

# Shipwreck cargoes in the western Mediterranean and the organization of Roman maritime trade

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Much has been written about the nature and scale of Roman maritime trade, yet there remains no detailed analysis of the range of shipwreck cargoes at our disposal and the information that they provide for the organizational aspects of maritime trade. Identifying the mechanisms through which products were traded is one of the most challenging aspects of the study of Roman trade. I will analyze the cargoes of a number of well-published and well-dated W Mediterranean wrecks between the 1st c. B.C. and the 4th c. A.D. with the aim of answering several questions:

° What processes were involved in the movement of goods from the point of production to the point of consumption?

° To what extent can shipwreck cargoes illuminate the organization of maritime trade?

° What do these wrecks reveal about the nature of Roman maritime trade and the economy?

Numerous wrecks will be mentioned, but the cargoes of 16 are discussed in greater detail in order to elucidate the multifarious processes of Roman maritime trade.

Two fundamental models have been proposed for maritime trade: tramping (often referred to as “cabotage” in English)<sup>1</sup> and directed trade through emporia.<sup>2</sup> Note that this is not a question of whether ships sailed along the coast or out of sight of land,<sup>3</sup> but rather a question of the scale of trade, the level of forethought and planning which went into the composition of the cargo, and the degree of information available with regard to markets. While most scholars argue that directed trade between major emporia was responsible for the vast movement of goods throughout the Roman world, both within and beyond the Mediterranean Sea, some continue to argue for the primacy of tramping.<sup>4</sup>

For N. Morley, the overarching question as to the nature of Roman trade is

... not therefore whether there was significant trade and exchange under the Roman empire, but how far distribution under the empire differed in volume and nature from the constant “Brownian motion” [i.e., irregular or random motion] of *cabotage* and periodic rural markets that had long characterized the Mediterranean region.<sup>5</sup>

In other words, are the significant quantities of imported products found across the empire due to a plethora of random exchanges, or can we demonstrate a level of planning and

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1 Cabotage is used in English and French scholarship with very different implications. In the former, cabotage is used to refer to tramping: P. Horden and N. Purcell, *The corrupting sea: a study of Mediterranean history* (Oxford 2000) 137-43; N. Morley, *Trade in classical antiquity* (Cambridge 2007a). In the latter, it means sailing along the coast, or cape to cape. In modern English usage it is also linked with aviation.

2 See primarily X. Nieto, “Le commerce de cabotage et de redistribution,” in P. Pomey (ed.), *La navigation dans l'Antiquité* (Aix-en-Provence 1997) 46-59; and A. Wilson, K. Schörle and C. Rice, “Mediterranean connectivity and Roman ports,” in S. J. Keay (ed.) *Rome, Portus and the Mediterranean* (Brit. School at Rome Arch. Monog. 21, 2012) 367-91.

3 Cf. P. Arnaud, “Ancient sailing-routes and trade patterns,” in D. Robinson and A. Wilson (edd.), *Maritime archaeology and ancient trade in the Mediterranean* (Oxford 2011) 62; A. Wilson, “Developments in Mediterranean shipping and maritime trade,” *ibid.* 53.

4 See P. F. Bang, *The Roman bazaar: a comparative study of trade and markets in a tributary empire* (Cambridge 2008) 141; Horden and Purcell (*supra* n.1) 142.

5 N. Morley, “The early Roman empire: distribution,” in W. Scheidel, I. Morris, and R. P. Saller (edd.), *The Cambridge economic history of the Greco-Roman world* (Cambridge 2007) 571-72.

systemization to the process of (particularly maritime) exchange? Several scholars have argued convincingly for the prevalence in the Roman period of directed trade based around entrepôts or emporia.<sup>6</sup> I will expand upon that argument, arguing that it is indeed possible to demonstrate that the processes of Roman maritime trade substantially diverged from those of “Brownian” cabotage (see n.165 below).

Arguably the most influential article on trade patterns is X. Nieto’s “Le commerce de cabotage et de redistribution”, in which he argues, particularly from the Culip IV wreck, that heterogenous cargoes should be regarded as the result of redistribution of products out of “ports principaux”, rather than cabotage.<sup>7</sup> P. Arnaud, G. Boetto and A. Wilson have since argued that a significant proportion of Roman (and in some cases broader ancient) maritime trade was conducted through emporium-based redistribution.<sup>8</sup> These studies dealt with shipwreck cargoes only briefly: Nieto considered one wreck in detail, referring briefly to others for comparison. Arnaud has concentrated primarily on navigational techniques and sailing patterns. Boetto recently outlined 5 models for “routes commerciales”, three of which involve the shipment of commodities through entrepôts, but her article aimed to address potential correlations between navigational technique and ship size (more on which below) and the fairly brief discussion of the models was based on an analysis of 5 wrecks. Wilson has dealt principally with shipwreck data as a whole and how it contributes to the overall picture of the economy. More detailed is B. Russell’s work on ships (wrecks) carrying stone cargoes.<sup>9</sup>

Given the potential of shipwreck cargoes to elucidate patterns of maritime trade, there remains a need for more detailed investigation of the available data. The present article aims for a greater breadth in terms of type of cargo and for a greater detail in looking at that range. The result will be not simply another argument in favor of directed trade, but rather a nuanced view of the processes behind different scales of trade as they can be ascertained from shipwreck cargoes.

### Shipwrecks and the Roman economy

It is important to note the nature of the shipwreck data and the caveats associated with their use, particularly with regard to studies of Roman trade. Shipwrecks and studies of the ancient economy have gone hand-in-hand since 1980 when K. Hopkins published a preliminary graph of A. J. Parker’s collection of ancient shipwrecks.<sup>10</sup> Use of this important body of evidence has only increased since 1992 when Parker’s catalogue made it possible to

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6 See n.8 below.

7 Nieto (supra n.2).

8 P. Arnaud, *Les routes de la navigation antique. Itinéraires en Méditerranée* (Paris 2005); id., “Diocletian’s Prices Edict: the prices of seaborne transport and the average duration of maritime travel,” *JRA* 20 (2007) 321-36; id. (supra n.3); A. Wilson, “Approaches to quantifying Roman trade,” in id. and A. Bowman (edd.), *Quantifying the Roman economy* (Oxford 2009) 213-49; Wilson (supra n.3); G. Boetto, “Les épaves comme sources pour l’étude de la navigations et des routes commerciales: un approche méthodologique,” in Keay (supra n.2) 153-73; Wilson *et al.* (supra n.2).

9 B. Russell, “*Lapis transmarinus*: stone carrying ships and the maritime distribution of stone in the Roman empire,” in Robinson and Wilson (supra n.3) 139-55; id., “Roman and late antique shipwrecks with stone cargoes: a new inventory,” *JRA* 26 (= 2013a) 331-61; id., *The economics of the Roman stone trade* (Oxford) (= 2013b).

10 K. Hopkins, “Taxes and trade in the Roman Empire (200 B.C.–A.D. 400),” *JRS* 70 (1980) 101-25.

engage with ancient shipwrecks as a coherent category of data.<sup>11</sup> He included 1259 wrecks before A.D. 1500, of which 1189 are in the Mediterranean. Many further wrecks have been discovered and documented since then. An important update (2013) of E Mediterranean and Black Sea wrecks by J. Strauss raised the number of wrecks to 1646, and by 2008 a project directed by M. McCormick had added to Parker's total 220 new wrecks dating between the 3rd c. A.D. and 1500.<sup>12</sup>

Since the dataset has its problems, a brief excursus is needed to clarify the ways in which shipwreck data are understood.<sup>13</sup> For a study of this nature, there are three significant limitations on the data. First, shipwreck data only reveal information about a limited range of products. Shipwrecks are primarily a record of heavy, durable cargoes — first and foremost amphora-borne goods, but also stone, metal ingots and, to a lesser extent, other ceramics. Cargoes of textiles, grain and other organic materials, which certainly existed, are rarely visible. The principal surviving cargo of most wrecks is amphorae,<sup>14</sup> which are extremely durable and will survive in a variety of circumstances; they are also large and fairly recognizable, even to amateurs, and thus probably over-represented.<sup>15</sup> Stone is another long-lasting cargo, though such wrecks are still far fewer in number than ships carrying chiefly amphorae. The second problem is the chronological distribution of wrecks. Parker's graph of Mediterranean wrecks by century showed a drastic increase in the number of wrecks leading up to and peaking in the 1st c. B.C., decreasing in the 2nd c. A.D., before a steep drop in the 3rd.<sup>16</sup> Since its publication, this graph has been much reproduced, occasionally with great liberty, to argue for a rapid growth and decline in maritime trade.<sup>17</sup> Wilson has re-graphed the wrecks based on an updated sample of 1646

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11 A. J. Parker, *Ancient shipwrecks of the Mediterranean and the Roman provinces* (BAR S580; Oxford 1992). See Wilson 2009 (supra n.8) 219-29 and 2011 (supra n.3) for an overview of the ways in which shipwreck data have been used in past research.

