

ROMAN COMMERCE AND ELITE MARKETS IN THE EASTERN MEDITERRANEAN: A CASE STUDY OF THREE 2ND-CENTURY SHIPWRECKS OFF KNIDOS

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Abstract: *The authors present three Roman shipwrecks, Knidos H, S, and R, recently identified in deep water off the Datça peninsula in the southeast Aegean. High-resolution imagery allows substantial analysis of their cargoes. Knidos H was carrying between 1,300 and 1,500 amphorae, mostly of Agora M 54 type, accompanied by few Cilician imitation of Coan amphorae (Dr 2-4) and others belonging to the crew: Dr 24 similis, Knidian, and Agora G 199. Knidos S, a smaller ship, was transporting a mixed cargo of wine amphorae, including Agora G 199, Cylindrical amphora type I (previously believed to be Aegean), and a new variant of olive oil amphora Dr 24. Knidos R is represented by a small assemblage of amphorae (Dr 24, Cretan, and possibly Mendeian types). Kitchen and drinking vessels that belonged to the crew were found on all three shipwrecks. The amphora evidence indicates that the ships sank in the first half of the 2nd century A.D. These discoveries illuminate Roman trade networks in the eastern Mediterranean and Aegean region, particularly between Cilicia Pedias and one or more unknown Aegean emporia at the political and economic height of the empire.*

The Straits of Rhodes and the waters around the Bozburun and Datça peninsulas served as a constricted maritime corridor between the southeast

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KOINÉ ET MOBILITÉ ARTISANALE ENTRE LA MÉDITERRANÉE
ET LA MER NOIRE DANS L'ANTIQUITÉ

PONTICA LI SUPPLEMENTUM V



MUSÉE D'HISTOIRE NATIONALE ET D'ARCHÉOLOGIE
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SUPPLEMENTUM V**

**KOINÈ ET MOBILITÉ ARTISANALE
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**Hommage à PIERRE DUPONT
à son 70^e anniversaire**

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Aegean and the eastern Mediterranean (Fig. 1). Ancient shippers who hauled cargoes between these two trading worlds were forced to contend with a myriad of navigational hazards.¹ Ships heading east and south out of the Aegean generally had following winds and good visibility with which to navigate between the area's islets, islands, and headlands. Ships sailing into the Aegean via the Rhodian Straits, however, were typically forced to tack and wear against headwinds (ancient etesians, modern *meltemi*) which blow daily with high intensity out of the northwest during the summer and autumn, the optimal seasons for seafaring. As sailing vessels zigzagged to make ground their steersmen strove to avoid the steep and jagged carbonate cliffs of the landmasses that bound the corridor. Sailing vessels were most exposed to the elements near the long and narrow Bozburun and Datça peninsulas, both of which extend their rocky fingers far into the Aegean. Ships attempting to round these natural wind screens were exposed to the full blast of the winds that intensify in these areas. It was at this point that many ships failed to make ground and so gave way before the wind. Many inevitably failed, some striking the coast (as evidenced by amphora cargoes found underwater at the base of cliffs), others, overcome by steep waves and violent winds, foundering in deeper areas.

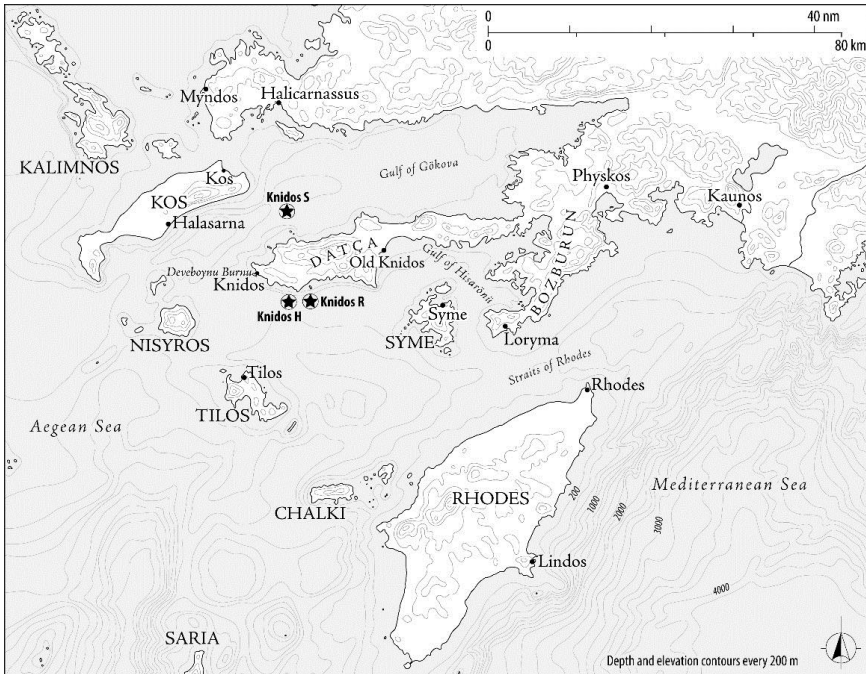


Fig. 1. Map of the southeast Aegean showing the locations of the Knidos H and Knidos S shipwrecks. (Map: D. Davis)

¹ On Greek and Roman navigational methods, see MORTON 2001; ARNAUD 2005; DAVIS 2009; on ancient navigational difficulties around Knidos and the Datça peninsula, see BRESSON 2011.

Those ships that attempted the passage in winter often experienced similar if not intensified conditions but from opposite directions, with southerly winds (a product of roving low-pressure systems) episodically lashing the coasts and building steep seas in the open areas. Harbor towns like Rhodes, Loryma, Knidos, and Myndos served in part as safety valves for ships making this challenging passage. Within the safety of these harbors crews could wait for shifts in the wind and improved conditions before embarking again. Knidos itself, founded at the western tip of the Datça peninsula (Deveboynu Burnu, ancient Triopion) in the early Hellenistic period, took advantage of the traffic and local hazards by catering to the maritime community. The harbor town with its picturesque but exposed setting included two, opposite-facing harbors, oriented on the axis of opposing seasonal winds.² It flourished well into the Roman and Byzantine eras. But even here, as recent discoveries have revealed, ships attempting to make safe haven wrecked on the breakwaters.³

Between 2010 and 2012 the deep seabed off the western tip of the Datça peninsula was the subject of scientific work by the exploration vessel *Nautilus*. In addition to conducting geological and oceanographic investigations of the area, the expedition, using acoustic sensors and a tandem remotely-operated vehicle system (*Hercules* and *Argus*), discovered twenty-six shipwrecks to the north, west, and south of the peninsula in waters ranging from 100 to 500 meters depth.⁴ The shipwrecks date to between the 6th century B.C. and the 20th century of our era, with most (fifteen) dating to between the 2nd century B.C. and the 7th century A.D. In partnership with Turkish colleagues, the expedition adopted the principle of *in situ* preservation as a first option in accord with the UNESCO Convention for the Protection of the Underwater Cultural Heritage and implemented a non-intrusive, non-sampling mode of survey and mapping.⁵ Fortunately, the clear waters of the southeast Aegean permitted high-resolution mapping, imagery, and investigation. Although the non-intrusive approach limits the degree of investigation, the wrecks can be described comprehensively and the amphorae can be measured and identified by type.⁶

Many of the ancient shipwrecks found during this work off Turkey exhibited damage to various degrees by bottom trawl fishing.⁷ This anthropogenic activity was observed to impact shipwrecks to greater extents with distance away from the no-trawl zones 2.5 km from the Turkish shoreline, with some wrecks more than 10 km from shore exhibiting severe impacts with more than 60% of the artifacts broken, scattered, and many likely dragged away.⁸ Some wrecks,

² BRESSON 2011, p. 400.

³ ASLAN 2015.

⁴ BRENNAN *et alii* 2011; BRENNAN *et alii* 2012; BRENNAN *et alii* 2016. We wish to thank Turkey's Ministry of Culture and Tourism for co-sponsoring the Bodrum Symposium on Archaeological Oceanography (October, 2014) at which these shipwrecks were publicly presented.

⁵ UNESCO 2001. On the methodology and technology used on the E/V *Nautilus* expeditions, see BRENNAN *et alii* 2012, esp. p. 58-60.

⁶ DAVIS *et alii* 2018, p. 60-61.

⁷ BRENNAN *et alii* 2016.

⁸ BRENNAN *et alii* 2012.

however, particularly those located closer to shore or in areas north of Datça where steeply sloping underwater terrain limits trawling activity, were found to be nearly undisturbed mounds of amphorae. Such activity, and the unintended damaging results to underwater cultural heritage sites, speak to the site formation processes of ancient wrecks in the Aegean Sea, as well as the preservation potential of these sites in deep water.

Three of the shipwrecks, Knidos H, S, and R, are singled out for study here (see Fig. 1). The shipwrecks date to the first half of the 2nd century A.D. and provide insights into the origins of some amphora types in circulation during the High Empire. Knidos S lies 6 km from the north shore of Datça on a flat seabed. Some 65% of its artifacts are shown to be damaged by modern trawl activity.⁹ Despite the damage we are able to identify many of the amphora types that remain intact on the site. Knidos H is located approximately 3 km from shore to the southeast of Knidos and is relatively intact given its proximity to the no-trawl zone located 2.5 km from shore. Knidos R, lying approximately 3.5 km from Datça's southern shore and 5 km east of Knidos H, was heavily trawled like Knidos S. All three ships were carrying Cilician amphorae of Agora M 54 type. Knidos S and H were also hauling Dressel 2-4, Agora G 199, 'Cylindrical' (typically considered to be of Aegean origin), and an unknown variant of Dressel 24. Knidos R, in addition to hauling a single Agora M 54 amphora, yielded two other singletons, including one from Crete (AS 1) and one possibly from Mende. While the cargo and route of Knidos R remain in question, the fact that Knidos S and H were carrying bulk cargo comprised of Cilician amphorae leads us to believe that the other types carried aboard each ship were also produced in this area and were being shipped westward. The ships themselves sank off Knidos before they could reach their destinations.

Knidos H

Knidos H was located at 372 meters depth southeast of Knidos (**Figs. 2-3**).¹⁰ The single mound of artifacts lies on a flat seafloor and is surprisingly intact, having suffered little degradation from modern fishing trawls. The site measures 17 x 10 meters, has *ca.* 1.8 m of relief, and is oriented roughly east-west. The orientation of the wreck, of course, does not indicate the direction of the ship's voyage at the moment of sinking; numerous factors can account for its current orientation, particularly its orientation upon foundering and currents in the water column on descent to the seabed. Typically the stern of a ship can be determined by crew's possessions which tend to congregate in the aft cabin or near the helm station. In this case, two small pots were discovered mostly buried just offsite at the site's western end. The eastern end of the mound, provisionally identified as the stern, includes a table amphora and jug, along with two singleton amphorae, a Dressel 24 similis and a Knidian amphora. Aside from these vessels and the main cargo of amphorae, no other artifacts such as anchors, bilge pump parts, or concretions are visible.

⁹ KRUMHOLZ & BRENNAN 2015.

¹⁰ First reported in BRENNAN *et alii* 2012, p. 60.

