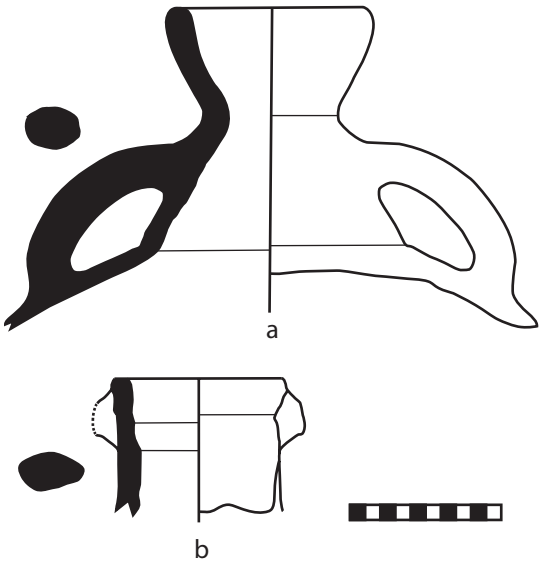

FIG. 23. Examples of amphoras from the cargo and shipboard supplies: *a*, LR2 amphora; *b*, LR1 amphora (scale = 10 cm).

FIG. 24. Ceramic lids collected primarily from the southern edge of the site, appropriately sized to fit an LR2 amphora.

[83] Kapitän 1969, 133; 1980, 123.

[84] Pieri 2005, 86–87.

[85] On the southern Argolid fabric, see Hammond 2015, 196–200. Thanks to Mark Hammond for assistance in comparing the fabrics.

[86] For pry marks on the corresponding rims of Late Roman amphoras, see van Doorninck 1989, 256.

Kenchreai,[87] these simple but separately made lids are distinct from other stoppers that were roughly cut from repurposed amphora body sherds or fashioned from clay, bark, or similar materials as in the case of the early seventh-century Yassıada 1 shipwreck.[88]

A smaller assemblage of Late Roman 1 (LR1) amphoras may also be considered cargo (see fig. 23b). Shipwreck remains in the eastern Mediterranean indicate that such LR1 jars frequently traveled along with LR2s in the period.[89] Marked by a pinched waist and cylindrical neck, their form appears closest to Pieri's LR1b subtype, which dates between the late fifth and sixth centuries.[90] The fabrics here are broadly consistent with Cypriot and Cilician production.[91] At least nine jars are represented by diagnostic fragments from recent campaigns, although again the original number is likely higher given their appearance in Kapitän's archival photographs and the possibility of illicit modern removal.

What agricultural cargo did these LR2 and LR1 jars transport? Oil and wine are often suggested as the common contents for these forms.[92] If the LR2 jars originated in the Argolid area, known for its oil production, this might be the preferable hypothesis, particularly as the interior surfaces reveal no traces of the pitch that frequently lined vessels containing wine.[93] But the assumption that each type must be connected to a single product runs counter to increasing evidence both for the reuse of individual jars during late antiquity and for the production of only a few types of jars over large areas known for diverse commodities.[94] It is conceivable that some of the LR2 or LR1 jars contained the galley's provisions, but the total is larger than necessary to supply the sailors (and any others) on board during the ship's final journey.

This additional agricultural shipment and the larger numbers of architectural elements together demand a recalculation of the overall tonnage. Kapitän estimated 77 tons in his most comprehensive accounting, although much higher figures of 200 to 300 tons have been routinely cited by other authors.[95] Such a high estimate would place it among the massive stone cargoes typical of the Imperial Roman era but render it an outlier for late antiquity, when the largest archaeological stone cargo has been estimated at 150 tons, and 50 tons seems to have been more the norm.[96] Working with the larger quantities of elements and, in some cases, revised average dimensions reveals an architectural cargo of around 95 tons, to which we can add here another several tons of packaged agricultural goods, bringing the total assemblage up to approximately 100 tons.[97]

THE SHIP

While these waters offer poor conditions for hull preservation, a significant number of metal fragments, iron concretions, and occasional small, fragile, and worm-riddled bits of wood were found.[98] As few materials related to the hull were found anywhere but along the site's southern edge (M and N units), a strong argument can be made that some part of the ship came to rest here. The majority are concretions that preserve the shapes of deteriorated iron objects,

[87] For the large assemblage of lids and associated LR2 jars at Kenchreai, see Heath et al. 2015. Gerousi (2014, 195) also mentions "lids, all characterized by pastes similar to those of LR2" in the excavation of an LR2 amphora workshop at Dilesi in Boeotia.

[88] On the Yassıada 1 amphora stoppers, see Bass 1982, 160–61; van Doorninck 2015, 207; see also, generally, Peña 2007, 73, 153–58.

[89] E.g., the Yassıada 1 wreck; see van Doorninck 2015. The LR1 jars at Yassıada were likely sealed with clipped amphora body sherds; van Alfen 1996, 190 n. 5.

[90] Pieri 2005, 75; see also Demesticha 2014, 602.

[91] Demesticha 2003, 471–72; Williams 2005, 619.

[92] Pieri 2005, 81–84; Elton 2007, 691–92; but see also Karagiorgou (2001a, 149), who describes them as oil containers.

[93] Hammond 2015, 208.

[94] van Doorninck 1989. See, generally, Peña 2007, 61–118.

[95] Kapitän 1980, 119–20 nn. 43, 44. The high estimate of 200–300 tons may trace to van Doorninck 1972, 136; echoed by many others, e.g., Castagnino Berlinghieri and Paribeni 2015, 1035; Nantet 2016, 525–26. Morrisson and Sodini (2002, 209) note 200–400 tons.