12 M. Jurišić, *Ancient shipwrecks of the Adriatic: maritime transport during the first and second centuries AD* (BAR S828; Oxford 2000); M. McCormick, "Movement and markets in the first millennium: information, containers and shipwrecks," in C. Morrisson (ed.), *Trade and markets in Byzantium* (Cambridge, MA 2012) 81. See also J. Strauss, "Shipwrecks database. Version 1 (OXREP databases)" at [oxrep.classics.ac.uk/databases/shipwrecks\\_database/](http://oxrep.classics.ac.uk/databases/shipwrecks_database/)

13 For discussion of the caveats, see, e.g., Wilson 2009 (supra n.8) 219-29; Boetto (supra n.8) 153.

14 A. J. Parker, "The evidence provided by shipwrecks for the ancient economy," *Thracia Pontica* 3 (1986) 35.

15 A further concern with regard to amphorae is their potential for re-use. Several wrecks have exhibited evidence for the re-use of amphorae, including the Roman wrecks Maire A, Culip D, and Grado. The first contained Apulian amphorae filled with pozzolana and sealed with stoppers cut from old amphorae (Parker [supra n.11] 254). Culip D contained Dressel 20 amphorae with very loose stoppers and thus assumed to have been reused (Parker *ibid.* 157). Grado contained Africana I and Tripolitanian I, typically used for oil, and Dressel 5 from Cos, believed to have contained wine, but investigation showed that all these were filled with fish products: R. Auriemma, "Le anfore del relitto de Grado e il loro contenuto," *MÉFRA* 112 (2000) 27-51. In each case, the re-use of the amphorae is obvious. For a detailed discussion of the re-use of amphorae as containers on shipwrecks, see J. T. Peña, in *Roman pottery in the archaeological record* (Cambridge 2007) chapt. 5. Parker suggests that the chance of amphora re-use contaminating the archaeological record is slim.

16 Parker (supra n.11), fig. 3.

17 Hopkins (supra n.10) 105-6; C. R. Whittaker, "Amphorae and trade," in *Amphores romaines et histoire économique: dix ans de recherche* (Colloq. 114, 1989) 537-39; D. Gibbins, "Shipwrecks and Hellenistic trade," in Z. Archibald *et al.* (edd.), *Hellenistic economies* (London = 2001a) 273-83; P. Erdkamp, *The grain market in the Roman empire* (Cambridge 2005); R. P. Saller, "Framing the

wrecks, according to probability *per annum*.<sup>18</sup> Graphing according to probability *per annum* implies that there was an equal probability that a ship would sink in each year within its date-range, and the probability is then accumulated by time period. This statistical adjustment produced an even more accentuated picture: still a rise in the number of shipwrecks under the Republic, but with the overall peak now occurring in the 1st c. A.D. and the initial drop occurring in the 2nd c.<sup>19</sup> Third, and as Parker made clear in 1992, the chronological distribution of wrecks is affected by numerous distorting factors.<sup>20</sup> One of the most important is the uneven geographical spread of known and published wrecks. While the the geographical distribution of shipwrecks has improved with the examples added since 1992, data are still very scarce for many parts of the Mediterranean, particularly all of N Africa and various parts of the E Mediterranean (other than Israel); this is not due to the lack of shipwrecks, but rather to a scarcity of documentation and systematic research.<sup>21</sup>

Using shipwrecks to study facets of the Roman economy is thus limited by the uneven distribution of the evidence. But while shipwrecks cannot be used simplistically to support sweeping statements about the nature of the Roman economy, they can support discussions of certain types of Roman trade with a level of detail often unattainable from archaeology on land. Shipwrecks provide a snapshot of the ways in which specific goods travelled, especially the amphora-borne products and other heavy cargoes mentioned above. As the food commodities (chiefly wine, oil and salted-fish products) that travelled in amphorae were one of the major categories of traded goods in the Roman world, they are precisely the types of products whose transport is crucial to an understanding of maritime trade.

### The wrecks

The following analysis focuses primarily in 16 wrecks (Table 1; fig. 1).<sup>22</sup> The main criteria for selecting the wrecks were that the cargo was published to the degree that it was clear that the significant majority of the whole was known and that, in the case of heterogeneous cargoes, the relative quantifications of each component could be assessed. All but one of the wrecks discussed are from the W Mediterranean, but preliminary evidence suggests that the patterns observed in the West would also have been common in the East.

Distinct patterns are observable in cargoes both in terms of their origin and their composition. In general, cargoes can be classed as local (cargo originating from within a day's journey of the point of export), regional/provincial or multi-regional.<sup>23</sup> The most

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debate over growth in the ancient economy," in J. G. Manning and I. Morris (edd.) *The ancient economy: evidence and models* (Stanford, CA 2005) 223-38 (referring to Hopkins' use of Parker's material); Morley (supra n.1) 98; A. Tchernia, *Les Romains et le commerce* (Naples 2011) 160-62; C. Holleran, *Shopping in ancient Rome* (Oxford 2012) 23-24 and 39-40.

18 Wilson 2011 (supra n.3).

19 A. Wilson's (2009 [supra n.8] 223-25) initial re-graphing, including graphs according to century, half-century, quarter-century and 20-year increments, is based on data from Parker. Wilson's publication of 2011 (supra n.3) updates the century and half-century graphs to include data from the OXREP database (Strauss, cited above in n.12).

20 Parker (supra n.11) 7.

21 See Wilson 2009 (supra n.8) 219-29.

22 Many of these are drawn from Parker's 98 shipwrecks with "well-preserved and thoroughly investigated and reported" cargoes (Parker 1992 [supra n.11] 7, though I have also included a number of wrecks published since 1992.

23 There are too many variables to provide an all-inclusive definition for region. Provincial boundaries are important here due to the existence of inter-provincial taxation (see below), but

TABLE 1  
PRINCIPAL WRECKS DISCUSSED

<i>Wreck</i>	<i>Major cargo elements</i>	<i>Size</i>	<i>Date</i>
Isola delle Correnti	39 blocks of Proconnesian marble	c.350 tonnes	c.A.D. 280-350
San Pietro in Bevagna	23 sarcophagi in Thasian marble	c.150 tonnes	1st half of 3rd c. A.D.
Boka Kotorska 1	c.1200 <i>tegulae</i> and probably a similar number of <i>imbrices</i>	c.45-55 tons	late 1st c. B.C./early 1st c. A.D.
Punta Scario A	Stamped roof-tiles	-	c.3rd c. A.D.
Cap de Volt	Pascual 1 amphorae	-	late 1st c. B.C./early 1st c. A.D.
La Giraglia	<i>Dolia</i> and Tarraconensian Dressel 2-4 amphorae	c.45-55 tons	<b>c.A.D. 20</b>
Diano Marina	<i>Dolia</i> and Tarraconensian Dressel 2-4 amphorae	c.45-55 tons	<b>c.A.D. 50</b>
Grand Ribaud D	<i>Dolia</i> and Italian Dressel 2-4 amphorae	c.45-55 tons	<b>9-1 B.C.</b>
Madrague de Giens	6000-7000 amphorae, mostly Dressel 1B; Campanian finewares	c.350-450 tons	70-50 B.C.
Chiessi	5000-7000 Spanish amphorae of 4 different types, mostly Beltrán 2A	-	A.D. 65-80
Plemmirio B	Africana I and Africana IIA amphorae; c.1 tonne iron bars	c.13 tons	c.A.D. 200
Punta Scifo A	c.30 pieces of pavonazzetto and Proconnesian marble	c.200 tonnes	early 3rd c. A.D.
Comacchio	102 lead ingots; Koan, Chian, Cnidian and Dressel 6A amphorae	c.130 tons	late 1st c. B.C.
Skerki Bank Wreck D	Amphorae of at least 12 different types; lamps; finewares	-	80 and 50 B.C.
Cabrera III	Spanish and North African amphorae; 967 coins	-	mid-3rd c. A.D.
Fig Tree Bay	Amphorae of 4 types from Cilicia, Syria and Gaul	c.5-6 tons	2nd c. A.D.