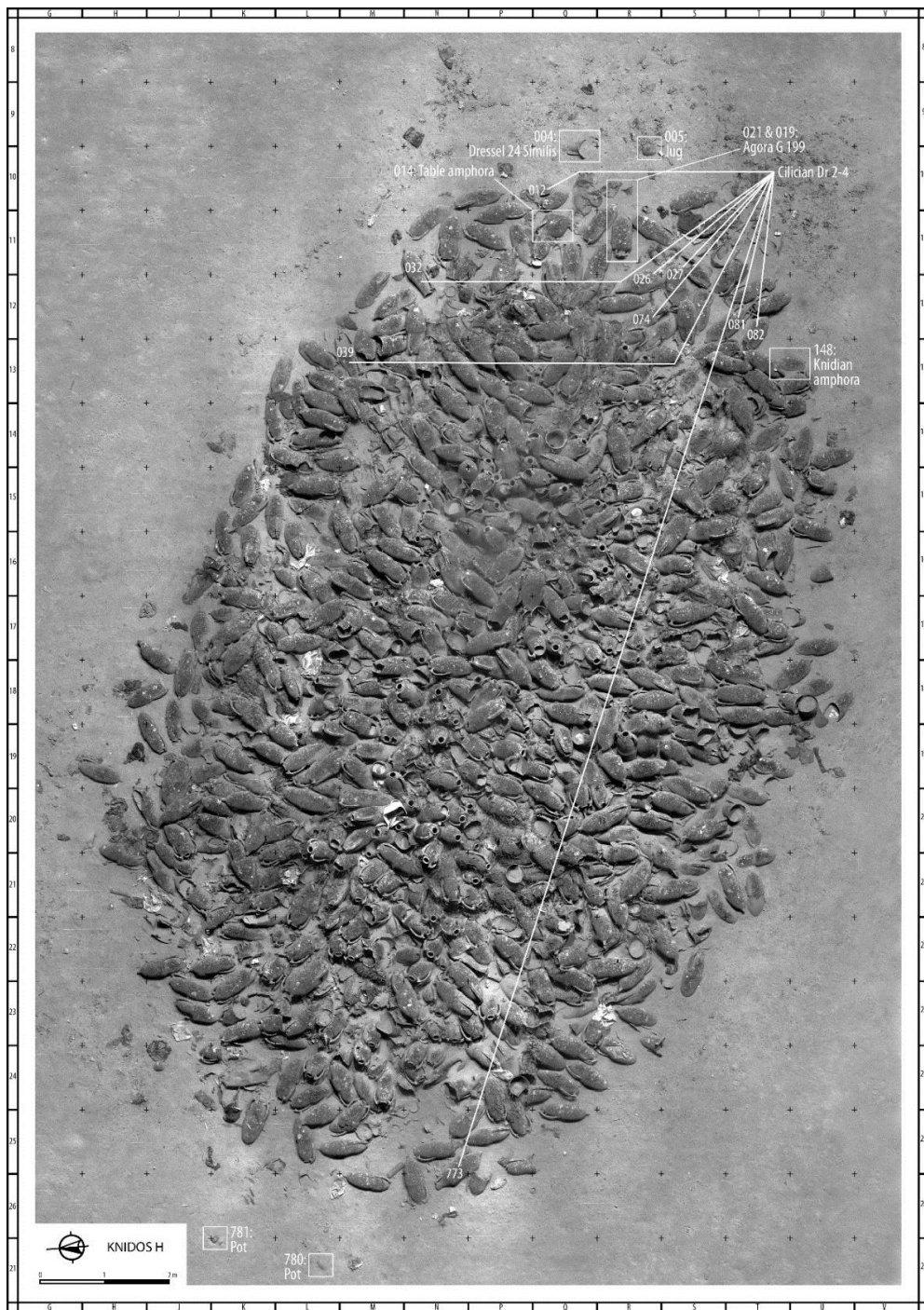


Fig. 2. Mosaic of the Knidos H shipwreck. Unlabeled amphorae are of Agora M 54 type. (Courtesy Ocean Exploration Trust)

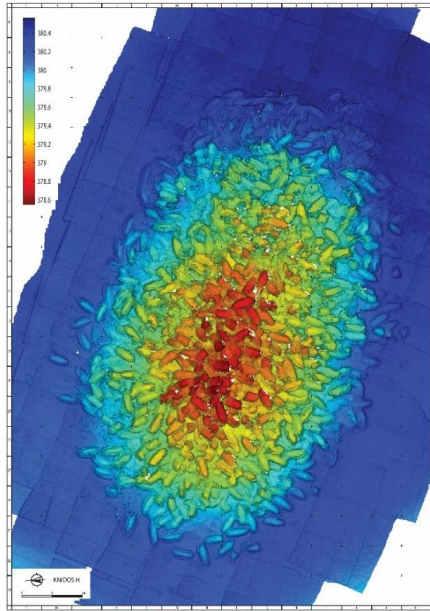


Fig. 3. Multibeam bathymetry map of the Knidos H shipwreck. (Courtesy Ocean Exploration Trust)

The ship was carrying between 1,300 and 1,500 amphorae stacked in two or three intercalated tiers. Their arrangement is evident in Figs. 3 and 4c. The primary cargo (> 90%) consists of amphorae of Agora M 54 type. Other types include at least nine jars that imitate Koan amphorae but are Cilician,¹¹ at least two amphorae of type Agora G 199, which also has a Cilician/Cypriot origin, and a Knidian amphora. A Dressel 24 similis amphora, perhaps of Aegean origin, likely represents olive oil provision for the crew. The crew also made use of a large table amphora, a pot, and two jugs.

Agora M 54

Among the amphorae visible on the site, 513 are identified as Agora M 54, and an additional 247 partially visible jars and fragments are tentatively identified as the same type (Fig. 4). To judge from the high relief of the mound, a great many more remain out of sight; these most likely include an additional 500-700 amphorae of this type.

Agora M 54 was the first type identified in the Athenian Agora.¹² It is also known as *amphores 'Pseudo-Cos' en cloche*, Knossos 47, and Nea Paphos type 8.¹³ On occasion it is considered a late derivative of Koan or the Dressel 2-4 amphora tradition due to its double-barreled handles.¹⁴

¹¹ GRACE 1961, fig. 60, centre.

¹² ROBINSON 1959, p. 89, pl. 19.

¹³ 'Pseudo-Cos': EMPEREUR & PICON 1989, p. 230-232, figs. 5-6; Knossos 47: HAYES 1983, p. 58, fig. 26.103; Nea Paphos type 8: HAYES 1991, p. 93-94, pl. 25.3 and LUND 2005.

¹⁴ LEIDWANGER 2013, p. 193.

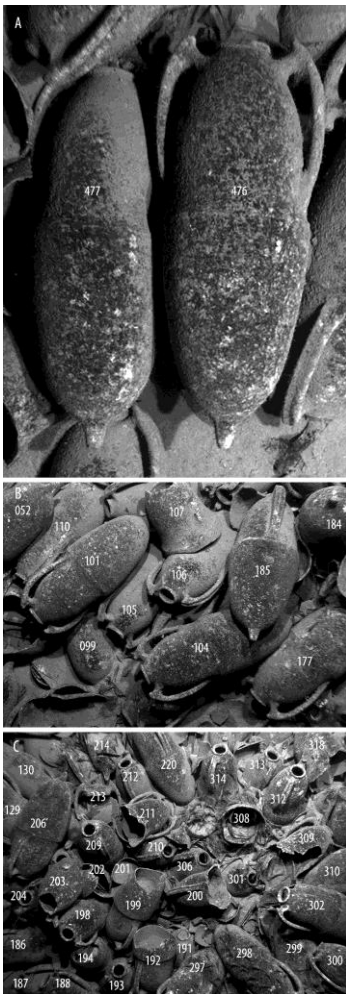


Fig. 4a-c. Agora M 54 amphorae from the Knidos H shipwreck. (Courtesy Ocean Exploration Trust)

However, the amphora body has nothing in common with a Koan type. The mouth has a rolled rim and, as the neck and shoulder are missing, the rim is set on the upper part of the body; the handles are bifid and curved, following the line of the upper part of the body and horned at the top. The upper part of the body bulges and is separated by an offset from the lower part; sometimes another small offset occurs on the middle of this upper part indicating the junction between two segments. The lower part of the body tapers and ends in a short, solid peg toe. Research undertaken in Cilicia in the 1980s securely identified three amphora workshops that manufactured amphora Agora M 54: Yumurtalık, Ayaş/Elaioussa Sebaste,¹⁵ and Aigeai.¹⁶ Empereur proposes an additional source in Cyprus.¹⁷

Amphorae of this type display a large variety of capacities. Three complete amphorae from the Athenian Agora have capacities that vary between 26.8, 29.1, and 35.4 litres.¹⁸ In addition, an amphora discovered at Olba has a capacity of 23.38 litres.¹⁹ Two amphorae discovered at Valencia typify perhaps the latest subtypes: one maintains its convexity in the upper part of its body, while the second exhibits a cylindrical body; both end in a solid peg toe. However, the handles of these vessels are not bifid but ovoid in section, with a deep longitudinal groove. They have impressive capacities, ranging between 78 and 96 litres.²⁰ Similar handles occur as survivals in a 4th century context in the Athenian Agora.²¹ As other amphorae from the Athenian Agora demonstrate,²² the cylindrical subtype will prevail during the 4th and 5th century but the capacity will severely decrease to as little as 12 litres.

What of its beginning date? It is worth noting Panella's observation that this type is absent at Pompeii as well as in the Flavian layers at Ostia. She suggests an

¹⁵ EMPEREUR & PICON 1989, p. 231-232.

¹⁶ AUTRET 2012, p. 257.

¹⁷ EMPEREUR 1998, p. 395.

¹⁸ 26,8 l (P 12361 = M 54); 29.1 l (P 11749); 35.4 l (P 3987).

¹⁹ ŞENOL & KEREM 2000, p. 92, fig. 15.

²⁰ BERLANGA & RIBERA I LACOMBA 2015, p. 276, fig. 6.5-6.

²¹ A. OPAİT, pers. observations. Thanks go to Professor J. Camp for allowing documentation in the Stoa of Attalos.

²² P 14103, P 13062.

origin in an “area grecofono,” with production starting around the end of the 1st century and the beginning of the 2nd century A.D.²³ The type’s period of circulation between the end of the 1st century and the early 3rd century A.D. is suggested by numerous Athenian discoveries²⁴ and by a deposit at Nea Paphos dating to “around A.D. 125-150.”²⁵ Reynolds, however, suggests that production ceased in the early 3rd century, and that Cilicia was its production area.²⁶ This type probably finished its evolution around the end of the 2nd century or sometime during the first half of the 3rd century.

The amphora was distributed widely but mostly in the eastern Mediterranean (**Fig. 5**): Athens,²⁷ Corinth,²⁸ Argos,²⁹ Nea Paphos,³⁰ Kition,³¹ Elaioussa Sebaste, Seleucia Pieria, Yumurtalık (Aigeai),³² Ephesus,³³ Eretria,³⁴ Beirut,³⁵ Troesmis, Ibida in Romania,³⁶ Pompeiopolis in Turkey,³⁷ Olba,³⁸ off Cilician shores,³⁹ Karanis,⁴⁰ Marina el-Alamein,⁴¹ Alexandria,⁴² Mons Claudianus,⁴³ and Quseir al-Qadim.⁴⁴ In the western Mediterranean it occurs only occasionally at Marseilles⁴⁵ and Valencia,⁴⁶ while in Italy it is present at Rome⁴⁷ and Ostia.⁴⁸ It has also been found on some shipwrecks, including Ouest-Embiez 1⁴⁹ and the Fig Tree Bay wreck.⁵⁰

²³ PANELLA 1986, note 15.

²⁴ ROBINSON 1959, p. 89, Deposit N 20:2; many other fragments of these type are deposited in the Stoa of Attalos.

²⁵ HAYES 1991, p. 93, no. 32.

²⁶ REYNOLDS 2005, p. 564, fig. 11.

²⁷ ROBINSON 1959, p. 89, M 54; BÖTTGER 1992, p. 338-339, nos. 55-60, fig. 1.12, pl. 99.2.

²⁸ SLANE 2000, p. 301, note 15.

²⁹ ABADIE-REYNAL 2007, p. 240-241, pl. 67, 431.1.

³⁰ HAYES 1991, p. 93, nos. 31-32, pl. 25.3, fig. 68.

³¹ MARQUIÉ 2004, p. 260.

³² EMPEREUR & PICON 1989, p. 231-232.