[96] Russell 2013a, 349–55.

[97] For tonnage calculations of the architectural elements, see Russell and Leidwanger forthcoming. Assuming a volume of 40 liters for each LR2 amphora, multiplied by the number of 70 lids, yields a total minimum volume of ca. 3 tons, to which another 1 ton might be added for the jars themselves. The LR1 amphoras should likely also be included. On the volumes of LR2 amphoras, see Karagiorgou 2001b, 148. Any perishable supplies or other organic materials not represented by this calculation are unlikely to change the overall picture.

[98] Kapitän (1969, 132–33; 1980, 118–19 and n. 42) also notes small wood fragments of uncertain date and an unspecified number of iron nail concretions with square sections and round heads. A report by Tusa (2015, 835 fig. 6) seems to have mistakenly associated a photograph of well-preserved hull remains with the Marzamemi 2 site.

especially nails with square sections and round heads in a variety of inconsistent sizes; intact nails range in length from 8.6 to 27.5 cm, with an average length of 16.3 cm from head to tip (fig. 25).[99] These were likely driven into planks from the outside and partway into the frames; that they are not clenched at their tips suggests they did not penetrate through to the inboard faces of the frames.[100] In rare cases, the iron corrosion preserved sufficient traces of the wood through which the nails were driven to indicate a general planking thickness of about 6.5 cm. A collection of nails with preserved lengths of about 6.5 cm from head to break may reflect shearing at the stress point between planking and frames.[101] Small amounts of organic material recovered inside some concretions may point to fibers wrapped around the fasteners before the heads were hammered in place.[102]

Other concretions preserve the shapes of longer bolts of varying lengths (about 40–67 cm long), some seemingly with round washers at their end. Parallels from the Yassıada 1 wreck suggest that these fasteners could have been driven through the keel to attach floor timbers or to affix wales, planks, and half-frames;[103] the surviving examples at Marzamemi provide little evidence for the specific dimensions of these hull members. An assortment of short tacks with square sections and rounded heads may have been used for some vanished structure like a deck or cabin, the presence of which is further supported by ceramic tiles (discussed below). Tacks are also found in contexts with small and irregularly shaped patches of lead sheathing that preserve square holes along their edges. Such patches were likely attached to the exterior of the hull to repair damage from marine shipworms (*teredo navalis*).[104]

FIG. 25. Casts of concretions representing nails likely from the ship's hull (scale = 10 cm).

What size of vessel should we imagine from these clues? The hull's meagre wood and metal remains cannot support a reconstruction, but a minimum size can be offered by considering the total load and assuming common proportions. Kapitän's suggestion of 25 m in length and 6 m in beam likely represented about the smallest vessel able to carry his lower estimate of 77 tons.[105] The new figure of 100 tons demands a larger ship. Interpreting vessel size based on archaeologically attested tonnage is complicated since hull shapes varied from fuller and boxlike to sleeker and faster.[106] Moreover, filling a hold to maximum capacity was generally unsafe and probably rare.[107] Room to spare must have been even more important for heavy and dense cargoes like stone, and the vessel's maximum tonnage likely exceeded this calculated cargo weight by a third or more.[108] Large round stones noted intermittently during excavation may indicate ballast for stability, not uncommon even for ships carrying heavy loads.[109] A vessel approximately 30 m in length and 8 m in beam, with a typical hull profile that balanced capacity and seaworthiness, could have accommodated the

[99] Excavated metal concretions have been selectively X-rayed and cast in epoxy. Our thanks to the Radiology Unit of Fondazione G. Giglio of Cefalù for undertaking diagnostic X-ray, fluoroscopy, and CT scan imaging.

[100] See also the Yassıada 1 hull, where comparable nails penetrated barely halfway through the frames; see van Doorninck 1982a, 56.

[101] Littlefield (2012, 54, fig. 3.13) indicates the shear point of nails from the Kızılburun hull at the plank-frame join; those nails extend fully to the inboard face of the frames.

[102] See Matthews and Steffy (2004, 86, 112) for similar fibers from the 11th-century Serçe Limanı hull.

[103] van Doorninck 1982a, 56–57.

[104] Kahanov 1999, 219.

[105] Kapitän 1980, 120–22.

[106] See, generally, Steffy 1994, 62–91; Pomey et al. 2012.

[107] For comparison, the two wrecks at Yassıada sailed at approximately half to two-thirds of their theoretical capacity; see Bass and van Doorninck 1971 (Yassıada 2); Steffy 1982, 85–86 (Yassıada 1); Nantet 2016, 488–91, 532–36.

[108] Throckmorton 1972, 76; Russell 2013b, 130.

[109] See, e.g., Throckmorton and Parker 1987, 76–77 (Methone D); Di Stefano 1991 (Camarina A); Carlson and Aylward 2010 (Kızılburun); see also Plin., *HN* 26.201; Parker 1992b, 90–92.

attested cargo at Marzamemi with reasonable room for safety.[110]

For this size, planking 6.5 cm thick cannot represent a heavily built hull. Using data primarily from the second and first centuries BCE, Fitzgerald shows that, in virtually all cases, ships 22 m or longer possess at least 6.0 cm of hull planking in one or two layers, while those 30 m or more exhibit planking 8.6–10.0 cm thick.[111] The gradual transition in late antiquity toward frame-first construction, in which planking was affixed to a prebuilt structure of frames attached to the keel, may have enabled shipwrights to use thinner planking for large ships. In the shell-first construction technique of earlier Roman and pre-Roman ships, structural integrity was achieved through heavier planking strakes built up from the keel with robust mortise-and-tenon edge joinery; internal frames were then added as secondary support.[112] In any case, the estimated thickness for the Marzamemi planking would seem to be fairly routine or even somewhat light. It is possible that the ship was reinforced internally or externally to accommodate this heavy cargo through the use of additional nails for frames, extra frames, or thicker wales or ceiling planking.[113] Not all of these adaptations would be necessary parts of the hull's original design or reflected in the scant surviving fragments.