straightforward are those wrecks that contained a single type of cargo from a localized area (e.g., Italian wine in Dressel 2-4 amphorae). These are often referred to as homogeneous, though I would argue that the dichotomy between homogeneous or heterogeneous obscures the level of complexity of most Roman-era cargoes. While it is occasionally possible to declare a cargo homogeneous in terms of the type of product (e.g., several wrecks appear to contain only wine), the wine is most often the product of several different vineyards owned by a number of different individuals. To understand the process of exchange for these cargoes, it is essential that the various origins of the cargoes be taken into account.

A common type of cargo is one comprised of multiple types of commodities from the same region or province (e.g., Baetican fish sauce or Baetican lead ingots). Also frequent

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I specify both regional and provincial because varying landscapes often cause provinces to be broken into multiple, natural regions.



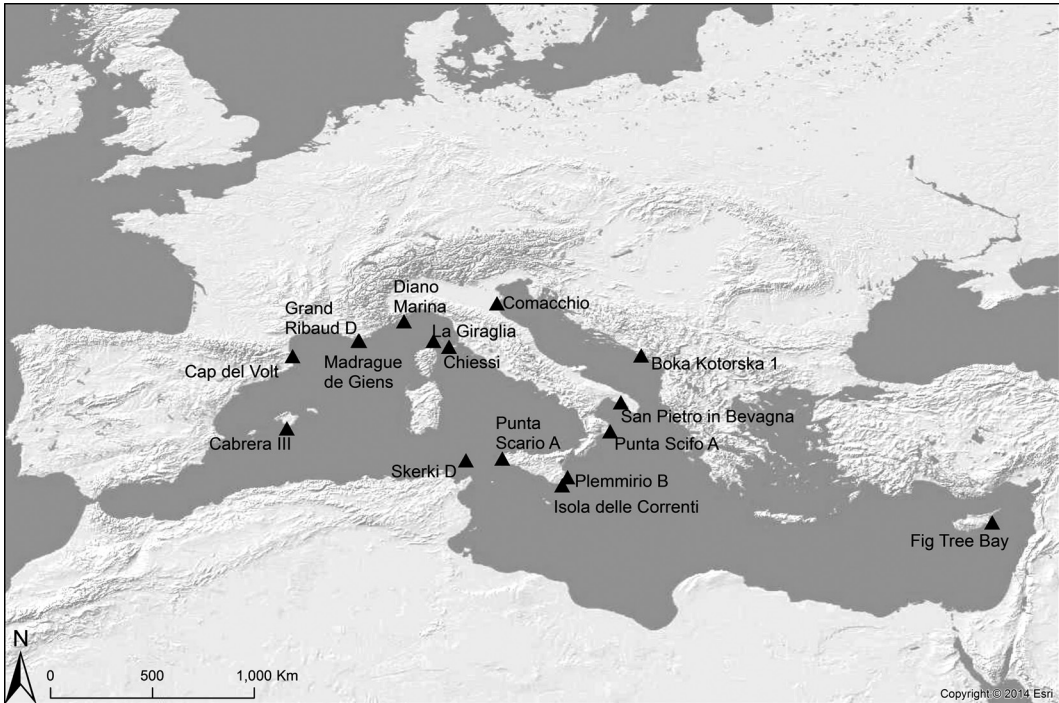


Fig. 1. Principal wrecks discussed.

are wrecks with cargoes from multiple regions or provinces; these may be of a single cargo type from multiple regions or, more commonly, a range of product types from a multiplicity of regions. The composite cargoes are far more common and also more difficult to understand.

Wrecks often contain what are referred to as “primary” and “secondary” or “complementary” cargoes. In some cases, there is a clear distinction between what must have been the primary cargo and what was a complementary one. The Madrague de Giens wreck is a classic example of this type: the bulk of its cargo space was devoted to wine amphorae from Latium, along with a small component of Campanian finewares and Aegean wine. The Chiessi wreck is similar: a main cargo of salted-fish products is augmented by a smaller quantity of olive oil. Here we will be concerned with both the primary and the secondary cargo, and in particular with what the complementary cargo reveals about the route and loading of the vessel.

In addition to determining the origin of a cargo, it is useful to ascertain whether or not the ship was engaged in the initial export of its cargo, or whether the cargo was being re-exported. This question is directly tied to understanding the ship’s route and whether or not the route can be determined from the cargo’s contents.

### **Cargoes consisting of a single commodity from a single region**

#### *Stone cargoes*

Let us begin with the wrecks with cargoes consisting of a single commodity from a localized production zone. Of the major categories of cargoes (amphorae, stone, metals), one of the most consistently homogeneous types is stone. Most stone cargoes are composed solely of stone; in his sample of 82 Roman and late-antique shipwrecks with stone

cargoes,<sup>24</sup> Russell singles out only 7 wrecks where goods other than stone formed a key element;<sup>25</sup> furthermore, the cargoes predominantly consist of a single type of stone, with only 7 wrecks having more than one type of marble on board.<sup>26</sup>

The Isola delle Correnti wreck (c.A.D. 280-350) is a good example of a stone wreck with a “typical” cargo. This 350-ton wreck, discovered off the S tip of Sicily, carried a cargo of 39 blocks of Proconnesian marble.<sup>27</sup> There was an isolated find of a broken architectural fragment, but otherwise the Proconnesian blocks were the only cargo. The Proconnesian quarries were in direct proximity to the harbour at *Palatia* (mod. Saraylar),<sup>28</sup> doubtless the loading point for this ship.

The c.150-ton San Pietro in Bevagna wreck provides a different type of example. This ship was discovered with a cargo of 23 sarcophagi of three types, all of Thasian marble.<sup>29</sup> Some sarcophagi were in pairs, awaiting separation by a producer at the receiving end. A further sarcophagus was still joined with a lid for which it was not a match, strongly suggesting that both it and the chest to which the lid belonged were destined for the same producer. It has been suggested that this cargo represents a specific order placed with the quarries at Thasos by a producer or multiple producers, probably based at Rome.<sup>30</sup> The sarcophagi probably would have been loaded at the harbour of Thasos’ coastal quarries and not transhipped through an entrepôt.

These cargoes, along with numerous others of stone, are amongst the most straightforward. Given the practicalities of transporting stone objects and the proximity of many quarries to harbours, this is perhaps unsurprising. Many, if not most, stone cargoes were loaded at harbours either adjacent to the quarry or close by, and many were specifically commissioned.<sup>31</sup> This implies a significant amount of planning and forethought, as well as specialization amongst traders involved in the stone trade. We recall Gaius Tullius Crescens, a *negotiator marmorarius* from Rome (*CIL* VI 33886) or a *negotiator artis lapidariae* known from Cologne (*CIL* XIII 8352). The idea that there were specially-built stone-carrying ships (“*naves lapidariae*”) has lost favour, yet there are several wrecks which seem to have carried stone cargoes repeatedly, thereby supporting the notion of specialized trading processes.<sup>32</sup> And it is not just the stone trade that demonstrates such specialization (see below).

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24 These are specifically Mediterranean wrecks. Russell 2013a (supra n.9) contains 83 wrecks because it includes a non-Mediterranean example: the London Blackfriars wreck.

25 Russell 2013b (supra n.9) 132.

26 These wrecks are: Giardini Naxos, Izmetiöte, Les Riches Dunes 5, Porto Nuovo, Punta Scifo A, Şile and Torre Sgarrata (ibid. 133). It is worth noting, however, that some quarries were owned by multiple individuals; thus, even when a cargo consisted of a single type of stone, the individual pieces could have been produced by different people and purchased from different owners (see the discussion of mixed quarry ownership, ibid. 57-61).