³³ BEZECCZKY 2004, p. 87; BEZECCZKY 2013, p. 80-81, type 13.

³⁴ PALACZYK 2018, p. 726, fig. 3.12.

³⁵ REYNOLDS 2005, p. 564.

³⁶ Unpublished examples.

³⁷ Unpublished examples.

³⁸ ŞENOL & KEREM 2000, p. 92, fig. 15.

³⁹ ŞENOL 2009, p. 225, no. 49.

⁴⁰ HAYES 1983, p. 158.

⁴¹ MAJCHEREK 2007, p. 20, figs. 4.25-27.

⁴² EMPEREUR 1998, p. 395, fig. 11; the wine from Yumurtalık (Aigeai) is attested in Alexandria by papyri (cf. HEILPORN 2000, p. 349).

⁴³ TOMBER 2006, p. 168-169, figs. 1.65-970-971.

⁴⁴ JOHNSON & WHITECOMB 1979, p. 88, pl. 27.f.

⁴⁵ PANELLA 1986, note 15.

⁴⁶ BERLANGA & RIBERA I LACOMBA 2015.

⁴⁷ RIZZO 2003, p. 156; COLETTI & LORENZETTI 2010, p. 159, fig. 3.

⁴⁸ RIZZO 2014, p. 338-339, fig. 47.

⁴⁹ JEZEGOU 2008, p. 451-460.

⁵⁰ LEIDWANGER 2010, p. 10, fig. 3.

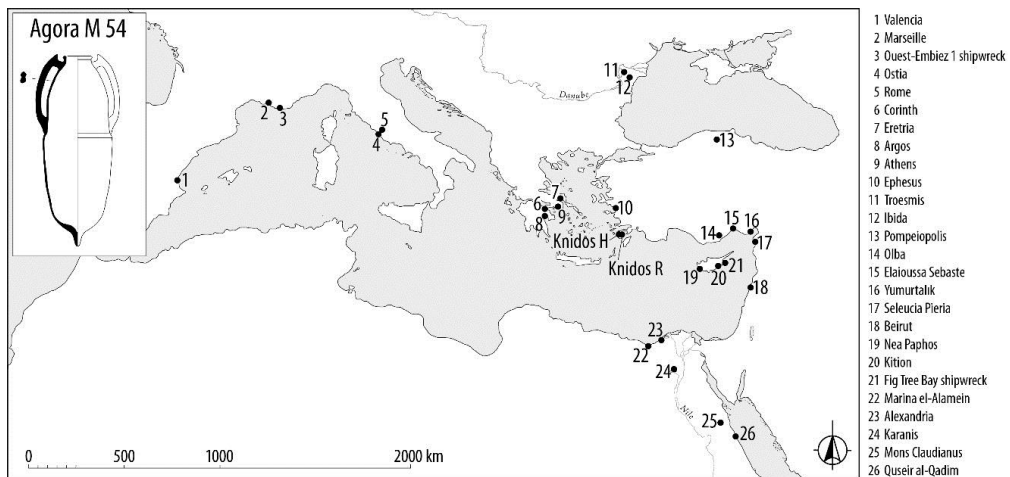


Fig. 5. Distribution of Agora M 54 amphorae. (A. Opaı̇ and D. Davis)

Many complete and fragmentary examples stored in the Stoa of Attalos bear traces of pitch on the interior,⁵¹ an indication of either wine or fish products. It is more likely that this was a wine amphora. In addition, a miniature terracotta version from the Benaki museum at Athens is decorated with vine leaves and grapes, thus suggesting wine as its main content.⁵² Sweet Cilician wine was highly praised by Pliny the Elder (*HN* 14.9.75) for being the second finest type of *passum* after Cretan wine. Another Cilician wine, “Abate wine,” was austere and sweet, thick and black.⁵³ However, as Komar has pointed out, it is difficult to believe that Cilician Abate was a red wine; rather it was a very old white or young red wine.⁵⁴ Some scholars, based on literary testimonia, however, consider that Abate was not commonly exported.⁵⁵ If we consider that Cilician *passum* required a special and quite lengthy treatment, with a high content of alcohol,⁵⁶ it is most likely that only amphorae of type Pompeii V, of a small capacity,⁵⁷ were more fitted for such an expensive and sweet wine, and Agora M 54 for a Cilician Abate wine.

The Agora M 54 amphorae discovered on Knidos H confirm the terrestrial finds. It is obvious that these vessels were manufactured in at least two or three sizes (Fig. 4a). Of course, it is impossible to differentiate between jars of 26 and 28 litres in the imagery but differences between 26 and 35 litres are easily visible (see Fig. 4b).

⁵¹ A. OPAİ, personal observation. A. Opaı̇ would like to thank to Professor J. Camp for permitting the study of these examples.

⁵² AUTRET & MARANGO 2011, p. 361, fig. 5.

⁵³ DALBY 2003, p. 1, citing Galen *VA* 99, *ST* 6.337, *SF* 11.648.

⁵⁴ KOMAR 2016, p. 167.

⁵⁵ AUTRET & MARANGO 2011, p. 364; KOMAR 2016, p. 167.

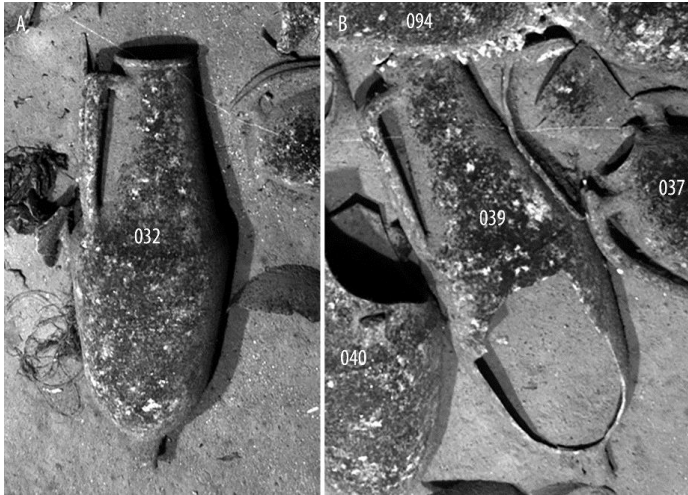
⁵⁶ See Columella *De arboribus* 12; BILLARD 1913 [1997], p. 491-492.

⁵⁷ A Pompeii V type has a capacity of *ca.* 1/10 of an Agora M 54 volume. Many scholars produce statistics that include different Cilician amphorae without considering the huge differences in volume/capacity that exist between Agora M 54, Cilician Dressel 2-4, and Pompeii V.

Also, it seems that the largest amphorae were stowed at the bottom of the ship while the smaller vessels were set on top. This kind of lading of the cargo is visible in some of the images (see **Fig. 4b-c**).

Cilician Dressel 2-4

The second type is represented by nine visible examples of a lesser known amphora yet without nomenclature. We tentatively name it Cilician Dressel 2-4. It has been found in the Athenian Agora and is mentioned by V. Grace in her booklet.⁵⁸ Intuitively, she positioned it next to Agora M 54. Given the fact that all nine examples but one were found in the stern and mixed among many of Agora M 54 type, we suggest that both were loaded together in the same port of departure. Therefore, a Cilician origin is posited and confirms the discoveries made in Cilicia at Yumurtalık (Aigeai)⁵⁹ and Bıçkıcı Kiln in Alanya Gazipaşa.⁶⁰ This type also seems to be made in two sizes. The largest has an impressive tronconic neck, almost equal in size to the body, which tapers slightly to the lower part, and a small, conical peg toe (**Fig. 6**).



**Fig. 6a-b. Cilician Dressel 2-4 amphorae from the Knidos H shipwreck.
a: KH.032; b: KH.039. (Courtesy Ocean Exploration Trust)**

The second variant, discovered at the edge of the wreck mound, has a small tronconic neck occupying almost one third of the entire profile, a carinated shoulder, and a more cylindrical body that ends in a massive tronconic peg toe.⁶¹ Both variants have bifid handles (**Fig. 7**).

Perhaps these variants represent the smallest vessels of this type. Intact vessels with capacities varying between 100 and 284 litres have been published

⁵⁸ GRACE 1961, fig. 60, centre.

⁵⁹ EMPEREUR & PICON 1989, p. 226, fig. 2.

⁶⁰ AUTRET & RAUCH 2010, p. 114, fig. 9; AUTRET 2012, 259, fig. 17.5.

⁶¹ See GRACE 1961, fig. 60, centre.

from the Cilician museums and Athens.⁶² The largest “pithoid amphora” was also found in the Sinai peninsula⁶³ and at Akamas.⁶⁴ They are also known from a shipwreck at Fig Tree Bay, Cyprus, whose investigator concluded that limited finds of this amphora must mean that they “travelled infrequently outside a restricted Levantine corridor.”⁶⁵ However, this Cilician wine reached other important markets as demonstrated by some amphorae of small and large sizes identified in Egypt at Mons Claudianus,⁶⁶ Quseir al-Qadim,⁶⁷ and Al-Zarqâ'/Maximianon.⁶⁸ These latter suggest an export from the Mediterranean to the Indian Ocean. The eight amphorae grouped in the stern may have been placed there owing to their slim shape and the narrowing of the cargo hold in this area. Alternatively, their tight grouping suggests a special consignment to be kept separate from the rest of the cargo. The ninth amphora, located in the bow area, was likely possessed by the crew.

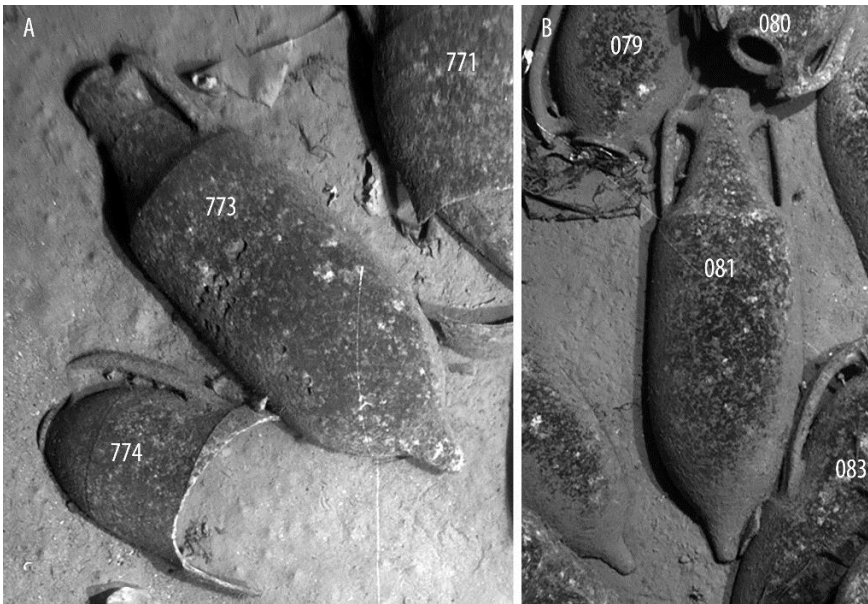


Fig. 7a-b. Cilician Dressel 2-4 amphorae from the Knidos H shipwreck: a: KH.773; b: KH.081. (Courtesy Ocean Exploration Trust)

⁶² ŞENOL & KEREM 2000, p. 90-91, pl. 16.11; ŞENOL 2009, p. 310, fig. 164; BÖTTGER 1992, p. 368, pl. 98.6, cat. no. 51.

⁶³ ARTHUR & OREN 1998, p. 198, fig. 4.6.

⁶⁴ LEONARD 1995, p.146, figs. 22 and 36. BB-15

⁶⁵ LEIDWANGER 2010; 2013, p. 199 with bibliography of other discoveries made in the Levant.

⁶⁶ Small versions: TOMBER 2006, p. 168-169, type 55, fig. 1.65.55-962-55.971; large versions: 170, type 58, fig. 1.65.58-975.