Other metal objects uncovered may be associated with ship construction, maintenance, and operation. Tools have not yet been definitively identified, but a bulbous iron concretion and another preserving a rounded hole perhaps for the insertion of a handle may represent parts of hammers. Further X-ray analysis and casting may also reveal that some objects identified as nails or bolts are actually chisels, awls, or levers; examples of such tools from the Yassıada 1 wreck are similar to fasteners in their general dimensions.[114] It is possible that some tools may have even been intended for working the architectural elements, as was the case with the set of stone-carving tools that accompanied the Roman marble cargo on the Porto Novo wreck.[115] Kapitän describes a sandstone disc, 70 cm in diameter with a central hole, as a possible counterweight for the rudder.[116] Nothing analogous has been brought to light in recent campaigns, though several large and thick pieces of lead are broadly similar to what have been interpreted as parts of a steering-oar complex on other Late Antique wrecks.[117] The multiple massive iron anchors that one would expect a ship of this period to carry are conspicuously absent; perhaps they were deployed farther out to sea.

CREW AND SHIPBOARD LIFE

A 30 m vessel on a lengthy journey would likely have required a larger crew than the smaller ships for which the archaeological record often indicates the presence of four or five sailors.[118] Even so, a ship of 100 tons probably necessitated no more than about 10–12 sailors,[119] a general figure that fits with the shipboard assemblage described and analyzed here, notwithstanding the possibility of additional opportunistic merchants, travelers, or artisans, as often appear in accounts of Late Antique voyages.[120]

The best window into crew life comes from the galley and related shipboard wares that have been largely

[110] A total displacement of 200 tons, half accounted for by the weight of the fully equipped ship and extra room, leaves 100 tons for cargo. The basic calculation here of dimensions from displacement is based on Gille 1957; drawing on early modern vessels of a fuller shape than ancient ones, this formula is critiqued but followed by Pomey and Tchernia 1978, 234; Nantet 2016, 92–93; see also discussion in Casson 1995, 188. For the relationship between total displacement, the fully equipped hull, and cargo tonnage, see Nantet 2016, 92. See also Parizzi and Beltrame 2020 for modeling the loading and size of stone-carrying vessels.

[111] Fitzgerald 1995, 128–31. Seagoing ships at Antikythera, Caesarea, Giens, and Mahdia, each estimated at 30+ m in length, were built with planking 8.6–10.0 cm in thickness in one or two layers; the planking of ships 22–25+ m in length at Grand Congloué, Titan, Diano Maria, Dramont, and Bourse ranges from 5.5 to 6.7 cm. Figures for later vessels given by Beltrame and Vittorio (2012, 144–45) generally agree, though they argue that smaller stone carriers could also have been planked more heavily.

[112] Steffy 1994, 84–85; Pomey et al. 2012, 298.

[113] Such adaptations have been observed on dolia ships and other vessels with dense cargoes: e.g., Marlier and Sibella 2002. The shift away from earlier Roman mortise-and-tenon joinery may have made certain adaptations during construction less likely (e.g., thicker tenons or more closely spaced joins).

[114] M. Katzev 1982, 242–48.

[115] Bernard et al. 1998.

[116] Kapitän 1969, 133. Kapitän subsequently described it (1980, 122) as a rotating disc, similar in thickness to a sharpening stone but of unknown onboard use.

[117] S.W. Katzev 1982, 281–83, figs. 12.10, 12.11 (Yassıada 1); Kingsley and Raveh 1996, 28, fig. 27, pl. 21 (Dor); Leidwanger 2007, 310 (Cape Zevgari).

[118] Beltrame 2002, 48–50.

[119] Whitewright 2016, 882.

[120] McCormick 2001, 404–10.

overlooked in previous discussions. Certain individual forms could date as early as the second half of the fifth century or as late as the mid sixth century; their discovery in a single context points to the early sixth century as the best fit.[121] Kapitän published details for only a few ceramic pieces but noted the discovery of forms he labeled as galley wares, including pans, jugs, and cups.[122] Recent work has brought to light 235 new diagnostic sherds belonging to vessels for supplies, storage, cooking, and dining, along with a number of ceramic tiles and bricks.[123] Some were recorded throughout the site, but other concentrations may be more meaningful. A cluster in excavation units toward the south-central part of the site (N7–N8) may be associated with a galley area.

In contrast to coarse and fine wares concentrated in the south and southwest, a relatively small number of amphoras likely used for supplies were found scattered across nearly the entire main site.[124] Distinct from the LR2 and LR1 jars identified above as cargo, diagnostic sherds from a minimum of 13 amphoras of various other types are preserved. At least one small, rounded handle can be linked to the southern Levantine LR5/6 form.[125] Several African jars are also identifiable by fabric even if most are preserved only as toes; one partial rim likely represents a spatheion (fig. 26a).[126] LR5/6 amphoras are generally assumed to have carried wine, but some of the African jars may have held oil or another product.