27 G. Kapitän, “Schiffsfrachten antiker Baugesteine und Architekturteile vor den Küsten Ostsiziens,” *Klio* 39 (1961) 287 Abb. 2, 288.

28 Russell 2013b (supra n.9) 79.

29 Parker (supra n.11) 381; A. Alessio and A. Zaccaria, “Nuove ricerche sul relitto di San Pietro in Bevagna (Manduria-Taranto),” in *Atti del Convegno naz. di Archeologia Subacquea, Anzio 1996* (Bari 1997) 211-24; Russell 2013b (supra n.9) Inv. 66.

30 Russell 2013b (supra n.9) 272.

31 Russell 2013b (supra n.9) 135; Russell 2011 (supra n.9) 149-50.

32 Russell 2013b (supra n.9) 131.

A distinct but related issue is that large amounts of stone, particularly marbles and granites, were destined for imperial building projects and therefore subject to a level of control far beyond that of commodities such as wine or fish-sauce. Stone was also traded on the private market, though imperial acquisition and subsequent redistribution must always be borne in mind.<sup>33</sup> This pattern of distribution was probably also standard across other products intended for the state (e.g., grain and oil for Rome, or precious metals).

*Cargoes of ceramic building materials*

Another category that tends towards homogeneity is that of ceramic building materials (CBM); for example, 83% of cargoes of tile contain only tiles.<sup>34</sup> Cargoes of CBM are understudied and probably under-reported; Parker recorded only 40, though several have been found since 1992.<sup>35</sup> While amongst the most durable, they are rather unglamorous cargoes. The relatively low value of bricks and tiles has also led to the assumption that they were rarely transported over long distances — and when they were, it was as a return cargo where the CBM are thought to have functioned as saleable ballast.<sup>36</sup> This assumption has been used to explain the presence of substantial quantities of Italian bricks and tiles in N Africa. A suggestion by Parker is that some CBM cargoes potentially represent specific consignments.<sup>37</sup> P. Mills and Russell both stress that CBM should be viewed as a potentially profitable return cargo intended for a specific market, rather than simply ballast.<sup>38</sup>

Several wrecks seem appositely identifiable as commissioned cargoes. This is what Boetto suggested for the Barthélemy B wreck, for example.<sup>39</sup> The Boka Kotorska 1 wreck, recently discovered off the coast of Montenegro, is another good candidate: preliminarily dated to the end of the 1st c. B.C./beginning of the 1st c. A.D. and estimated at c.22 m in length, it contained c.1200 *tegulae* and probably a similar number of *imbrices*.<sup>40</sup> The production site is not known, but they appear to be a homogeneous shipment and probably represent a single roofing project.<sup>41</sup>

As Parker has noted, the Punta Scario A wreck, which contained a large cargo of stamped roof-tiles, was probably a consignment.<sup>42</sup> Discovered near Marsala and now dated to the 3rd c. A.D., it contained bricks produced by Ti. Cl. Felix, a producer of tiles from Campania whose *figlinae* in Salerno produced bricks that have been found at Hippo Regius, Carthage, Hadrumetum, Leptiminus, Thapsus and Themetra.<sup>43</sup> This cargo would have been loaded

33 Ibid. 352-56.

34 P. Mills, *The ancient Mediterranean trade in ceramic building material: a case study in Carthage and Beirut* (Roman and Late Antique Mediterranean Pottery 2; Oxford 2013) 8.

35 E.g., the Boka Kotorska 1 Wreck: J. Royal, "Illyrian Coastal Exploration Program (2007-2009): the Roman and Late Roman finds and their contexts," *AJA* 116 (2012) 405-60.

36 E.g., Wilson *et al.* (supra n.2) 368-70; D. P. S. Peacock, "The ceramic building materials," in M. Fulford and id. (edd.), *Excavations at Carthage, the British Mission*, vol. 1.2. *The Avenue du Président Habib Bourguiba, Salammbô. The pottery and other ceramic artefacts* (Sheffield 1984) 246; R. Tomber, "Evidence for long-distance commerce. Imported bricks and tiles at Carthage," *RCRFA* 25-26 (1987) 162.

37 A. J. Parker, "Artifact distributions and wreck locations: the archaeology of Roman commerce," in R. L. Hohlfelder (ed.), *The maritime world of ancient Rome* (Ann Arbor, MI 2008) 187.

38 Mills (supra n.34).

39 Boetto 2012 (supra n.8), 156.

40 Royal (supra n.35) 424.

41 Ibid. 421.

42 Parker (supra n.37) 187; id. (supra n.11) 360 no. 961.

43 Wilson 2011 (supra n.3) 1; id., "Ti. Cl. Felix and the date of the second phase of the East Baths,"



at Salerno and would have been destined for what is now Tunisia, where the majority of stamps have been discovered.

On land, tiles with the stamps of potters from *Forum Julii* (Fréjus) are well known from the S coast of France and *Tarraconensis*. The stamps of one particular potter, L. Herrinus, are widely distributed (Alicante, Bocairant, Valencia, Sagunto, Tarragona, San Ginès de Vilasar, Barcelona, Badalona and Mataró, as well as on Majorca).<sup>44</sup> The trade seems to skip the area of Languedoc, implying a direct connection between *Forum Julii* and *Tarraconensis*. Similarly, Mills has demonstrated that *Berytus* (Beirut) imported substantial numbers of tiles from Cilicia between the Seleucid and Byzantine periods, estimating that the Roman-period tiles represent an absolute minimum of 460 shiploads.<sup>45</sup>

While several wrecks, such as the Dramont D and Roches d'Aurelle, contain tiles as part of a mixed cargo, most tile wrecks, like the stone wrecks, are composed of a generally homogenous cargo. This pattern, which is not the standard for other types of cargo such as amphorae (see below), is potentially due to the specifics of commissioning construction materials for particular building projects.

#### *Return cargoes*

To some degree, interpreting CBM cargoes as commissioned purchases goes against the standard interpretation that views return cargoes as composed of low-value, high-bulk goods. A case in point is that of *pozzolana*. A number of ancient harbours were constructed using pozzolanic sand from Italy, including several examples in the E Mediterranean<sup>46</sup> such as the pozzolanic harbour at *Pompeiopolis* (near Mersin) in Cilicia dedicated by Antoninus Pius.<sup>47</sup> Perhaps the best known is the Sebastos harbour at Caesarea Maritima, which alone required c.52,000 tons (100-150 shiploads) of pozzolana. It has been suggested that this was acquired as a cargo returning from Italy on Alexandrian grain ships.<sup>48</sup> Sand is viewed as a low-value, high-bulk cargo, but, while it does make a good return cargo, should we really assume that Herod's showpiece harbour depended upon 100-150 grain ships to return with pozzolana on their way back from Rome? Sebastos, along with several other harbours, was the product of major investment, and it seems improbable that the acquisition of critical materials depended on their subsidy by "higher value" cargoes such as grain. Further, return cargoes do not always equal low-value or 'afterthought' cargoes. Return cargoes could be the main impetus behind a shipping arrangement. It is a fundamental tenet of economics that "imports, not exports, are the purpose of trade".<sup>49</sup> As P. Krugman candidly adds:

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in L. M. Stirling, D. J. Mattingly and N. Ben Lazreg (edd.), *Leptiminius (Lamta): a Roman port city in Tunisia. Report no. 2* (JRA Suppl. 41, 2001) 25-28.

44 C. Rico, "La diffusion par mer des matériaux de construction en terre cuite: un aspect mal connu du commerce antique en Méditerranée occidentale," *MÉFRA* 107 (1995) 778.

45 Mills (supra n.34) 253.

46 C. Brandon *et al.*, *Building for eternity: the history and technology of Roman concrete engineering in the sea* (Oxford 2014).

47 C. Brandon *et al.*, "Geology, materials, and the design of the Roman harbour of Soli-Pompeiopolis, Turkey: the ROMACONS field campaign of August 2009," *IJNA* 39 (2010) 390-99.