⁶⁷ JOHNSON & WHITECOMB 1979, pl. 28.m; WHITECOMB 1982, p. 86, pl. 15.b-d and 19.d.

⁶⁸ BRUN 2007, p. 519, fig. 17.2

Agora G 199

The third amphora type found on the shipwreck is Agora G 199. Only one complete example and the neck of a second have been identified (**Fig. 8a**). This is a well-known type of Cilician/Cypriote origin (see below).⁶⁹ Most likely, given its position at the eastern end of the wreck, it belonged to the crew.



Fig. 8a-c. Amphorae from the Knidos H shipwreck. a: Agora G 199 (KH.019, KH.021); b: Knidian (KH.148); c: Dressel 24 similis (KH.004). (Courtesy Ocean Exploration Trust)

Knidian Amphora

Also near the stern is a Knidian amphora, perhaps brought on board during a previous voyage or perhaps in a nearby port (**Fig. 8b**). The sub-type is well established from the first half of the 2nd century A.D.⁷⁰ Our example seems to be of a small size.

Dressel 24 similis

The necessary olive oil used for the crew's cooking and consumption was stored in a variant of a Dressel 24 similis amphora, a vessel also typical for the end of the 1st century and first half of the 2nd century (**Fig. 8c**).⁷¹

Coarse Wares

Also among the crew's possessions were a table amphora, a pot, and two jugs (**Fig. 9**). All of these 'auxiliary' vessels, together with the olive oil amphorae, are located and more or less grouped at the periphery of the site. Most likely they were kept in the cabin on the stern.

⁶⁹ ROBINSON 1959, p. 43, pl. 8. G199; PANELLA 1973, p. 474-476, fig. 34; ZEMER 1978, p. 52, no. 41; RILEY 1979, p. 186-187; HAYES 1991, p. 91-92.

⁷⁰ PANELLA 1976, p. 152, pl. XLII.1; PANELLA 1986, p. 621, fig. 18; GRACE 1961, fig. 64, the last amphora; AURIEMMA 2000, p. 38, fig. 12 (dated "prima meta or decenni centrali del II sec. d. C.").

⁷¹ OPAIT 2007, p. 632-633, fig. 8.41. An Athenian example (P 11746) is dated to the early 2nd century A.D.

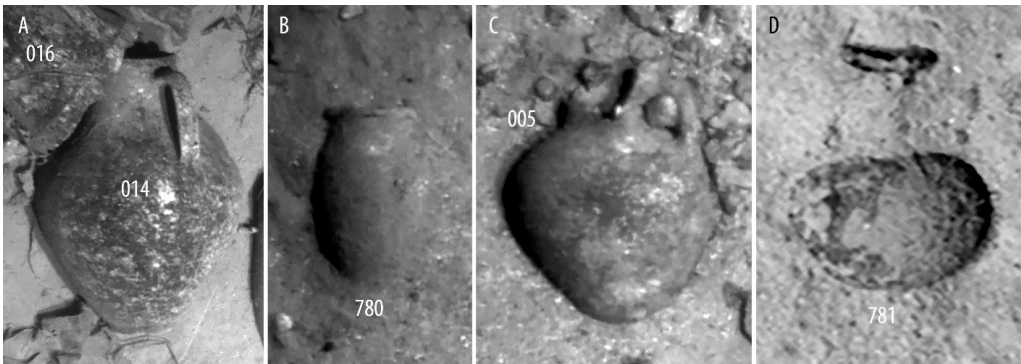


Fig. 9a-d. Crew's possessions from the Knidos H shipwreck. a: table amphora (KH.014); b: pot (KH.780); c: jug (KH.005); d: jug (KH.781). (Courtesy Ocean Exploration Trust)

The main index for the size of the cargo are the Agora M 54 amphorae. The three amphorae discovered in the Athenian Agora (discussed above) demonstrate that this type was made in different sizes and capacities varying between 26 and 35 litres. The weight of the three amphorae found in the Athenian agora varies between 8 and 12 kg. Therefore, it will be safe to consider, on average, a volume of *ca.* 30 litres and a weight of an empty vessel of 10 kg, which results in a total weight of *ca.* 40 kg. If this figure is multiplied by 1,300 amphorae, we derive a minimal weight of 50-52 tons.

Knidos S

Knidos S was discovered at 343 meters depth north of the Datça peninsula (see **Figs. 1** and **10**).⁷² Unlike the relatively intact Knidos H site, this wreck is characterized by a rather small scattering of amphorae, most of them broken by modern fishing trawls; it is highly probably that a good deal of the cargo has been dragged off site by fishing gear in modern times. The site measures 20.5 × 10 m and exhibits less than a meter of relief. The axis of the wreck is roughly north-south, with a smaller density of finds at the southern end and a larger, more scattered concentration at the northern end. Two anchor assemblages at the southern end indicate the bow, and the stern is represented at the northern end by several small kitchen vessels.

The cargo is smaller than that of Knidos H. Our count yielded nearly 500 complete and fragmentary vessels. However, the cargo is extremely interesting as it gathers together three distinct amphora types in one assemblage: Agora G 199, Dressel 24, and a Cylindrical amphora type previously considered to be of Aegean origin.⁷³ Again, this cargo seems to have been loaded in a Cilician/Cypriot port as it is quite certain that this is the origin of Agora G 199.⁷⁴

⁷² First reported in KRUMHOLZ & BRENNAN 2015, p. 129.

⁷³ OPAIT 2014, p. 50-53.

⁷⁴ LUND 2005 - http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/details.cfm?id=369.

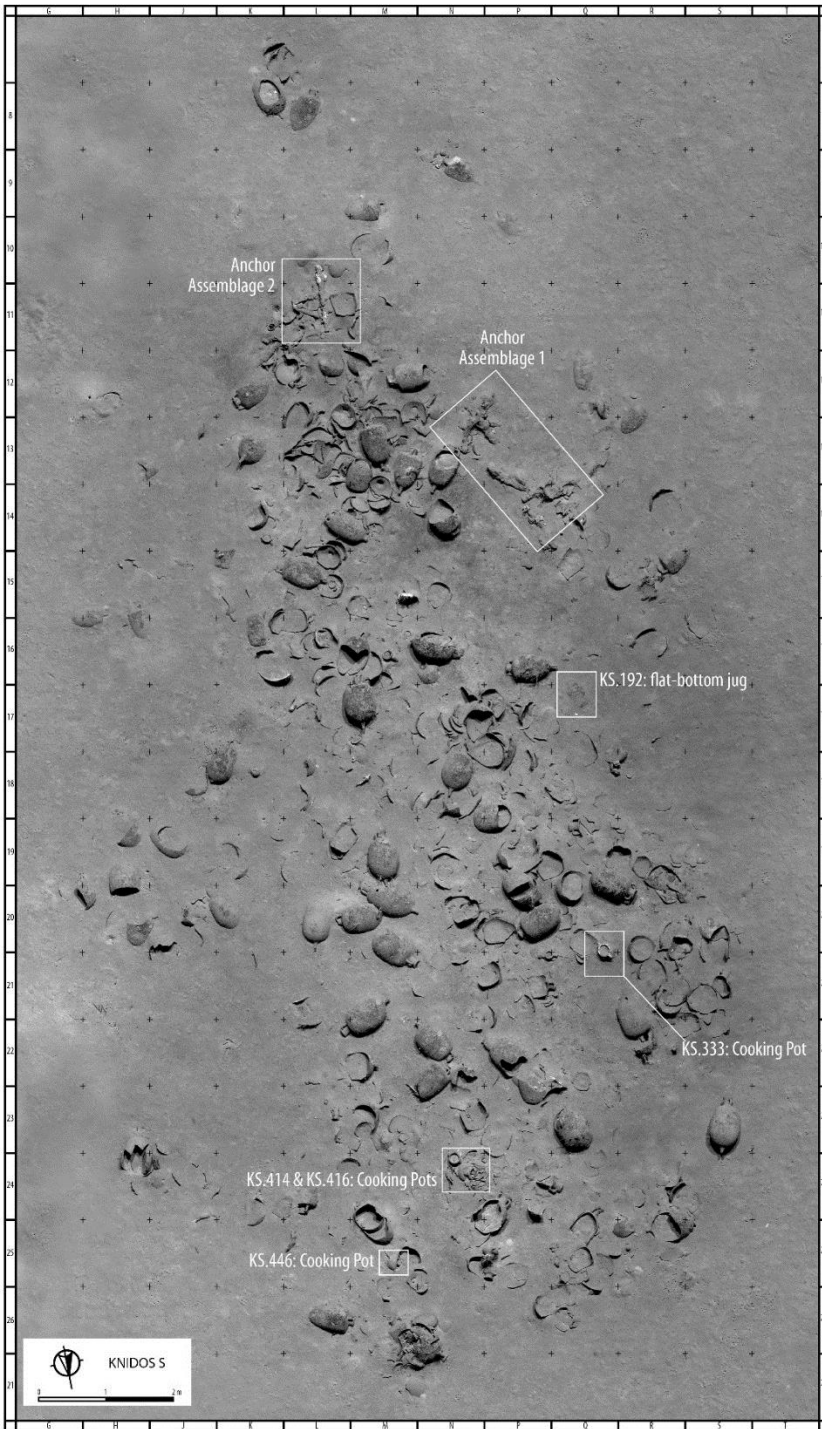


Fig. 10. Mosaic of the Knidos S shipwreck. (Courtesy Ocean Exploration Trust)

Although a first glance suggests that an unpatterned assemblage of vessels make up the site, on some occasions a grouping is evident. Most likely they were loaded according to their weight and shape to ensure good balance of the ship. Consequently, we can safely surmise that the same origin can be bestowed on the other two types as well, all of them being loaded at the same time and at the same port.

Agora G 199

Amphora type Agora G 199⁷⁵ goes by various other names, including Ostia forma 631, Mid Roman 4, Mau 27/28, Pinched handle amphora, Zemer no. 41, and Nea Paphos 3, to name just a few.⁷⁶ The rim is rolled, or thickened, the neck is quite short and cylindrical, the handles are grooved and pinched at the point of curvature and make a right angle to fall vertically onto an almost horizontal shoulder.



Fig. 11. Agora G 199 amphorae from the Knidos S shipwreck: KS.067 (left), KS.098 (center), and KS.100 (right). (Courtesy Ocean Exploration Trust)

The body shape suggests the existence of two variants (**Fig. 11**). One has a cylindrical body (KS.067 on the left, KS.100 on the right), while the second has a tapering body with a sharp angle between shoulder and body (KS.098, center). The body of both variants is wheel-ridged and ends in a long spike with a mushroom cap. The latter variant occurs in a reduced number. It is difficult to say without examining fabrics whether these morphological differences suggest different workshops.

The vessel enjoyed a certain popularity (**Fig. 12**). It was known in Athens,⁷⁷ Corinth,⁷⁸ Thessaloniki,⁷⁹ Ephesus,⁸⁰ Nea Paphos,⁸¹ Kioni,⁸² off Cilician shores,⁸³

⁷⁵ ROBINSON 1959, p. 43, pl. 8.

⁷⁶ Ostia forma 631: PANELLA 1973, p. 474-476, fig. 34; Mid Roman 4: RILEY 1979, p. 186-187; Mau 27/28; pinched handle amphora: LEONARD 1995, p. 144-145; Zemer no. 41: ZEMER 1978, p. 52; Nea Paphos 3: HAYES 1991, p. 91-92.

⁷⁷ ROBINSON 1959, p. 43, pl. 8; BÖTTGER 1992, p. 340, nos. 65-66.

⁷⁸ SLANE 2004, p. 365-366, fig. 4.

⁷⁹ GRIGOROPOULOS 2010, fig. 4B.7.

⁸⁰ BEZECZKY 2013, p. 83-84, pl. 13.146.