Excavation in the southern sector revealed fragments from what appear to be two large storage vessels. One is quite substantial, with a rim 3–4 cm thick (see fig. 26b); the other is thinner, produced in what may be a North African fabric, and includes a curved protrusion on its outer surface and traces of interior glaze or slip applied in uneven horizontal and vertical bands. Fragments belonging to two similar jars—probably even the same jars—are reported by Kapitän and documented in his photographic archives. Kapitän compared one to a water vessel from the Yassıada 1 shipwreck that was assumed to have been covered with a wooden lid.[127] Some means of storing potable water on board would have been critical, and the dimensions suggested by the outward jutting shoulder of the thick-rimmed jar indicate a larger volume than the 100-liter Yassıada parallel, perhaps 200 to 300 liters as one might expect for a correspondingly larger crew. If the second jar was also used to store fresh water, it would have extended this capacity. Extracting liquid from these and other vessels on board was probably accomplished with the wine thief, a small ceramic pipette-like device, excavated by Kapitän.[128]

Other closed forms were likely used for food storage or service, comprising 15% of the current total diagnostic noncargo ceramics. Many are too worn to identify definitively, but others belong to large-mouthed jars with horizontal handles, several rounded pots, some with flat bases (see fig. 26c), jars with straighter walls (26d), smaller-mouthed rounded pots (26e), and one ampule or flask. In most cases, these vessels were used to store and perhaps serve foodstuffs, though their general-purpose shapes could have found many uses on board, for instance as containers for trade items or the orpiment discussed above.[129] The pointed toe of a storage vessel too small to be an amphora contains pitch, either to waterproof the jar or for ship maintenance.[130]

Evidence of food preparation comes in several forms. Folded lead net weights may indicate fishing to procure food for the crew.[131] Their basic functional shape throughout the centuries, however, makes it impossible to prove an association with the ship assemblage. More easily connected is a heavy vessel of rough gray stone, assumed to be a mortar used for grinding grains or preparing ingredients for sauces and other foods (fig. 27). The vessel is roughly 30 cm tall

[121] The marine environment is especially detrimental to the preservation and identification of common and fine wares. Organic contexts darken fabrics and inclusions, thereby compromising visual identifications. The surfaces of friable cooking wares and slipped fine wares in well-levigated clays are particularly affected; see Lopez-Arce et al. 2013.

[122] Kapitän 1980, 123.

[123] This number may grow through ongoing study; finds from the 2019 campaign have been loosely classified but not identified further.

[124] McCormick (2001, 410) notes that travelers on ships were expected to provision themselves, for which they kept supplies in baskets or sacks.

[125] Pieri 2005, 114–29; Reynolds 2005, 573–74.

[126] Bonifay 2004, 125–29.

[127] Kapitän 1980, 123–24; Bass 1982, 186 no. P82 (Yassıada 1).

[128] Kapitän 1969, 132–33; 1980, 124; see also Bass 1982, 181 no. P65 (Yassıada 1).

[129] For the difficulty in assigning specific uses to such forms, see Allison 1999.

[130] E.g., Ximénès and Moerman 1991, fig. 7 (Laurons 2); Jézégou 1998, 344–45 (Saint-Gervais 2).

[131] Kuniholm 1982, 302–8 (Yassıada 1).