48 R. L. Hohlfelder, C. Brandon and J. P. Oleson, "Constructing the harbour of Caesarea Palaestina, Israel: new evidence from the ROMACONS field campaign of October 2005," *IJNA* 36 (1997) 409-15.

49 P. R. Krugman, "What do undergrads need to know about trade?," *Am. Econ. Review* 83 (1993) 24.

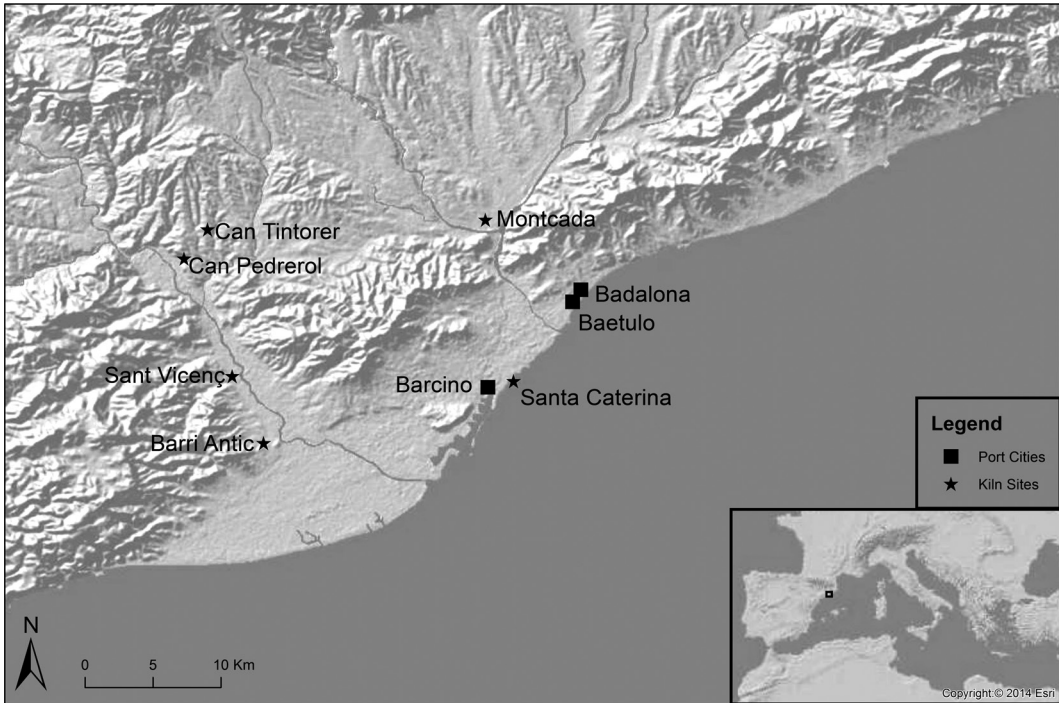


Fig. 2. Ports and kilns in *Tarraconensis*.

Exports are not an objective in and of themselves: the need to export is a burden that a country must bear because its import suppliers are crass enough to demand payment.

This is by no means a modern concept. In the 4th c. B.C. in *Against Dionysodorus* (56) and *Against Lakritos* (35), Demosthenes records that it was the return voyages that brought grain back to Athens. In the latter he writes that 3000 jars of Mendeian wine were exported from Athens or Mende to the Bosphorus or deeper into the Black Sea and used as surety for a maritime loan in order to ensure a return cargo (probably of grain). I will return to the idea of return cargoes at the end of the article.

#### *Amphora cargoes*

With amphora cargoes the patterns are generally more complicated, even amongst wrecks that contain a single commodity from a localized production zone. A good example of this category is the Cap de Volt wreck. Dating to the late 1st c. B.C./early 1st c. A.D.,<sup>50</sup> and discovered off the Spanish coast, it measured 18-19 m in length and was carrying a cargo of Pascual 1 amphorae transporting Laietanian wine.<sup>51</sup> The initial assumption was that the amphorae were fairly homogeneous,<sup>52</sup> but work on the stamps has shown that the amphorae come from at least 5 production sites. Of the stamps that can be securely tied to a production zone, 37% were produced at Sant Vicenç, 27% at Montcada, 18% at Barri Antic, and 9% each at *Baetulo* (Badalona) and Santa Caterina (fig. 2).<sup>53</sup> Recent archaeometric

50 The wreck is dated by a piece of Tarraconensian black gloss belonging to the crew.

51 F. Foerster, "A Roman wreck off Cap del Vol, Gerona, Spain," *IJNA* 9 (1980) 245.

52 Parker (supra n.11) 102.

53 C. Carreras Monfort, "Evolució de les terrisseries del Baix de Llobregat a partir de les seves marques i els seus derelictes," in id., J. Guitart and A. López (edd.), *Barcino*, vol. 2. *Marques i terrisseries d'àmfores al Baix Llobregat* (Barcelona 2013) 339.

investigations on 20 of the amphorae expand production from the Baetulo region as 18 of those were produced in the lower Besòs valley near *Baetulo*.<sup>54</sup> As the kiln sites are clustered around three possible export harbours, various scenarios have been proposed for the ship's loading: as a ship loaded in three steps — at the mouth of the Llobregat river, *Barcino* (Barcelona), and *Baetulo*<sup>55</sup> — or in two steps — at *Barcino* and then *Baetulo*.<sup>56</sup> Alternatively, one could view it as having been loaded at just one of these locations where wine from the various vineyards had already been assembled. In any case, the cargo represents the initial export of this wine. The most straightforward explanation is that the amphorae were loaded as a single shipment from one port. Support may come from the recently discovered amphora deposits at Baetulo. In 2004, excavations near known docking facilities at its Roman harbour revealed two large dumps of Roman amphorae, as well as three *dolia*,<sup>57</sup> a common combination in harbour warehouses,<sup>58</sup> as a result of which these deposits have been interpreted as from a harbour loading zone.<sup>59</sup> These deposits contained a variety of wine, oil and fish-sauce amphorae of Tarraconensian, Baetican and perhaps even Gallic origin.<sup>60</sup> Stamps on the Tarraconensian amphorae from the second of the two deposits show that some came from production sites in the Llobregat valley:<sup>61</sup> two stamps (AC and M) are associated with the production site of Can Tintorer, one (NI or IN) with the site of Can Pedrerol (fig. 2). The combination of amphorae from a multitude of production sites, not only amphorae within the port's immediate hinterland but also from the Llobregat valley (at least a 2-day journey) and *Baetica* (1½ or 2 weeks' sail if departing from Gades), illustrates the habit of storing products in port prior to export and re-export. It confirms that the Cap del Volt ship could have acquired its cargo at a single port, thereby simplifying the process of loading and obviating the need to re-balance the cargo three times. There is no apparent advantage for the merchant in purchasing what must have been a similar wine from a variety of different producers in different locations, whereas purchasing the entire lot at one spot would presumably have saved both time and money. Indeed, several other ships have similar patterns: the Els Ullastres wreck (50 B.C.–A.D. 25), also carrying Pascual 1 amphorae, and La Chrétienne H wreck (c.A.D. 15-20), carrying both Pascual 1 and Dressel 2-4 amphorae.<sup>62</sup>



54 V. Ferreras *et al.*, "From Hispania Tarraconensis (NE Spain) to Gallia Narbonensis (S France). New data on Pascual 1 amphora trade in the Augustan period," *Applied Clay Science* 82 (2013) 77.

55 C. Carreras Monfort and P. Berni Millet, "Microspatial relationships in the Laietanian wine trade: shipwrecks, amphora stamps and workshops," in L. Rivet and M. Sciallano (edd.), *Vivre, produire et échanger: reflets méditerranéens (Mélanges offerts à Bernard Liou)* (Montagnac 2002) 361-62.

56 Carreras (supra n.53) 339.

57 M. Comas and P. Padrós, "Deux grands dépotoirs d'amphores léétaniennes, bétiques et gauloises hors les murs de la ville de Baetulo (Badalona)," *SFECAG, Actes du Congrès de L'Escala-Empúries* (2008) 75-86.