⁸¹ HAYES 1991, p. 204, no. 23, type III; HAYES 2003, p. 479, fig.18.181; MAYZA & BAGIŃSKA 2013, figs. 5-6.

⁸² LEONARD 1995.

⁸³ ŞENOL 2009, p. 223-224, nos. 47-48.

Beirut,⁸⁴ Atlit,⁸⁵ Caesarea,⁸⁶ Egypt,⁸⁷ Quseir al-Qadim,⁸⁸ and Benghazi.⁸⁹ In the central and western Mediterranean, it is found only at Rome,⁹⁰ Pompeii and Ostia,⁹¹ Brindisi,⁹² Lyon,⁹³ and Seville.⁹⁴ In the Black Sea-Lower Danube area it is also widely distributed without being numerous in quantitative terms: Noviodunum, Durostorum, Capaclia,⁹⁵ Histria,⁹⁶ Tomis,⁹⁷ Niculițel,⁹⁸ Novae,⁹⁹ Slăveni,¹⁰⁰ Sozopol,¹⁰¹ Chersonesos,¹⁰² Panticapaeum,¹⁰³ and Tanais.¹⁰⁴ It is worth pointing out that these amphorae, in spite of their widespread distribution, occur only in reduced percentages. They were likely a luxury product. Also, it was much more popular than Agora M 54 in the Black Sea or in the central/western Mediterranean.

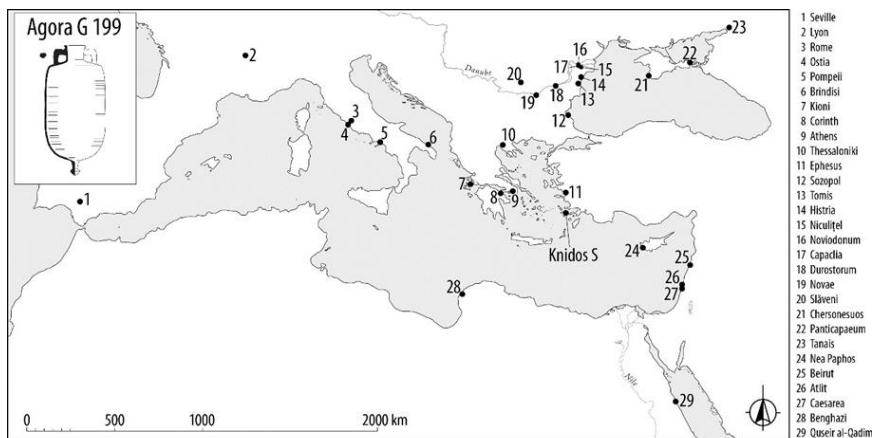


Fig. 12. Distribution of Agora G 199. (A. Opaïț and D. Davis)

⁸⁴ REYNOLDS 2005, p. 564, fig. 32.

⁸⁵ ZEMER 1978, p. 52, no. 41.

⁸⁶ OLESON *et alii* 1994, p. 118, A 85; JOHNSON 2008, p. 102, no. 1233.

⁸⁷ MAJCHEREK 1990, p.47, fig.12.4; BOURRIOU & FRENCH 2007, p. 126-127, fig. 3.4; MAJCHEREK 2007, p. 21-24, fig. 5.32-33, 6.34-38.

⁸⁸ JOHNSON & WHITECOMB 1979, pl. 25.u.

⁸⁹ RILEY 1979, p. 186-187, fig. 83.236-238.

⁹⁰ RIZZO 2003, p. 183, pl. XL.218.

⁹¹ PANELLA 1973, p. 474-476, fig. 34; PANELLA 1986, p. 622, fig. 19; CECI 2006, p. 34, fig. 10.

⁹² AURIEMMA & QUIRI 2004, p. 49.

⁹³ LEMAÎTRE 2000, figs. 2-3.

⁹⁴ GARCÍA VARGAS 2015, p. 406, fig. 6/2.

⁹⁵ HONCU & STĂNICĂ 2017, p. 315, fig. 5.10.

⁹⁶ Unpublished.

⁹⁷ OPAIȚ 1987, p. 256, fig. 6/4a-b.

⁹⁸ PARASCHIV 2014, no. 56, pl. 9/56.

⁹⁹ DYCZECK 2001, p. 160, type 22.

¹⁰⁰ BONDUC 2016, p. 218, pl. 8/2.

¹⁰¹ KUZMANOV 1985, p. 13, type 5, fig. 4/36A.

¹⁰² STRJELETSKIY *et alii* 2005, p. 73-74, pl. X.2.

¹⁰³ GOLOFAST 2010, pl. 11.7-8, 26.18, 24-30.

¹⁰⁴ ARSEN' EVA & NAUMENKO 1992, p. 148-149, fig. 28.1; NAUMENKO 2008, p. 277, fig. 5/6; NAUMENKO 2012, p. 67, figs. 5/6, 7/9.

The amphora's capacity varies. Two amphorae from Athens hold 23.8 and 26.7 litres,¹⁰⁵ the amphora from Ostia 36.8 litres,¹⁰⁶ the amphora from Atlit 53 litres,¹⁰⁷ and the Tomitan vessel 48.5 litres.¹⁰⁸ The weight of the Athenian examples varies between 7.0 and 7.5 kg. It is difficult to calculate the capacities of our amphorae, but the tapering variant would seem to hold fewer litres than the cylindrical one.

So far the only kiln sites that have been discovered to date are in Cilicia at Anemurium¹⁰⁹ and Biçkici.¹¹⁰ Cyprus has been suggested by Hayes¹¹¹ and Lund¹¹² but without kiln evidence. Recent petrographic analyses do not confirm their hypothesis.¹¹³

Cylindrical amphora

The Cylindrical type, defined and discussed in a recent paper,¹¹⁴ is also well distributed but in reduced quantities. In many respects it shares common features with Agora G 199. It is a large amphora with a slightly thick and flaring rim, a short neck, ear-shaped handles with two longitudinal ribs, a cylindrical body with wheel-turned traces, and ends in a spike with a mushroom cap (**Fig. 13**). The spike, however, is shorter than that of Agora G 199. The body is slightly enlarged on its lower half but it will become perfectly cylindrical in the 3rd century A.D. Excellent parallels are found at Athens where the amphora is dated to between 140 and 170 A.D.¹¹⁵ To the list of sites in which this type of amphora has been found¹¹⁶ we may add Pompeiopolis,¹¹⁷ which is far inside northern Anatolia, and Eretria.¹¹⁸

Regarding the capacity of this type, two amphorae found at Athens and Chersonesos have a volume that varies between 36 and 46 litres, while the Athenian example has a weight of 11 kg. However, an example found at Quseir al-Qadim¹¹⁹ has a double capacity (*ca.* 94 litres), suggesting that its weight was also double. The morphology of our amphorae suggests a close resemblance to the latter amphora. Most likely these large amphorae belonged to the later part of the 1st century A.D., while the smaller can be dated during the next two centuries. The differences in capacity between the Cylindrical type and Agora G 199 are visible in **Fig. 13c**.

¹⁰⁵ 23.8 litres (P 2545); 26.7 litres (P 11124).

¹⁰⁶ PANELLA 1986, fig. 19.

¹⁰⁷ ZEMER 1978, p. 52, no. 41. However, the mathematical calculus, according to Zemer's drawing, suggests a capacity of 45.5 litres, but the drawing seems somewhat skewed.

¹⁰⁸ OPAIȚ 1987, p. 256, fig. 6/4a-b.

¹⁰⁹ WILLIAMS 1989, p. 90-95.

¹¹⁰ RAUH & SLANE 2000; RAUH 2004.

¹¹¹ HAYES 1977, p. 100.

¹¹² LUND 2000.

¹¹³ WILLIAMS & LUND 2013, p. 160-161.

¹¹⁴ OPAIȚ 2014, p. 50-52.

¹¹⁵ P 8164; cf. OPAIȚ 2014, p. 51, fig. 26.

¹¹⁶ See OPAIȚ 2014.

¹¹⁷ A. OPAIȚ, pers. observation.

¹¹⁸ PALACZYK 2018, p. 726, fig. 4.2.

¹¹⁹ OPAIȚ 2014, note 54.

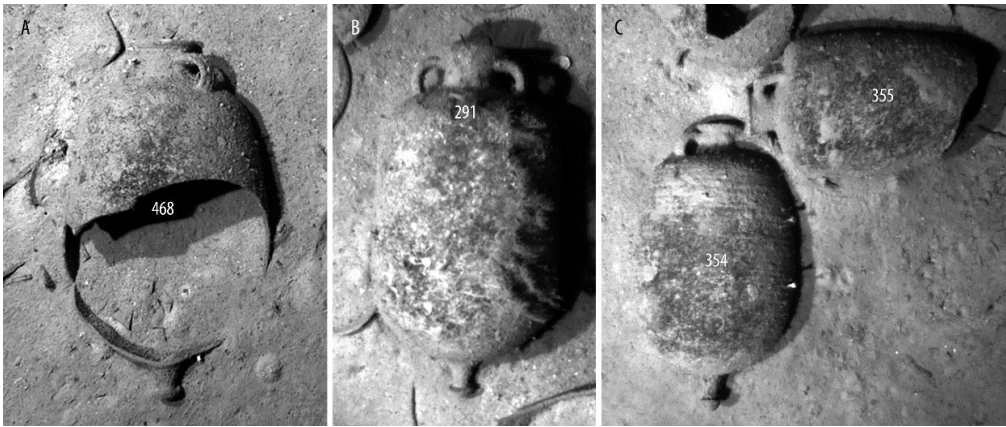


Fig. 13a-c. Cylindrical amphorae from the Knidos S shipwreck. a: KS.468; b: KS.291; c: KS.354. (Courtesy Ocean Exploration Trust)

Dressel 24

Dressel 24 was also a widely distributed.¹²⁰ Its abundance in the Black Sea/Lower Danube region is no doubt due to research intensity of early Roman sites in the area but also to the continuation of intense commercial connections between the Aegean and Black Sea since Archaic, Classical, and Hellenistic times. As we have pointed out, this type is frequently discussed together with amphorae called by us Dressel 24 similis.¹²¹ This regrettable confusion should be abandoned since their regions of manufacture are completely different.¹²² The Knidos S shipwreck contributes more data to their distinction. As has recently been shown, this type has deep Hellenistic roots and continued to be manufactured in some Aegean islands and on the western coast of Asia Minor during the early Roman period; its production continued in the late Roman era and its form is known to us as LRA 2.¹²³

The vessel has a funnel-shaped mouth that is flattened on top. It is separated from the tronconic neck by an incised line. Its shoulders are wide and less steep, its handles ovoid or rounded in section and attached under the mouth and on the middle of the shoulder. Its lower attachment is slightly pulled toward the neck. The body is ovoid, growing larger in its lower section and ending in a long, conical spike (**Fig. 14**).

¹²⁰ OPAIŦ 2007.

¹²¹ OPAIŦ 2007.

¹²² PANELLA 1986, figs. 22-23.

¹²³ OPAIŦ 2007.