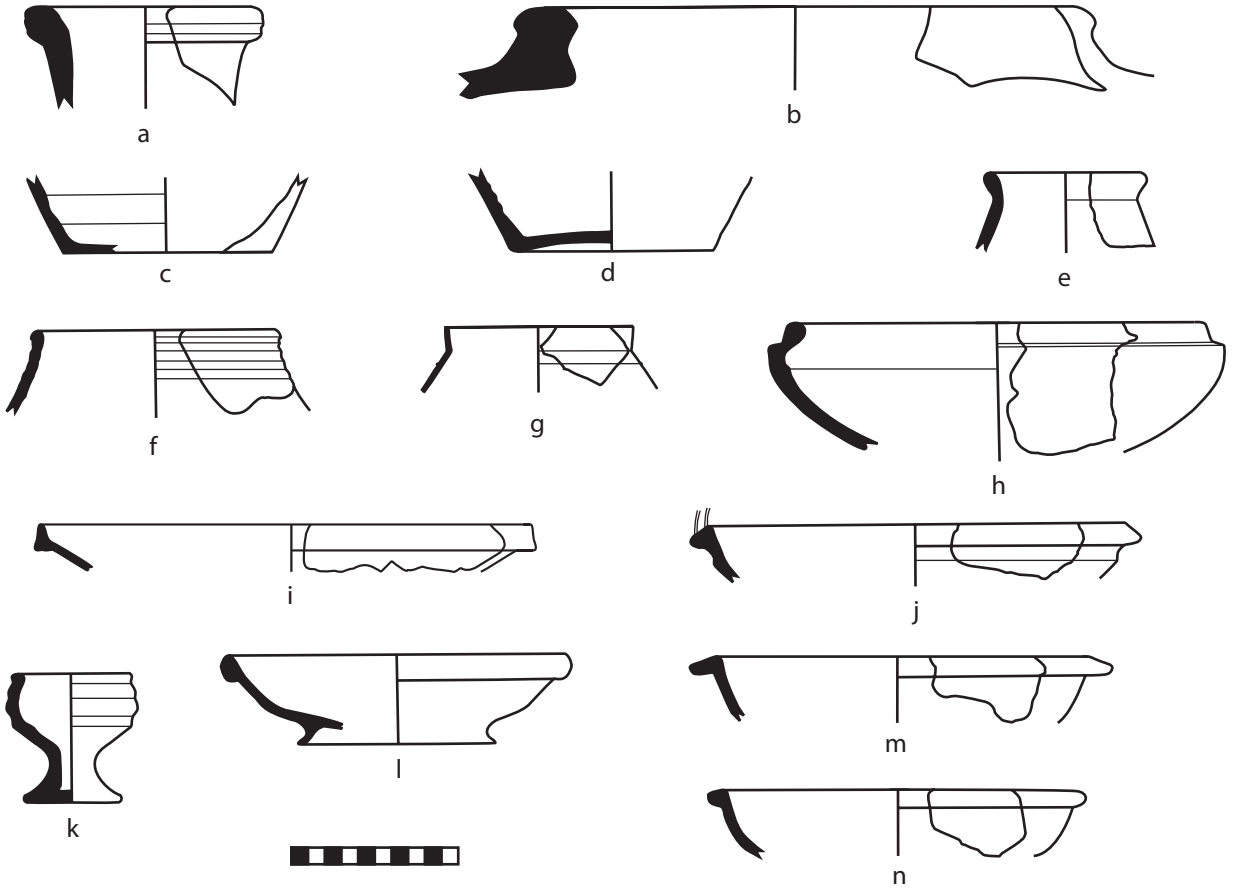

FIG. 26. Vessels from the assemblage of galley ceramics: *a–e*, storage; *f–h*, cooking; *i–n*, tableware (scale = 10 cm).

and cylindrical in shape with a deep interior cavity; its exterior tapers before flaring slightly at its thick base. Parallels to the form, and in some cases the material, are common at sites in Asia Minor but rarely with evidence for date or function.[132] This bulky shape would seem unwieldy at sea, though the thick lower part might have aided in stability.

More than a dozen fragmentary cooking vessels are revealed by sherds that are coarse and brittle with micaceous and sandy inclusions. Among these are a small rounded form with an open mouth and little handle

FIG. 27. Stone vessel found in the southern part of the site being cleaned.

[132] Late Antique stone mortars are not unusual but are commonly hemispherical rather than cylindrical; see Decker 2008, 494. For mortars in Proconnesian marble, see also Gill 1986, 234; Marano 2014, 421. Similar cylindrical limestone vessels appear frequently at Sagalassos and other regional sites. One parallel to the Marzamemi example in material and form, but larger and of unknown origin, is currently in the Bodrum Museum of Underwater Archaeology.

stub, a thin rim of a small pot, and a thin-walled larger pot with exterior ribbing along its neck (see fig. 26f). A vertical collar and small rim likely belong to a squat, flat-bottomed North Palestinian pot with a combed body dating from the late fifth or the sixth century (26g).[133] Four sherds represent one or perhaps several examples of a distinctive carinated Palestinian or Cypriot form (26h), a large container 24–27 cm in diameter with rounded walls, angular carinated edge, and inset rim. The carination was perhaps designed for a lid, and the vessel may have been used for cooking or as a brazier.[134] The dominance of closed cooking forms, typically used to prepare sauces, soups, and stews, suggests that liquid-based meals were the mainstay.[135] Other cooking may have been accomplished without ceramics, either over fire during stopovers on shore or in metal braziers, perhaps in conjunction with heavy terracotta bricks and tiles found in the same general area that may indicate a firebox or cooking surface.[136]

The vessels used for food consumption offer additional clues to the geographic reach and possible date of the assemblage. Several point to eastern Mediterranean origins, including a sherd of Hayes' Egyptian Red Slip form H. This shallow bowl (30 cm diam.) in a pinkish-orange fabric likely from Aswan features a heavy overhanging rim and dates to the second half of the fifth century (see fig. 26i).[137] A Cypriot Red Slip Ware sherd represents a bowl in Meyza's form H8 (25 cm diam.) with a thick, triangular rim exhibiting two parallel groves and dating between the late fifth and the early sixth centuries (26j).[138] Some meters to the southwest of the main site was an intact small goblet of a possible Levantine fabric, a unique example and likely a personal possession rather than regular galley ware (26k).

Most common by far in the assemblage are North African dining wares, particularly form Hayes 99A. This type of shallow bowl with a thick, rolled rim dates from the end of the fifth to the middle of the sixth century and is commonly associated with Tunisian production, especially at Oudhna (see fig. 26l).[139] At least 11 examples share this form, in a wide range of diameters (16–24 cm). There are perhaps another four examples of Hayes 93B, an early sixth-century form similar in size and probably in use to 99A; these exhibit a flat angular rim (21.0–24.5 cm diam.) and ring base (26m).[140] Two of Bonifay's Sigillée Type 58 bowl with a rounded rim (18 cm diam.) and small foot are preserved (26n).[141] These range in date from the late fifth to the middle of the sixth century. The only pottery stamp from recent excavation is a leftward-facing bird surrounded by rouletting, similar to Hayes' 208 or 210 (fig. 28).[142] This stamp is usually associated with the Hayes 103 form, a wide plate or bowl with a thick rim that has not yet been found on the site, though it is possible that one of the Hayes 99A rims is a worn Hayes 103. No additional examples have been found of the Hayes 93A form, the only other ceramic piece (along with the wine thief) published in detail by Kapitän, in this case because of its distinctive stamp of a dalmatica-clad figure.[143] From the perspective of both morphology and use, there is little difference among these several forms, all of which could have served equivalent functions. Their size suggests a mode of dining in which food was served from common cooking pots into receptacles for individual consumption.[144]

Other galley ware assemblages, such as from the Yassıada 1 wreck and the Hellenistic Kyrenia ship, reveal matching sets of vessels.[145] But little about the Marzamemi assemblage suggests the dedicated or uniform set of wares one might expect for a fixed crew. The dining wares are not matched in size and seem unlikely to have been acquired together; even if they were primarily produced in North Africa, the common forms circulated widely and could be acquired in markets across the Mediterranean. The majority belong to a consistent type (Hayes 99A), but their wide range of diameters, 16–24 cm with no evident clustering, is more diverse than one might typically expect for ceramic vessels produced together or purchased as

[133] Cathma 161, produced at Workshop X; see Reynolds and Waksman 2007, 72, fig. 32.