58 E.g., at Lattara and Massalia.

59 Comas and Padrós (supra n.57) 83.

60 Ibid. Deposit 1 contained 72% Tarraconensian amphorae (54% Pascual 1 and 18% Dressel 2-4). In this deposit 8% were Gauloise 4, which may or may not have been imported (they could be local imitations). There were also Dressel 7-11 amphorae from both *Baetica* and *Tarraconensis*, and Dressel 20s from *Baetica*. The second deposit contained 74% Tarraconensian Dressel 2-4 and 15% Pascual 1, the remaining 11% being primarily Baetican (Dressel 20 and Dressel 7-11).

61 6 amphora stamps and 6 graffiti were recovered (ibid.).

62 Carreras (supra n.53) 339 and 341.

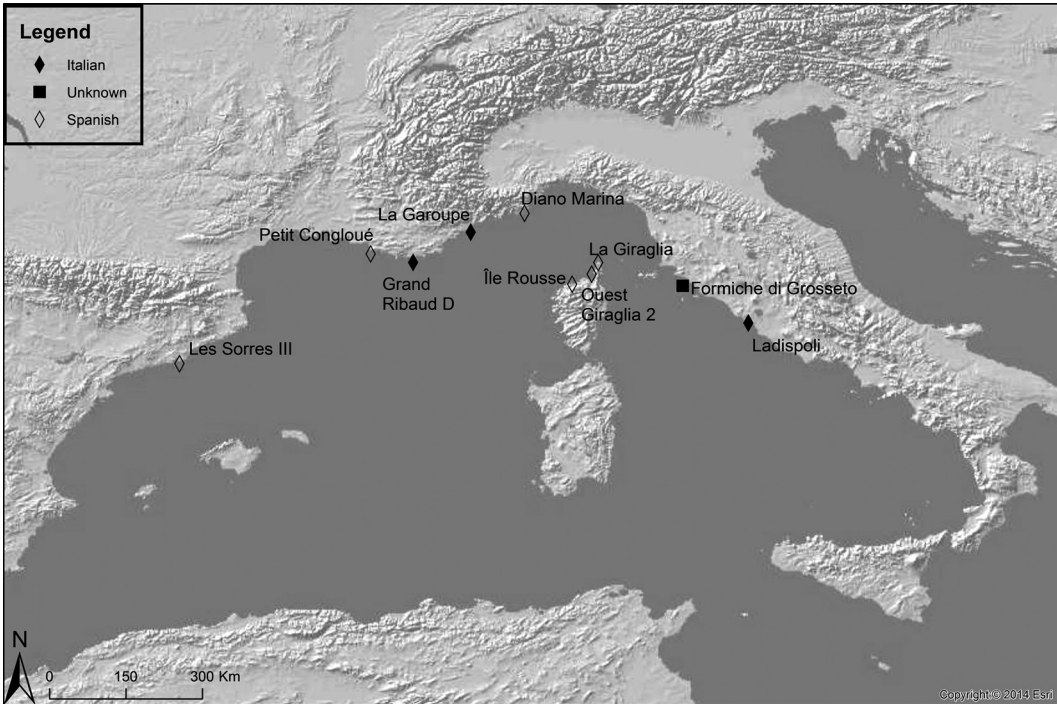


Fig. 3. *Dolia* wrecks.

#### *Dolia* wrecks

If we now turn to Dressel 2-4 cargoes, a specific group of wrecks — called *dolia* wrecks because *dolia* were installed in their central hull section — can also be largely categorized as carrying a single commodity from a localized production zone, although in this case there are two different types of containers and perhaps two different qualities of wine. These wrecks, also referred to as “bateaux-citernes” or tankers, spanned a fairly limited period between the late 1st c. B.C. and the end of the 1st c. A.D. (fig. 3).<sup>63</sup> The number of *dolia* wrecks depends on the criteria used to determine whether the ship was a tanker-style wreck or simply a wreck with *dolia* on board. At the very least, I consider the 10 wrecks (listed in Table 2 that have both multiple *dolia* and additional cargo in the form of Dressel 2-4 to be securely identifiable as tanker-style wrecks. These wrecks are generally well discussed;<sup>64</sup> they are the subject of a 2008 dossier in *Archaeonautica*, as well as a lengthy counter-article in 2011.<sup>65</sup> That being said, much is still debated in terms of construction technique, place of construction, ownership, and whether or not they were intended for both maritime and fluvial shipping.

63 The number of *dolia* wrecks depends on the qualifications used to determine whether the ship was a tanker-style wreck or simply a wreck with *dolia* on board. K. Heslin, “*Dolia* shipwrecks and the wine trade in the Roman Mediterranean,” in Robinson and Wilson (supra n.3), provides a comprehensive list of all possible *dolia* wrecks and considers there to be 13 definite tanker-style wrecks.

64 See M. Corsi-Sciallano and B. Liou, “Les épaves de Tarraconaise à chargement d’amphores Dressel 2-4,” *Archaeonautica* 5 (1985), particularly 169-74. More recently, Heslin *ibid*.

65 *Archaeonautica* 15 (2008) 113-97; P. Dell’Amico and F. Pallarés, “Appunti sui relitti a *dolia*,” *Archaeologia Maritima Mediterranea* 8 (2011) 47-135.



TABLE 2

<i>Wreck name</i>	<i>Date</i>	<i>Cargo amphorae</i>	<i>Wreck location</i>	<i>Piramus stamp</i>
Grand Ribaud D	9-1 B.C.	Italian Dressel 2-4	France	Yes
Ladispoli	Late 1st B.C. – early 1st A.D.	Italian Dressel 2-4	Italy	Yes
La Giraglia	c.A.D. 20	Tarraconensian Dressel 2-4	Corsica	Yes
Les Sorres III	A.D. 25-100	Tarraconensian Dressel 2-4	Spain	Unknown
Petit Congloué	Mid-1st A.D.	Tarraconensian Dressel 2-4	France	Yes
La Garoupe	Mid-1st A.D.	Italian Dressel 2-4	France	Yes
Île Rousse	Mid-1st A.D.	Tarraconensian Dressel 2-4	Corsica	Yes
Diano Marina	c.A.D. 50	Tarraconensian Dressel 2-4	Italy	Yes
Formiche di Grosseto	10 B.C. – A.D. 40	Dressel 2-4 of unknown origin	Italy	Yes
Ouest Giraglia 2	Unknown	Tarraconensian Dressel 2-4	Corsica	Yes

Through stamps on the *dolia*, these wrecks have been connected to the Piranus family of Minturnae.<sup>66</sup> As the Piranus stamps appear only on the *dolia*, it is not known if the Piranus family was involved solely with the production of *dolia* or were also involved in the construction of the ships, though it seems there was a shipyard at Minturnae.<sup>67</sup> In any case, the stamps are useful for tracing the chronological span of these ships and it has been proposed that the stamps span three generations of the family.<sup>68</sup> The stamps also link the ships with central Italy, a link that is borne out by additional cargo in several of the wrecks. Indeed, the additional cargo is of interest for its potential to shed light on the trading routes in which these ships were engaged. Ten wrecks have secure evidence of additional cargo in the form of amphorae loaded fore and aft of the *dolia* (Table 2), and in all but one<sup>69</sup> the amphora cargo consists solely of Dressel 2-4 wine amphorae. Particularly intriguing is that some of these are Italian and some are Tarraconensian, though both types do not occur as cargo in the same ship.

The Giraglia wreck, discovered in 1993 off the N tip of Corsica near the island of La Giraglia,<sup>70</sup> contained 10 *dolia* and probably 5 or 6 *doliola*. One *dolium* bore the stamp (. . . ITESIPIRA(m).CER(donis)S(ervus).F(ecit)), connecting the *dolium* directly with the Piranus family.<sup>71</sup> In addition to the *dolia* and *doliola*, there was a cargo of Dressel 2-4 amphorae

66 S. Marlier, "Architecture et espace de navigation des navires à *dolia*," *Archaeonautica* 15 (2008) 153-173; Corsi-Sciallano and Liou (supra n.64) 173-74.

67 Marlier *ibid.*; Heslin (supra n.63) 165-66.

68 Corsi-Sciallano and Liou (supra n.64) 26-43 and 173-74.

69 The *Petit Congloué* likewise contains a small cargo of no more than 10 Gallic wine amphorae: Corsi-Sciallano and Liou *ibid.* 35.