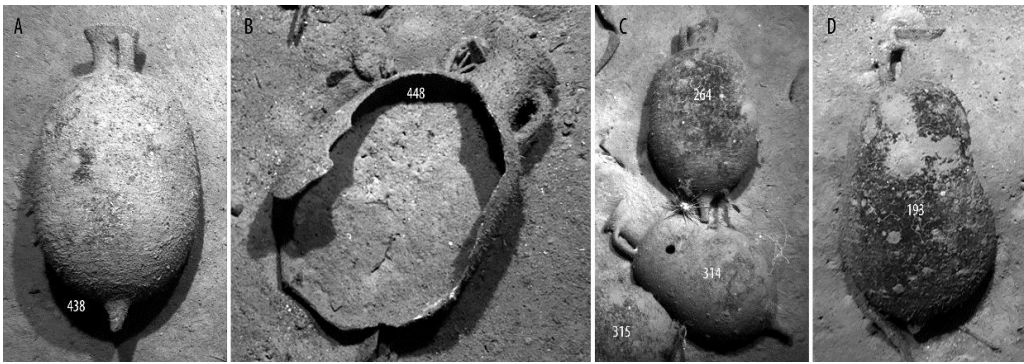


Fig. 14a-d. Dressel 24 amphorae from the Knidos S shipwreck. a: KS.438; b: KS.448; c: KS.264, KS.314; d: KS.193. (Courtesy Ocean Exploration Trust)

A workshop for this type may exist in proximity to Knidos as a cup-shaped and internally hooked rim fragment was discovered in a workshop at Hisarönü in the Rhodian Peraia.¹²⁴ The obvious question is: Were these vessels made in Knidos and loaded onto this ship when it entered that city's harbor? This does not seem to be the case since just one sherd of this type was published from this site and it was not described as a waster; it may belong to an imported amphora. In addition, complete examples known from terrestrial sites lack wheel traces on the body, but the examples found on this shipwreck show such traces on most of the body. Also, the height of the mouth seems to be shorter than that of known examples. On the other hand, it makes sense to load the complete cargo in the port of departure to balance the vessel's trim.

Two variants of this type were also included on this shipwreck. The first is larger, with an ovoid body (**Fig. 14c**), while the second seems to be smaller, with narrow shoulders and a bag-shaped body ending in the same tronconic spike (**Fig. 14d**). They may represent two sizes of a type made by a single workshop. These two variants of Dressel 24, both found on this shipwreck, are so far unknown on terrestrial sites and represent a significant discovery.

Regarding capacity, given the lack of precise parallels, it is difficult to form a firm picture. The capacities of some amphorae, such as those discovered at Pompeii, Tanais, and Chersonesos, show variations between 50 and 70 litres. These vessels may have dimensions and capacities similar to the smaller, bag-shape variant. In this case, the larger variant might have a volume of *ca.* 80 litres. The crew's wares visible on the surface include four cooking pots and a flat-bottomed jug (**Fig. 15**).

¹²⁴ EMPEREUR & TUNA 1989, p. 285, fig. 14:b.

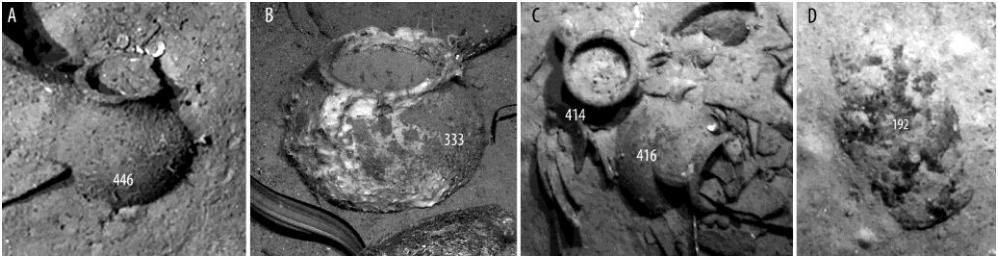


Fig. 15a-d. Crew's possessions from the Knidos S shipwreck. a: cooking pot (KS.446); b: cooking pot (KS.333); c: cooking pots (KS.414, KS.416); d: jug (KS.192). (Courtesy Ocean Exploration Trust)

We can conclude that Knidos S has a much more reduced tonnage than Knidos H, perhaps as little as one-third. If we consider an average amphora capacity of 70 litres, a weight of *ca.* 12 kg each for empty vessels, and multiply by *ca.* 200 examples, we derive a cargo weight of *ca.* 17 tons.

The Anchors

The Knidos S site includes at least two anchor assemblages. The first, an iron anchor, consists of several cylindrical concretions in grid-squares N12-13, P12-14 and Q14 (see Figs. 10 and 16). Most distinctive are the crown (A), a single, semi-lunate arm (B), and a portion of the shank where it meets the crown (C). The opposite arm has broken away from the crown and is not evident in the imagery. The extant arm measures 55 cm in length from the center of the crown, giving the arms an apparent span of *ca.* 1.10 m. The arm's outer end provides no hint of a palm or fluke. A short concreted nodule extends outward from the crown beyond its junction with the arm. The surviving shank measures *ca.* 50 cm in length, and concretions D (length 70 cm) and perhaps E (30 cm) appear to be continuations of it. The average thickness of all three concretions, and the arm, is *ca.* 10 cm, but caution is naturally warranted in extrapolating original anchor thicknesses and cross-sectional shape from concretion shells. Whether the remaining concretions (F, G, H, and I) represent pieces of the shank, the shaft, or some other element of ground tackle is difficult to determine due to their amorphous shapes.

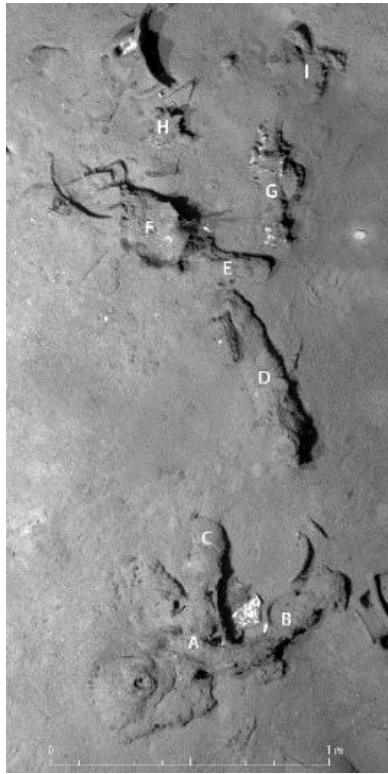


Fig. 16. Anchor assemblage 1 from the Knidos S shipwreck (grid-squares N12-13, P12-14 and Q14). (Courtesy Ocean Exploration Trust)

The second anchor assemblage, lying *ca.* 2.5 m from the first, consists of three linear elements in grid squares L10-L11 (Figs. 10 and 17). The longest piece, element A (length *ca.* 95 cm, diam. *ca.* 8-9 cm), is an iron concretion oriented on the long axis of the wreck mound. Two hemispherical nubs on the concretion shell project outward, the upper larger than the lower. Element A's lower end tapers slightly before terminating in a jagged break. Element B (length *ca.* 42 cm, width *ca.* 7-8 cm) is heavily sedimented but appears to have a flat upper surface suggesting a rectangular cross-section. To judge from its position and near right angle to element A, element B appears at first glance to be attached to the latter but actually lies below it. Its straight edges and flat upper face suggest that it is made of lead. A hole pierces its outer end. Element C (length *ca.* 40 cm, width *ca.* 7-8 cm), like element B, exhibits a flat upper face but its lower edge is rough. The left end is formed at an angle of *ca.* 30 degrees from its axis while its right end merges with the sediment below element A. It too may be made of lead.

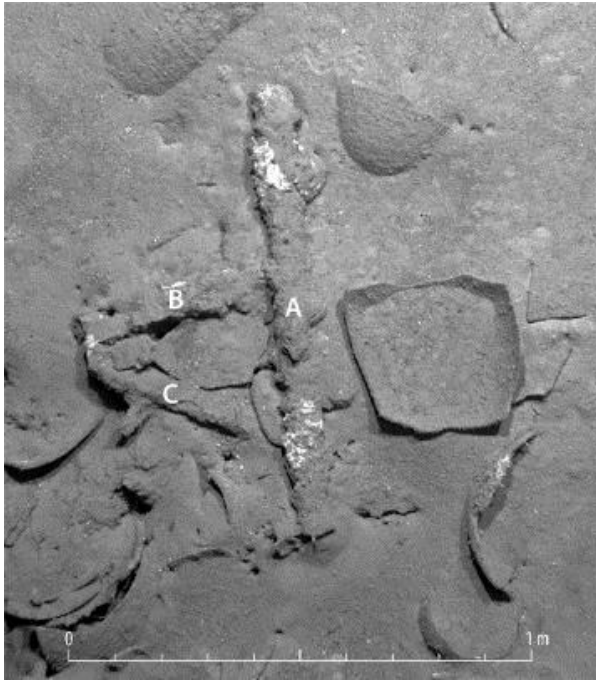


Fig. 17. Anchor assemblage 2 from the Knidos S shipwreck (grid-squares L10-L11). (Courtesy Ocean Exploration Trust)

Trawling action has disarticulated both anchor assemblages. Although the upper half of anchor 1 is damaged beyond reconstruction, the extant shank, crown, and arm aid in its classification as a Kapitän Type B.¹²⁵ Iron anchors of this type include lunate arms and two iron rings for attaching anchor rope, one at the crown, the other at the top of the shank. Typically a removable stock of wood, iron, or lead is slotted into an aperture near the top of the shank. Whereas most ancient anchor types are difficult to date due to reuse and uneven development within and across regions, this type is relatively fixed to the first two centuries of our era. Specific examples of Type B have been found at Lake Nemi, Pompeii, and southern France, and less reliably dated examples have been reported from Pisa, Sardinia, Sicily, Libya, and Cyprus.¹²⁶ The closest parallel is an iron anchor excavated recently from an early Roman Imperial context in the port of Genoa. It is nearly identical in size and shape to this anchor from Knidos S.¹²⁷

¹²⁵ KAPITÄN 1984, fig. 8; for a discussion of ancient anchor evolution see VAN DOORNINCK 1982, p. 141-142; CASSON 1995, p. 252-254; CAMPBELL 2012, esp. p. 414-415.

¹²⁶ Lake Nemi and Pompeii: UCELLI 1950, p. 238-239, figs. 270-272; southern France: BENOIT 1960, p. 45-49 and fig. 16; Pisa: BIGAGLI & FERRINI 2000, p. 92-97 and fig. 3; Sardinia, Sicily, and Libya: UCELLI 1950, p. 240-241; Cyprus: GREEN 1973.

¹²⁷ TIBONI 2016, p. 204-205, fig. 2.

The fragmentary state of anchor assemblage 2 unfortunately precludes its assignation to a specific anchor type. Element A, to judge from its concretion shell, is likely the shank of an iron anchor of slightly smaller size than anchor 1. Both the stock and arms are evidently broken away and not visible in the imagery. Element B is likely one end of a lead stock¹²⁸ or a lead stock with a wooden core.¹²⁹ Archaeological examples of both stock types contain a hole near one end for attaching a secondary rope, either for releasing the anchor from an obstruction on the seabed or for attaching an anchor buoy, or both.¹³⁰ It may well extend under and past element A. Element B may be associated with A, but their relationship is not clear. Element C may be another stock.

Since the four cooking pots are positioned close to the northern end of the wreck, we may surmise that both anchor assemblages mark the ship's bow. Whether either or both anchors were serving as bowers is difficult to determine. Anchor 1 may have originally been secured to the starboard bulwark forward of amidships. Its position on the site may be explained if the ship came to rest on its keel and leaned to port. As the ship decayed and collapsed, the anchor would have worked its way down to rest among artifacts within the outline of the ship. If anchor 2 were serving the same purpose on the port side, its final position forward of anchor 1 may be explained by the violence of the ship's departure from the surface and its subsequent landing on the seabed. Alternatively, the shank and two apparent stocks may have been stowed in the bow locker for later use.

That only two anchors are evident is rather surprising. Excavations of Roman ships mainly in the western and central Mediterranean demonstrate that merchant ships carried at least two and as many as seven anchors of both iron and wooden types, some no doubt ready to deploy (bowers), others as spares in the event of loss and emergency.¹³¹ The 7th-century Yassiada ship, though perhaps an extreme (and late) example, was carrying eleven iron anchors of cruciform type.¹³² It is probable that the Knidos S ship carried additional anchors that are located off site or are now lost or buried out of sight of surface investigation.