[134] For the possibility of a brazier, see Bonifay 2004, 196 n. 1.

[135] Arthur 2007; Donnelly 2015, 143.

[136] van Doorninck 1982b; and, generally, Beltrame 2015, 63–65. Kapitän (1969, 133) notes the recovery of many tiles and bricks. For sailors cooking on land, see *Physiologus latina* 31.

[137] Hayes 1972, 389–90.

[138] Meyza 2007, 60–61.

[139] Hayes 1972, 152–55; Bonifay 2004, 180–81.

[140] Hayes 1972, 145–48.

[141] Bonifay 2004, 185–87.

[142] Hayes 1972, 256, 260–61.

[143] Kapitän 1969, 125; 1980, 124, 125 fig. 31; Hayes 1972, 145, 264–65.

[144] See Hudson 2010, 692–93.

[145] Bass 1982, 188 (Yassıada 1); S.W. Katzev 2005, 76 (Kyrenia); see also Beltrame 2002, 48–50.

FIG. 28. Bird stamp from an African Red Slip bowl or wide plate.

a set.[146] The vessels suggest a more hodgepodge collection and may represent components of the rough equivalent of mess kits that traveled with individual sailors.

RETHINKING THE CHURCH WRECK

New fieldwork and analysis provide an opportunity to re-evaluate the Marzamemi 2 assemblage as a whole, from the famous architectural cargo to the ship and crew that transported it, and the details and date of its final voyage. The uneven numbers of capitals, bases, and column shafts, exceeding the 28 proposed by Kapitän, where counts are possible, demand a shift in thinking away from the model of a complete prefabricated set, even though they likely originated in the same workshops. If the 35 (or more) capitals were matched by shafts and bases and designated for the interior of a single structure, the hypothetical colonnade would surpass the scale of church interiors with similarly sized columns; for example, the large nave of S. Apollinare Nuovo uses an order with 24 columns of nearly the same dimensions as those from the Marzamemi ship.[147] There is no need to assume either that the elements were shipped in identical numbers or that they were destined for a single structure. Other preserved cargoes reveal consistently mismatched numbers of newly produced (nonspoliated) elements.[148] The sixth-century Amrit wreck off the Syrian coast included 20 Corinthian capitals, 16 bases, 1 shaft, and 1 pilaster.[149] A fifth- or sixth-century vessel lost at Altınkum, western Turkey, was carrying 15 Corinthian capitals and 25 bases.[150]

Shedding the model of a prefabricated kit removes the presumption of a complete church inventory and in turn the impetus to identify hypothetical furnishings like the ciborium proposed by Kapitän,[151] even though the ambo and chancel screen could only have been destined for a religious structure. The column components could have been used for other, nonreligious, construction programs like the macellum-forum at Dyrrachium, which provides some of the closest comparanda for the wreck's capitals.[152] Another structure, or at least another part of the same project, might help account for the uneven and apparently excessive numbers of similar elements, some of which might have been intended for the next phases or project. That future shipments were envisioned is suggested by the samples of green porphyry and perhaps also by the pigments and glass that typically reflect the final decorative stages of building. Several additional tons of processed agricultural goods in amphoras were evidently an enterprising sailor's opportunity for extra profit on a voyage already financed by the stone. The Church Wreck cargo included components certainly meant for a church, but these were neither a church's complete furnishings, nor were all pieces necessarily consigned only to one church.[153]

The archaeological remains of the ship entrusted to carry this 100-ton load tell a similarly untidy story. Bound up with narratives of heavy stone cargoes are assumptions about specialized transport systems

[146] For standardization and diversity within North African workshop production, see Riley 1979–1980; Busto-Zapico and Cirelli 2018.

[147] Deichmann 1974, 130–35.

[148] Russell and Leidwanger forthcoming.

[149] All in Proconnesian marble; see Dennert and Westphalen 2004; Russell 2013a, 332 n. 3.

[150] Pulak and Rogers 1994, 19; Pulak 1995, 7–8; Russell 2013a, 332 no. 2.

[151] The same can be understood in Kapitän's suggestion (1969, 128–29) that another small column might be a support for the altar table or a *candelabrum sacrum*; see also Barsanti and Paribeni 2018, 46–50.

[152] Hoti et al. 2008, 374–76; Baronio 2018.