70 S. Marlier and P. Sibella, "La Giraglia, a *dolia* wreck of the 1st century BC from Corsica, France: study of its hull remains," *IJNA* 31 (2002) 161.

71 M. Sciallano and S. Marlier, "L'épave à *dolia* de l'île de la Giraglia (Haute-Corse)," *Archaeonautica* 15 (2008) 113-51.



from *Tarraconensis*; 55 amphora toes were recovered from the site,<sup>72</sup> and it is estimated that there were *c.*200 amphorae originally on board.<sup>73</sup> The stamps can be securely linked with 4 kiln sites; amphorae from Sant Vicenç dels Horts are in the majority (54%), followed by Can Tintorer (31%), Can Pedrerol (8%), and Barri Antic (7%).<sup>74</sup> As most of the amphorae were from sites located in the Llobregat valley, it seems probable that the ship was loaded at *Barcino*.<sup>75</sup>

The Diano Marina wreck had a similar assemblage of amphorae from the Llobregat valley and is thought to have been loaded at *Barcino*, although it also had amphorae produced farther north in the Maresme.<sup>76</sup> The amphora stamps for the Île Rousse and Petit Congloué wrecks are less well known, but it is generally argued that the Petit Congloué was loaded in the Llobregat region while the Île Rousse was loaded farther north in the Maresme region, despite the fact that they do share stamps between them.<sup>77</sup>

If we turn to wrecks with Italian Dressel 2-4 amphorae, the Grand Ribaud D wreck (9-1 B.C.) was discovered at a depth of 19 m at the NW point of the islet of Grand Ribaud.<sup>78</sup> Eleven *dolia* were recovered, one of which was stamped with C.PIRANUS/SOTERICUS.F.<sup>79</sup> Two of the *dolia* bore graffiti relating to their volume. One graffito, LXIII, is interpreted as specifying that this particular *dolium* contained 63 amphorae worth of wine (1656 litres) and the other, LXXV, as that *dolium* containing 75 amphorae worth of wine (1972 litres). The ship was also transporting a cargo of Italian Dressel 2-4 wine amphorae, estimated to have originally numbered more than 200.<sup>80</sup> There was a minimum of 141 Pompeian Dressel 2-4 amphorae, of at least 5 different types with 4 different stamps,<sup>81</sup> in addition to a minimum of 26 Dressel 2-4 amphorae that are thought to have been produced in Italy's Adriatic region. Two different stamps and one painted inscription were noted from these amphorae. The stamps indicate that the amphorae were the products of several different estates. Determining the loading location of this ship is not straightforward since it contains amphorae from both E and W Italy. Was it loaded at Pompeii where the majority of the amphorae were produced, or at Minturnae where the ship may have been built, or somewhere unrelated? It seems fairly certain that it was loaded on Italy's W coast, but to go further is guesswork. If we look to the other *dolia* wrecks that contained Italian amphorae, the La Garoupe wreck also had a cargo of Pompeian wine, but the Ladispoli wreck contained Campanian amphorae from outside Pompeii.

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72 Ibid. 124.

73 Marlier and Sibella (supra n.70) 161.

74 Carreras (supra n.53) 341.

75 Ibid.

76 Dell'Amico and Pallarés (supra n.65) 101.

77 Carreras (supra n.53); P. Berni Millet and J. Miró Canals, "Dinámica socioeconómica en la Tarraconense oriental a finales de la República y comienzos del Imperio. El comercio del vino a través de la epigrafía anfórica," in J. López Vilar (ed) *Tarraco biennial: Actes, 1er Congrès Int. d'Arqueologia. I Món Antic: govern i societat a la Hispània romana, Novetats epigràfiques. Homenatge a Géza Alföldy* (Tarragona 2013) 77.

78 A. Hesnard *et al.*, "L'épave romaine *Grand Ribaud D* (Hyères, Var)," *Archaeonautica* 8 (1988) 16.

79 Ibid. 41.

80 The publication (supra n.78) gives an estimate of between 208 and 267 amphorae, but the review by Marlier (supra n.66) 154-73 gives an estimate of 441-515.

81 Hesnard *et al.* (supra n.78) 41.

Of particular interest to a discussion of trading patterns are the two groups of amphora cargoes, those from *Tarraconensis* and those from Italy, and what they illustrate about the processes of maritime trade. These are not tramping vessels; the *dolia* ships typically seem to have carried between 45 and 50 tonnes of cargo<sup>82</sup> and so fall into what Parker categorizes as the smallest and most common category of ship size, those with under 75 tons of cargo,<sup>83</sup> yet they were participating in a well-organized trading system. Construction of these ships entailed certain considerations in terms of cargo and probably the mechanics of filling and emptying the *dolia*. The *dolia* were installed into the mid-section and could not easily be re-arranged; this would create a restricted space in the fore and aft sections of the ships, allowing considerably less flexibility in terms of the remaining cargo than otherwise would be the case. When these ships were being built, the primary wine amphorae being manufactured around Minturnae were Dressel 2-4 amphorae. It seems then that these ships were constructed with the intent of carrying cargoes of Dressel 2-4 wine amphorae in the fore and aft sections. This would balance the weight of the *dolia* and allow for a more diversified cargo, with lower-quality wine shipped in the *dolia* and a higher-quality vintage in the amphorae.<sup>84</sup> Perhaps more importantly, by consistently carrying Dressel 2-4 amphorae the *navicularius* would know roughly how many amphorae would fit in the hold, regardless of whether the ship was being loaded with a Spanish cargo or an Italian one. This could allow for easy expansion into the Spanish wine market.

The dating of the wrecks in comparison to the different cargoes of amphorae is also suggestive. In 1985, M. Corsi-Scialliano and B. Liou proposed a chronology for three generations of the Piranus family. The first is that of Sotericus, the second is that of Felix and Cerdo,<sup>85</sup> while Primus and Philomusus are part of the third generation.<sup>86</sup> The earliest dated wrecks — Grand Ribaud D and Ladispoli, whose cargoes place them in the late 1st c. B.C. during the first generation of Pirani involved in the production of *dolia* — contain cargoes of Italian Dressel 2-4 amphorae. Based on present evidence, those ships with cargoes of Tarraconensian Dressel 2-4 amphorae begin with the second generation of the Pirani. Of these ships, the earliest dated is the Giraglia wreck (A.D. 20) which was connected with Cerdo. Ships with cargoes of Italian Dressel 2-4 amphorae certainly continued, as evidenced by the Garoupe wreck which contained *dolia* stamps of Sotericus but also of Felix and Cerdo — Pirani of the second generation. Were these ships all owned by the same family or firm, or were they constructed and then sold off to individual shipowners and traders? We can speculate that, if they belonged to the same family or firm, we have evidence of a business that started off with cargoes of Italian wine in *dolia* and additional cargoes of Italian Dressel 2-4 amphorae; by the second generation, the business expanded and connections were cultivated with *Tarraconensis* where Dressel 2-4 amphorae were being made that would permit the same or similar stowage arrangements as the Italian Dressel 2-4, thereby providing a ready return cargo to Italy. The design of the *dolia* ships placed tight restrictions on additional and return cargo, but this was minimized when they began carrying Tarraconensian amphorae (and presumably also Tarraconensian wine in the *dolia*).

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82 Sciallano and Marlier (supra n.71) 149.

83 Parker (supra n.11) 26-27.

84 Heslin (supra n.63) 163.

85 It has been debated whether Cerdo belongs to the first or second generation (Sciallano and Marlier [supra n.71] 151), but, based on the dating of *La Giraglia* and *La Garoupe*, it appears that Cerdo belongs to a second generation.