Knidos R

Knidos R, lying at 360 m depth and approximately 5 km east of Knidos H, offers an interesting contrast to wrecks H and S (**Fig. 18**). In lieu of an obvious wreck mound, the site consists of a small, 7 x 4 m cluster of amphorae, utilitarian wares, and concretions lying directly on a flat seabed. Trawling activity has scattered some artifacts to the north and south, and recent trawl scars were

¹²⁸ Cf. KAPITÄN 1984, p. 38-39 and fig. 5.2; COSMA 1973, p. 235, 237, fig. 3a, fig. 4.2b; COSMA 1975, p. 21, fig. 1b.

¹²⁹ Cf. KAPITÄN 1978, p. 269-271 and fig. 2.

¹³⁰ ZEMER 1981, p. 64-65; COSMA 1975, p. 22.

¹³¹ PARKER (1992) has cataloged 34 Roman and Byzantine wrecks with iron anchors, the majority of which include more than one anchor.

¹³² VAN DOORNINCK 1982, p. 125-131, 137-139. Cf. the 6th-century wreck discovered off Marmaris in the Rhodian channel (ROYAL 2006, p. 210-213, fig. 21). It yielded nine iron anchors (6 cruciform, 1 with lunate arms).

observed near the site. While this wreck lies a similar distance from shore as Knidos H, the seabed here is flat and easily trawled in an E-W direction, making it an area easily fished, although the site has likely not seen as heavy trawl activity as that in the area of Knidos S. That the remains are not part of a cargo jettisoned during heavy seas to lighten ship is indicated by ballast stones that lie among and under the central group of artifacts in grid-squares K10 and L10. These indicate that the ship, or at least a sizeable part of it, arrived at the seabed in one piece. Trawling has likely dragged some artifacts off site, but the ballast stones and some amphorae remain in place at the location of sinking.

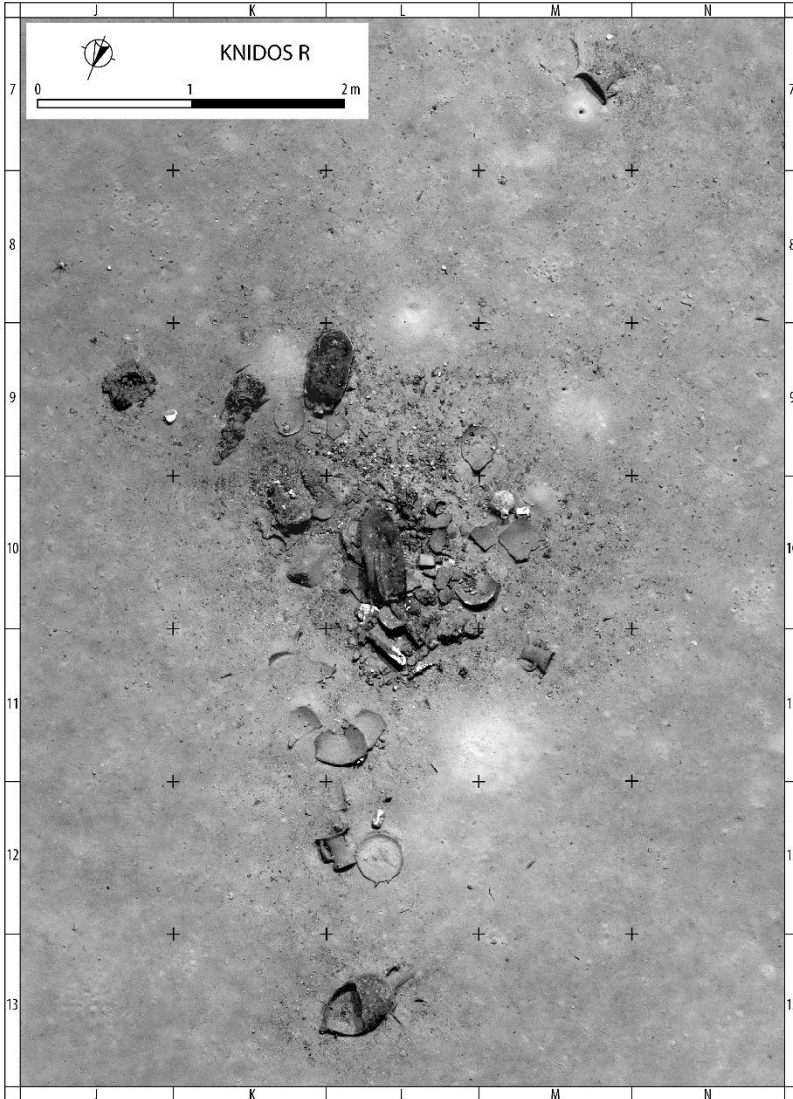


Fig. 18. Mosaic of the Knidos R shipwreck. (Courtesy Ocean Exploration Trust)

The assemblage consists of at least two Dr 24 amphorae (**Fig. 19a-b**) that were used mainly for olive oil, and at least three containers of vintage wine. The first, a well-preserved Cretan amphora measuring 57 cm in height, belongs to type AC 1 (**Fig. 20a**).¹³³ According to Marangou-Lerat, this container typically measures *ca.* 60 cm height and 30-33 cm in maximum diameter. Its capacity is *ca.* 20/25 litres. Its neck and body are cylindrical, and its rim is slightly thickened and vertical. The type was manufactured from the second half of the 1st century to the early 3rd century A.D.¹³⁴ Robinson published a complete amphora found in the Athenian Agora, dated from the late 1st to early 2nd century A.D.¹³⁵ The type, mostly likely containing the famous *Passum Creticum*, was one of the most exported amphorae of Roman Crete.¹³⁶

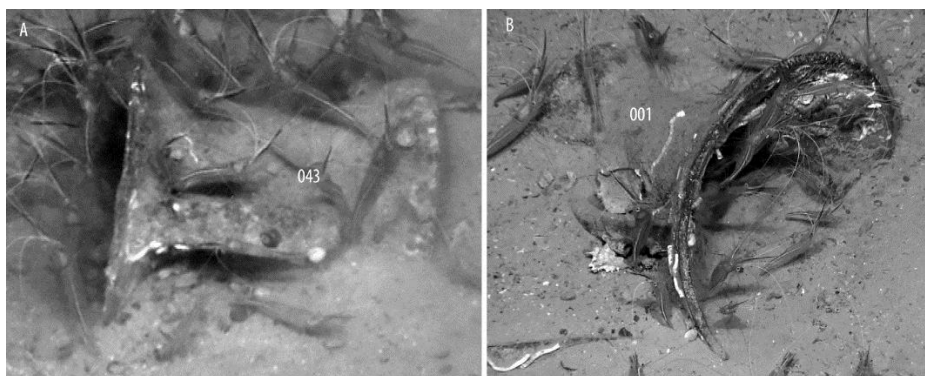


Fig. 19a-b. Dressel 24 amphorae from the Knidos R shipwreck. a: KR.043; b: KR.001. Note the heavy presence of marine life occluding some details of the artifacts. (Courtesy Ocean Exploration Trust)

The second was Cilician wine carried by an amphora of Agora M 54 type, which is also present on the other two shipwrecks (**Fig. 20b**). It is well-preserved and measures *ca.* 64 cm in height.

The third amphora, surviving nearly complete, is difficult to assign to a known production area (**Fig. 20c**). It has a cylindrical neck with a height of *ca.* 20 cm, a slightly beaded rim, and a slightly ovoid body that enlarges at its lower part and ends in a small, conical stump. Exceptional are its handles whose lower section constricts to form a kind of letter S. There are no known parallels for this amphora in the early Roman period. However, if we take into considerations certain features, such as its small, beaded rim separated from the neck by a small, incised line, a relatively tall, cylindrical neck, and especially the constricted lower part of the handles, they suggest a relationship with Classical amphorae made in

¹³³ MARANGOULERAT 1995, p. 67-77; GRACE 1961, fig. 33, right. The imagery does not permit its assignment to any of the variants discussed by Marangou-Lerat.

¹³⁴ MARANGOULERAT 1995, p. 75.

¹³⁵ ROBINSON 1959, p. 43, G 197, pl. 8.

¹³⁶ MARANGOULERAT 1995, p. 77.

Mende and the region of Chalkidike.¹³⁷ Of course the body does not mimic the conical shape of Mende's Late Classical forms; instead it is nearly cylindrical, a characteristic similar to other Rhodian, Koan, and Knidian amphorae of early Roman times. However, the handle modeling and attachment suggest Mendean roots, as this part of the amphora is the most conservative. More terrestrial excavations will likely bring new data regarding this interesting amphora type.

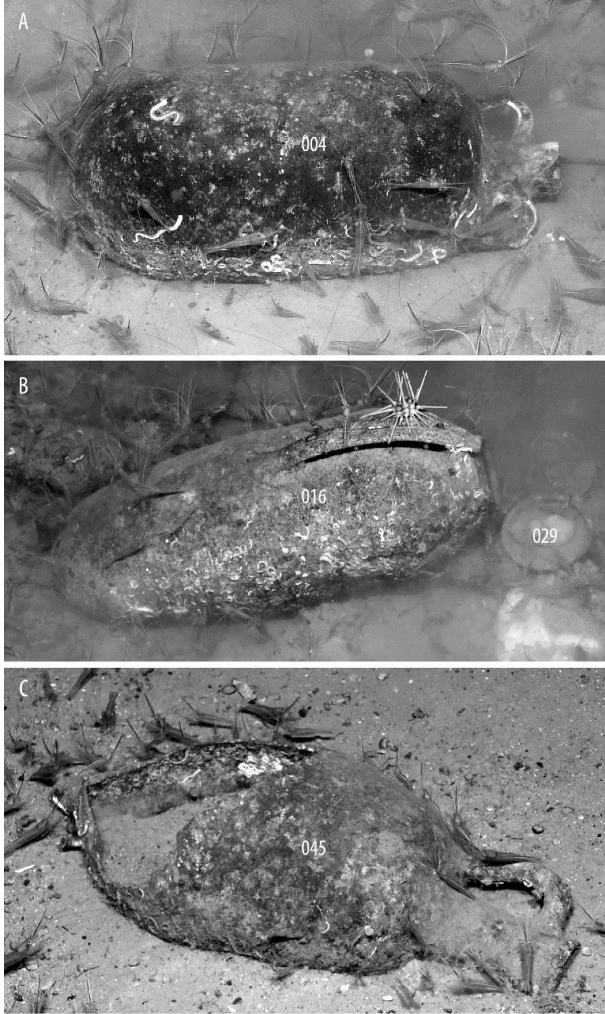


Fig. 20a-c. Amphorae from the Knidos R shipwreck. a: Cretan AC 1 (KR.004); b: Agora M 54 (KR.016) and ESA dish (KR.029); c: Mendean(?) (KR.045). (Courtesy Ocean Exploration Trust)

¹³⁷ For the shapes of Classical Mendean amphorae see GRACE 1961, fig. 43, front; PAPAPOPOULOS & PASPALAS 1999, figs. 2-5; MÓNACHOV 2003, p. 88-95, pls. 59-66.