[153] See Aylward and Carlson (2017, 234), who suggest the Kızılburun wreck reflects regular shipments of selected drums rather than the transport of one complete column at a time.

involving a class of purpose-built vessels (*navis lapidaria*),[154] but stone carriers were more likely considered within the general category of heavy freighters (*navis oneraria*).[155] Shipwreck evidence suggests bulk cargoes traveled in all sizes of vessels, and construction techniques were more closely tied to hull size than intended cargo.[156] Nothing detected archaeologically about the Marzamemi ship would contradict the emerging consensus that stone traveled in regular vessels or the corollary assertion that private commercial merchant mariners carried routine consignments of stone just as they did other specialty bulk cargoes such as grain.[157] If so, the Marzamemi ship and its sailors represented just an appropriately sized vessel that was available to carry the load where needed, rather than a specialized enterprise connected to particular quarries, ship types, or crews. It would have been one of the larger ships at sea, though hardly exceptional for an interregional merchant calling at major Mediterranean ports.[158]

Lead patches designed to protect a sea-worn hull speak for the vessel's long history of plying warm Mediterranean waters, and hints from the crew's wares tell a similar story. At least some of the 10–12 sailors may have worked on different vessels and routes before joining on for this particular journey; short contracts were regular practice for ancient mariners.[159] Together, the site assemblage reflects a broader geographical reach and zone of interaction than the area covered by the final journey. The connections may be indirect: stone shipped from quarries of the Aegean and Sea of Marmara for carving in specialized workshops, Levantine or Cilician provisions traded for resale in urban markets, a memento goblet or Egyptian dish from a sailor's past journey, and cooking pots or ubiquitous North African shallow bowls replaced upon breakage at the next port. Such links underscore a deep history of interregional voyages for the ship and its crew.

These earlier connections seem to have converged on the Northern Aegean and Sea of Marmara, where Constantinople offers the most plausible origin for the final voyage of the Marzamemi ship. The architectural cargo was quarried primarily on nearby Proconnesus, but there is no clear evidence for extensive prefabrication on the island; instead the imperial capital was a key market for the carving and consumption of Proconnesian marble.[160] The similar decorative motifs between the chancel screen and the verde antico ambo favor a common production location, and Constantinopolitan stylistic connections have long been noted.[161] Raw or roughed-out materials needed to be shipped first from quarries in Proconnesus and Thrace, but the system brought considerable advantages regarding labor and production.[162] Loading a complete stone cargo at one major port would have greatly simplified the logistics of transportation; the stones could be balanced and secured once for the entire journey rather than being repositioned at subsequent stops.[163] The imperial capital surely provided access to sailors and supplies and also to the full range of decorative materials on offer, such as Laconian porphyry and Egyptian glass. This is not to say that the ship bypassed other ports en route, nor would it be equipped with provisions for the entire long journey. Water stores were sufficient for the open-sea crossings required for the final voyage but would have needed replenishing every few days.[164] The acquisition of supplies at any layover may have been accompanied by opportunistic transactions by the captain or crew to fill extra space in the hold. The LR2 amphoras would seem to fit such an additional stop, perhaps in southern Greece. Where the ship was headed when it sank

[154] Petron., *Sat.* 117.12; Russell (2013b, 129–31) reviews the scant literary evidence, first discussed by Rougé (1966, 76–77).

[155] Vitr., *De arch.* 10.3.5.

[156] Nantet (2016, 190), following Beltrame and Vittorio (2012), surveys evidence for the varied construction methods of stone-carrying vessels.

[157] Littlefield 2012, 153–54; Russell 2013a, 350. On commercial mariners carrying grain, see Casson 1980; Garnsey 1983.

[158] Nantet 2016, 153–60.

[159] See discussion of historical practice in Broekaert and Zuiderhoek 2020, 121.

[160] On exports from the Proconnesian quarries during late antiquity, see Betsch 1977, 120–21; Sodini 1989, 164; Asgari 1995; Marano 2014.

[161] Sodini 1989, 183; Bohne 1998, 7; Russo 2010, 52. The workshop marks on the capitals may also point to Constantinople (Marsili 2015, 372–73).

[162] Russell and Leidwanger forthcoming.

[163] Sodini 2002, 133; Russell 2013b, 136–38.

[164] A volume of 200–300 liters would have lasted perhaps 3–5 days for a crew of 10–12, assuming a minimum of ca. 5 liters per person for consumption only (not hygiene); see World Health Organization 2011. Filling the second large jar with water would have expanded this capacity, but strenuous activity, additional uses and passengers, and evaporation would have reduced the time to replenishing.

remains an ongoing area of research, but we offer some preliminary thoughts below.

We are on somewhat firmer ground regarding when the final voyage took place. The galley assemblage is at home anywhere between the earliest years of the sixth century into the second quarter, although the spans of certain forms and the occasional long use-life of shipboard pottery complicate definitive temporal brackets. The architectural materials generally find their strongest parallels in the first half of the sixth century, especially the first quarter.[165] The capitals are best situated in the initial decades of the sixth century, with particularly good parallels from the macellum-forum of Dyrrachium; based on comparanda for the chancel screen panels, Ulbert likewise suggested a date in the first quarter of the century.[166] The breadth of the Mediterranean left room for varied tastes and differential uptake of new styles. At the same time, there remains little evidence for deliberate stockpiling of stone products in workshops or marble yards such that they sat idle for long;[167] the repurposing of older architectural materials in this period suggests shortfalls rather than surpluses.[168] The stylistic coherence of the Marzamemi column components, as well as between the chancel screen and ambo, indicates an interest in acquiring new and matching materials. These observations favor the first quarter of the sixth century, although a later date into the second quarter of the century need not at present be excluded.