In addition to the amphorae other vessels offer important information on both crew life and the dating of the wreck. These include a globular jug with a short neck, a ring base, and a broken handle (**Fig. 21a**), and an Eastern Sigillata A dish with a horizontal rim (Figs. 20b and 21b), dated to the Antonine period.¹³⁸ From the same period comes a square bottle of thick greenish glass with a horizontal rim, a short, cylindrical neck, a prismatic body, a slightly concave base, and a wide strap handle, typically reeded (**Fig. 21c**).¹³⁹ To judge from the modern soda can beside it, the bottle's height appears to reach *ca.* 15-16 cm. This type of bottle was especially popular between 70 and 130 A.D.¹⁴⁰

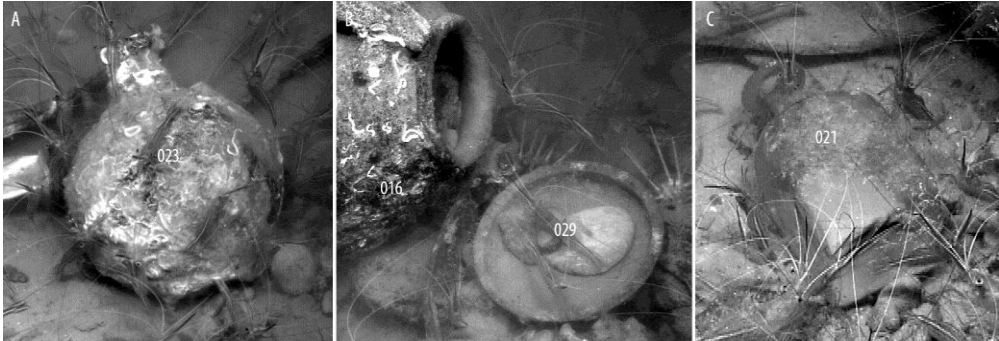


Fig. 21a-c. Crew's possessions from the Knidos R shipwreck. a: jug (KR.023); b: Eastern Sigillata A dish (KR.029); c: glass bottle (KR.021). Note the heavy presence of marine life occluding some details of the artifacts. (Courtesy Ocean Exploration Trust)

Concluding Remarks

At three different points during the reigns of Trajan and Marcus Aurelius three ships foundered off the Datça peninsula near ancient Knidos. The clarity of the water at the time of discovery and the expedition's high-resolution imagery combine to enable a relatively comprehensive understanding of their cargoes (including differing sizes and variants), crew's possessions, and, in the case of Knidos S, ground tackle. The dating of the wrecks hinges primarily on the amphora evidence. The Dressel 24 similis and Knidian amphorae aboard Knidos H help date the wreck solidly to the early to mid-2nd century A.D. The date of Knidos S may be later than that of Knidos H, as amphora Agora G 199 ranges in date from the second half of the 1st century to the 3rd century A.D., and Cylindrical I has good parallels at Athens where it is dated to 140-170 A.D. The wreck's Cilician Dressel 24 amphorae are newly identified, so their tentative dates are to be taken from the wreck's other amphorae. The iron anchors aboard Knidos S, though weaker in terms of dating evidence due to the type's wide chronological range, nonetheless help bolster the amphora dates. The date of Knidos R, hinging

¹³⁸ HAYES 1985, p. 42, pl. VIII.9-10.

¹³⁹ ISINGS 1957, p. 63-66, form 50; CHARLESWORTH 1966; ANTONARAS 2017, p. 115-117, type 75.

¹⁴⁰ CHARLESWORTH 1966.

primarily on its amphorae, an ESA dish, and a glass bottle, falls roughly within the same range as the other two wrecks.

The shipwrecks represent different post-sinking site formation processes and impact by bottom trawl fishing due to their different locations. Knidos H was somewhat protected by its proximity to a no-trawl zone off the Turkish coast and is thereby almost entirely undisturbed, whereas Knidos S and R have been heavily damaged by trawls. Indeed Knidos S exhibits some of the greatest damage of the wrecks located in deep water off Knidos. Nevertheless, the cargoes of Knidos H and S reveal a similar origin, and both give strong indications that they set sail from Cilicia Pedias and were heading west into the Aegean before foundering off Knidos.

The Knidos H ship, with a burden of *ca.* 50 tons, was hauling a modest and rather homogenous cargo of wine, probably a prestigious Cilician variety, in amphorae mostly of Agora M 54 type but also the rarer Cilician Dressel 2-4. A careful analysis of the imagery makes it possible to identify differing sizes of both types. The amphorae were stowed in two or three rows, with slightly smaller amphorae positioned atop the larger ones. Vessels for liquids belonging to the crew are visible on the margins of the site at the stern. They include an olive oil amphora (Dressel 24 similis), at least two Cilician wine amphorae (Agora G 199) conceivably acquired in Cilicia before departure, and a Knidian wine jar, perhaps purchased in Cilicia or along the way. In addition to the visible drinking wares (a table amphora and jug) located at the far eastern end of the site, we may assume the existence of cooking and other wares on board, now hidden by the cargo or buried out of sight.

Knidos S, of much smaller size, enhances the picture of ancient trade with its heterogeneous cargo of wine amphorae of type Agora G 199 and Cylindrical I, as well as Dressel 24, which was typically used to transport olive oil. Interestingly, the latter amphorae exhibit a rilled body and were made in two distinct sizes. Their particular design and origin were unknown, but we may posit a Cilician origin now for these Dressel 24 variants.

Knidos R is largely a mystery. Its size and cargo (if it had one upon sinking) remain unknown. The ship may have been transporting an organic cargo now perished, and only some of the crew's possessions and ballast now furnish signs of a shipwreck on a flat seafloor. The remains link the ship with Cilicia through its Agora M 54 amphora, but the Cretan and possible Mendean singletons (the latter an apparently new amphora type) complicate the picture of the ship's route. The amphorae likely carried expensive vintage wines, but it is impossible to determine whether they made up part of the cargo or belonged to the captain or merchant(s) on board. Were they picked up in their respective regions of manufacture or in an emporium where goods from all over were collected for resale? Was the ship heading into or out of the Aegean? The personal items—a glass bottle, an ESA dish, and a modest jug—also fail to shed light on these questions, though they surely represent just a portion of the personal objects that went down with the ship. The rest remain buried or were dragged offsite by trawls. At this stage of investigation we can say only that Knidos R likely engaged in shipping along the same routes as Knidos H and S.

The cargoes of Knidos H and S in particular have improved our knowledge of certain Roman amphora morphologies, and they also allow a glimpse into the mechanics of Roman maritime trade. No doubt the sailing master of each ship had made this voyage many times along this heavily-trafficked maritime corridor, the crew becoming more efficient with each completion.¹⁴¹ The complex network of distribution centers and routes infers careful planning by specialized traders.¹⁴² Cilicia's specialization in wine and olive oil began as early as the second half of the 1st century A.D., as amphorae of type Agora G 199/Mau 27/28 are known in the Pompeian market. As Adam Smith postulated, there is a direct connection between specialization and the market, and Cilicia's specialization was directly tied to the development of a huge demand for vintage wines and olive oil mainly at Rome and some large cities during the *pax Romana*.¹⁴³ Only through such narrow specialization could Cilician producers compete with other eminent vintage production areas such as Crete, Ephesos, and Chios. Cilician producers delivered their products to a specific emporium as part of a well-planned strategy to compete successfully. From such a large emporium, enjoying a central location, important connections, and access to information, Cilician products could be sold in smaller or larger quantities according to specific consignments to selected clients. Almost certainly consumers knew that Cilician wine could be found in emporium X. Cilician amphorae had a wide distribution but occur in relatively small quantities. Maps of distribution (see Figs. 5 and 12) strongly suggest that Cilician wine targeted mostly select large cities or legionary headquarters with high living standards, such as Rome, Ephesus, Alexandria, Beirut, Eretria, Chersonesos, Tomis, Noviodunum with its headquarters for the *Classis Flavia Moesica*, Troesmis with its headquarters for *Legio V Macedonica*, and some sites on the Red Sea coast. Cilician amphorae found in the last-named region suggests that Cilician wine was exported to exotic markets, perhaps as far as India. Also worth noting is their preponderant presence in the eastern Mediterranean, which suggests the existence in the region of at least one large emporium specializing in expensive Cilician wines. In fact, within this trading world of Cilician wine products there is a dividing line between the eastern and western Mediterranean, a product of the region's well-established interconnectivity. The same interconnectivity helped create a north-south axis of trade from Moesia Inferior to the Red Sea.¹⁴⁴ The presence of Cilician wine in these selected markets suggests a clientele that not only had a taste for this region's products but also had the ability to purchase them.

Large *emporia*, such as the one(s) to which these two ships were heading, played an important role in sustaining this interconnectivity. It is most likely that Cilician wine, due perhaps to its prohibitive price, was merely a complementary component of composite cargoes re-exported from a large *emporium*, but its demand helped sustain this particular axis of trade. The same axis was perhaps

¹⁴¹ RICE 2016, p. 191.

¹⁴² RICE 2016, note 166.

¹⁴³ SMITH 1789, p. 157-166.

¹⁴⁴ The existence of an east-west separation of Mediterranean centres was suggested already by FULFORD 1987; 1989.

responsible for the transport of olive oil in amphorae of Dressel 24, Dressel 24 similis and San Lorenzo 7 types to the Lower Danubian border of the empire. However, in addition to this logistical limitation, we must assume that the physical capacities of production areas imposed some limits, both for olive oils and vintage wines, limits which, combined with transport distance, also contributed to the high price.

In terms of larger economic structures, the wrecks are reflective of certain kinds of interregional trade at work during the High Empire.¹⁴⁵ Knidos H's cargo of mainly Agora M 54 amphorae typifies direct trade, "a single type of cargo from a localized area."¹⁴⁶ However, this shipwreck seems to show that exporting a single, major product over long distance was not as rare as some have suggested.¹⁴⁷ It is a classic case of direct shipping from a major Cilician port to a major *emporium*.¹⁴⁸ This implies careful research, large investment, and voyage planning to turn a profit.

Knidos S, on the other hand, with its combination of wine and olive oil amphorae, corresponds to Rice's second type of trade, one specializing in "multiple commodities from the same region."¹⁴⁹ In this mode of trade, mixed products from a single production area were sent under consignment to a certain emporium. A Roman ship found at Fig Tree Bay off Cyprus,¹⁵⁰ for example, may also have loaded its cargo in Cilicia Pedias. Its load of Agora M 54, Dressel 30, Gauloise 4, and a large amphora supposedly manufactured at Ras al Bassit in Syria was recently dubbed by Rice a "multi-provincial cargo."¹⁵¹ But recent discoveries have demonstrated that the large amphora was made in Cilicia. As most of the cargo is comprised of Cilician amphorae we may infer that the ship was loaded in a Cilician port before sinking off eastern Cyprus.

Finally, there appears to be an incongruity between the abundance of Agora M 54, Agora G 199, Cilician Cylindrical, and Cilician Dressel 24 (the last so far completely unknown) on these wrecks and their reduced presence on terrestrial sites. Most likely the cargoes of Knidos H and S were loaded in a Cilician port such as Elaioussa/Sebaste or Anemurium, but what was their intended destination? Perhaps their final resting spots can help with the answer. Knidos H was found just to the south of that city, Knidos S just to the north. Both ships were well into the Aegean at this stage of the voyage; their locations do not necessarily suggest an intended trajectory toward the western Aegean via the Cyclades, and both ships appear to have bypassed the important trading city of Rhodes. Thus we can infer that the ships were sailing directly to a certain *emporium* to the north of Knidos. Although it is difficult to say which *emporium* lay in their sight, we can speculate that they may have included such larger east Aegean harbor cities as Halicarnassus or Ephesus. Whatever their destination, it

¹⁴⁵ NIETO 1997; WILSON *et alii* 2012; RICE 2016.

¹⁴⁶ RICE 2016, p. 169; see also BOETTO 2012, p. 163.

¹⁴⁷ RICE 2016, p. 189.

¹⁴⁸ ROUGÉ 1966, p. 415-421; ROBINSON & WILSON 2011, p. 6; WILSON 2011, p. 53-54.

¹⁴⁹ RICE 2016.

¹⁵⁰ LEIDWANGER 2010; 2013.

¹⁵¹ RICE 2016, p. 188.

is to these emporia, and not production centers per se, that buyers traveled to purchase smaller, more expensive wines for their clients.

Cilicia's specialization in vintage wine continued its development during the Late Roman period. As both literary sources and archaeological discoveries demonstrate,¹⁵² amphorae of LRA 1 type will dominate eastern Mediterranean trade until the mid-7th century.

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¹⁵² *Expositio Totius Mundi et Gentium* (ed. J. Rougé), Paris, 1966, p. 39; DECKER 2003.

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