These dating considerations offer a strong impetus to question the wreck's long-standing association with Justinian (r. 527–565 CE) and his imperial rebuilding initiatives described by Procopius. The prevailing Late Antique narrative of decline and fragmentation that has been fundamental to early interpretations of the site meant that a massive long-distance shipment of expensive stone could only be understood within this short-lived context of a resurgent Roman state. Even allowing the possibility that the ship sank during the early part of Justinian's reign, the new analysis demonstrates that the wreck need not be fused to the period and person of one emperor or even to the imperial fisc more generally.[169]

Decoupling the wreck in this way allows it to be understood within a broader framework of Late Antique economy and interaction. A shift in focus away from one monumental shipment of architectural elements and toward the ship, its galley wares, and its other cargo reveals diverse and ongoing connections tied to multiple intersecting networks: journeys of raw stone from quarry to workshop, regular passages of sailors and merchants through Aegean, Levantine, and North African ports, and the inspection and commissioning of decorative materials for later building phases. These are hardly signs of economic disintegration. Neither is a ship carrying more than 100 tons whose patched hull saw a busy life before its end off southeast Sicily. Several tons of agricultural commodities signal the wider networks activated by private entrepreneurial agents charged with a shipment that paid their way. The coordinated movement of cargoes, whether building materials commanded by Constantinopolitan officials and local elites or olive oil for urban dwellers, underscores the prevalence in this period of both "high" and "low" commerce, as Horden and Purcell aptly put it, and the interdependence of their mechanisms.[170] Viewed through this lens of entangled elite and everyday markets serving state and private needs, the rich assemblage sheds new light on interregional connections of the period and the convergence of different drivers to sustain these networks.

Such connectivity was not predicated on a politically—or religiously—unified Mediterranean, and attempts to restrict possible destinations for the Marzamemi ship in this way are unnecessary.[171] North Africa has long been favored, although that suggestion is often tied to the assumption that the shipment postdates the Roman reconquest from 533 CE.[172]

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[165] See also Marano 2014, 422; Barsanti and Paribeni 2016, 206 n. 44.

[166] Ulbert 1969, 84–85.

[167] Not to be confused with the possibility, noted above, that some column materials may have been ordered and shipped in advance but for another structure. On stockpiling, see Terry 1988, 18, 55–56; Harper 1997, 146 (Ravenna); Pensabene et al. 1999 (Ostia); Russell 2013b, 238–39. Cf. Kapitän (1980, 89–91, n. 14), who in arguing that a date in the second quarter of the sixth century cannot be excluded, favors the idea that some pieces may have been sculpted years before.

[168] E.g., Cassiod., *Var.* 1.6, 1.28, 5.8.

[169] See also Pensabene and Barsanti 2008, 465.

[170] Horden and Purcell 2000, 365–67.

[171] E.g., Kapitän (1969, 133) argues against Italy or Sicily based on "the political situation at the time." On the similarity of religious architecture across denominations, see Bockmann 2014.

[172] Kapitän 1980, 129; Harrison 1985; Sodini 1989, 167; van Doorninck 2002, 899; Castagnino Berlinghieri and Paribeni 2015, 1035.

Recent studies, however, have questioned the tendency to assign activity to this late window and drawn attention to Procopius' reframing of local building initiatives in imperial terms, for example at Carthage, where urban continuities are more apparent than a pattern of Vandal decline followed by imperial rejuvenation.[173] It is worth noting, too, that the ambo was not a typical feature this far west in North Africa.[174] Destinations in Italy or the Adriatic also fit plausibly within this ship's geographical network.[175] Although Rome may have been rich in building materials for reuse, Theoderic's mandate to restore the brickmaking industry in the port sector signals ongoing renewal already in the first decade of the sixth century.[176] Most of the Gothic king's letters, though, underscore the gravitational pull of Ravenna together with its port of Classe, which supplied still other cities with monumental building materials.[177] The Adriatic region was known for its widespread use of verde antico, rare elsewhere in the west, and as a busy market for Proconnesian marble.[178] Wherever the ship was headed, that center clearly possessed the resources and desire to command not only special furnishings in stone of the highest quality, such as the verde antico ambo, but also a remarkably large assemblage of new columns; this in itself may be a statement of extravagance anywhere spolia were also available.

The decades before the imperial reclamation of territories under Justinian were marked by economic links that circulated ideas and information along with elite and everyday goods.[179] In the east, shipping had been rebounding over the course of the fifth and into the sixth century, and connections to both North Africa and Italy remained crucial to this maritime revival.[180] It is precisely within this context of flourishing interregional networks that we should situate the Marzamemi vessel and its cargo. In doing so, we allow its final voyage to stand as evidence not for the last gasp of Roman trade but for the entangled elite and everyday consumption of bulk commodities that continued to drive Late Antique connections across much of the expansive (Roman and non-Roman) Mediterranean world.

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[173] Humphrey 1980, 88; Roskams 1996, 44–45; Feissel 2000; Miles 2020, 19–21. Cf. emphasis on this phase by Leone 2013, 195–96, 200–2 (Carthage), and 218–29 (Sabratha).

[174] Duval 1998, 184; see also Paribeni and Castagnino Berlinghieri 2015, 397–98.

[175] For a suggestion of Syracuse, see Paribeni and Castagnino Berlinghieri 2015, 398–99; but see also Wilson 1990, 241.

[176] Cassiod., *Var.* 1.25.

[177] See also Cirelli 2007. For Ravenna's marble supply and as a warehouse, see Terry 1988, 57; Harper 1997.

[178] Karagiorgou 2001a, appx. 6, 6-16 (verde antico); Marano 2016; Barsanti and Paribeni 2016 (Proconnesian marble).

[179] See, generally, Pieri 2005; Wickham 2005, 711–12; Bonifay 2007.

[180] Leidwanger 2020, 117–21.

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