86 Sciallano and Liou (supra n.64) 173-74.

These ships appear to have a relationship with Gaul as well, as the Grand Ribaud D, Petit Congloué, La Garoupe and Meloria B wrecks all lie along the S coast of France and some of them contain various Gallic products (e.g., the small number of Gallic amphorae aboard the Petit Congloué). Ports such as Marseille and Lattara contained *dolia* warehouses and, given the location of the wrecks (fig. 3), the likeliest explanation is that the wine in the *dolia* was being exchanged in S Gaul, whereas the amphorae were intended for Italy or for Spain.<sup>87</sup> It has also been suggested that the *dolia* ships were towed up the Rhône to Lyon;<sup>88</sup> we have insufficient information about the construction methods of *dolia* ships to be sure, although from the available evidence (particularly from the Ladispoli wreck and early reports on the Ovest Giraglia 2 wreck) the ships probably had a relatively flat bottom and keel and a draft that would have been low enough (under 1.5 m) for towing up the Rhône, at least in certain seasons;<sup>89</sup> yet the fact that no wrecks are known with Gallic amphora cargoes might speak against this.

The *dolia* wrecks represent a particular niche of trade during the Early Roman period. They provide a look at trade in bulk (i.e., as bulk containers) – trade that certainly occurs later in barrels but is rarely visible in the archaeological record. These ships must have had specific intended markets by way of ports at which they could unload the contents of the *dolia*, and that implies good communications between ports and disseminated knowledge of the facilities available.

*Principal and complementary cargoes*

Frequently, however, cargo arrangements are more complex than in the cases just discussed. A number of wrecks contain cargoes where most of the space is taken up with a single commodity from a localized production zone but there is also a smaller secondary or complementary cargo. The Madrague de Giens wreck (70-50 B.C.), found on the N part of the Giens promontory and extensively excavated between 1971 and 1983, is an excellent example of this type of composition.<sup>90</sup> It is also one of the largest wrecks yet excavated, having originally carried c.350-450 tons of cargo including some 6000-7000 amphorae, most of them Dressel 1B.<sup>91</sup> Yet here too there is variety even amongst the Dressel 1Bs. The majority of amphorae on board were produced at two kiln sites on the S Italian plain at Fondi. Of these, roughly a third are from the estate of P. Veveius Papus at Canneto as shown by numerous stamps. The other two-thirds of the Dressel 1B come from kilns at San Anastasia.<sup>92</sup> This kiln site was not attached to a particular estate but produced amphorae that could be purchased to hold the wine of vineyards that lacked their own kilns. Two distinguishable types of Dressel 1B from San Anastasia (“série 1” and “série 3”) were found on the wreck. There was also a fourth type of Dressel 1B, present only in small numbers and from a still-unidentified kiln site in Latium.<sup>93</sup> Further, a range of other amphorae was present at a minimum of 10 of each: Dressel 1A, Lamboglia 2, Brindisi, flat-bottomed

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87 Three of the wrecks with Tarraconensian amphorae appear to have sailed past the French coast.

88 Sciallano and Marlier (supra n.71) 164-70.

89 Ibid. 164-70.

90 Parker (supra n.11) 249.

91 Ibid.

92 A. Hesnard, “L’épave La Madrague de Giens (Var) et la plaine de Fondi (Latium),” *Archaeonautica* 17 (2012) 71-93; A. Tchernia et al., *L’épave romaine de la Madrague de Giens (Var) (campagnes 1972-1975)* (Paris 1978) 36-38.

93 Hesnard ibid. 85.

amphorae, Richborough 527, and a group of Rhodian, Coan and Chian amphorae.<sup>94</sup> Such diverse groups of amphorae are often attributed to the crew's own supplies, but their numbers here are too high to represent supplies for the crew and they were clearly integrated within the cargo in the hull. The fourth type of Dressel 1B mentioned above perhaps also belongs to this group, as they are distinct from the main cargo of Dressel 1Bs. The cargo also contained a group of Campanian finewares (hundreds of fragments were recovered), as well as substantial numbers of coarseware vessels produced at San Anastasia, all of which were stowed above the amphorae.<sup>95</sup> The detailed recording of this wreck has made it possible to study how the cargo was stowed. A. Hesnard has recently re-examined the stowage arrangements for the lowermost level of amphorae near the bow, where there was no intervention by the ancient *urinatores* (divers) who salvaged part of the cargo and the ship's pump. She shows that there was no differentiation between the stowage of the amphorae from the different groups; the amphorae were loaded in one event and with no regard for which amphorae were to go in which areas. There was thus no need to distinguish between various production sites or amphora owners; the cargo was all meant to be unloaded at the same time.<sup>96</sup> This is supported by Hesnard's analysis of the stamps on the amphora stoppers. These are plausibly interpreted as marks applied by merchants following the sale of the wine by the producers; but it is clear that the amphorae were not loaded according to these stamps, suggesting that when the diverse cargo of amphorae was loaded into the hull it had become a unified cargo, probably owned by a single merchant.

If we turn to salted-fish products, the Chiessi wreck presents a similar pattern to that of the Madrague de Giens, although with a greater variety of amphora-borne products on board. The Chiessi wreck was discovered some 500 m off the coast of Elba at a depth of 50 m.<sup>97</sup> The cargo consisted of some 5000-7000 Spanish amphorae of 4 different types. Beltrán 2A made up 90% of these, while the remaining 10% were Beltrán 2B, Dressel 20 and Haltern 70.<sup>98</sup> Beltrán 2A were produced in *Baetica*, most commonly in the region around Cadiz, and generally contained a salted-fish product. Those recovered from the Chiessi wreck contain traces of pitch and numerous fish bones.<sup>99</sup> The Beltrán 2B were very similar in form to the Beltrán 2A; they were also pitched and probably contained some kind of fish product; the Dressel 20 olive oil amphorae came from *Baetica*, and the 6 Haltern 70 amphorae were produced in the same region as Dressel 20.<sup>100</sup> On the basis of painted inscriptions and contents analysis the most commonly recorded product was *defrutum*.<sup>101</sup> The ship therefore held a cargo from several locations within a single province, but it was probably loaded as a single process. It is logical that the Dressel 20s would have been transported downriver to a port like Cadiz where they could have easily mixed with a cargo of Beltrán 2. If we consider the weight of even 25 Dressel 20s holding a combined total of c.1750 litres (1.575 tonnes)<sup>102</sup> and how they would affect the balance of the ship, they must

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94 Ibid. 77.

95 Ibid. 87.

96 Hesnard, *ibid.* 84.

97 D. Rossi, "Relitto di Chiessi (Marciana)," in M. Zecchini (ed.), *Relitti romani dell'Isola d'Elba* (Lucca 1982) 128.

98 Ibid. 129.

99 D. Rossi, "Chiessi," *Archeologia Subacquea* 4 (1982) 80.

100 C. Carreras Monfort, "Haltern 70: A Review," *JRomPotStud* 10 (2003) 86.

101 Carreras *ibid.* 88 for a discussion of the debates concerning the contents of Haltern 70.

102 The average capacity of a Dressel 20 is thought to be 70-75 litres; it weighs 63 kg when full

have been accounted for in the original loading of the ship, and not added as a part-cargo along the way.<sup>103</sup>

### Cargoes with multiple commodities from a single region

Diversity within a cargo from a localized production area is more pronounced in a case like Plemmirio B. This wreck was discovered at a depth of 22-47 m near Capo Murri di Porco (SE Sicily) and excavated between 1983 and 1987.<sup>104</sup> The wreck was spread across the talus of a cliff; it is thus fairly scattered, with little of the hull remaining, but the area of the galley was distinguishable.<sup>105</sup> The ship seems to have been quite small and is estimated to have had a capacity of *c.*13 tons. The wreck is dated to *c.*A.D. 200 on the basis of the N African amphorae.<sup>106</sup> On board were two types of N African amphorae: Africana I and Africana IIA. Africana I typically contained olive oil, and one of those recovered here contained olive pits.<sup>107</sup> Africana IIA have been shown to contain salted fish products.<sup>108</sup> It is estimated that there were *c.*200 amphorae on board, with the Africana IIA making up the majority of the cargo.<sup>109</sup> Instrumental Neutron Activation Analysis demonstrated that the majority were from the same source, one matched most closely by material gathered from kiln sites in the late 1980s around *Sullecthum* (Salakta). The INAA signatures indicate that the most probable sources are 4 sites on the coast (El Hri I, El Hri II, Salakta, Catacombs) which were clearly producing Africana I and Africana IIA.<sup>110</sup>

The ship also contained *c.*1 tonne of small iron bars. As no analysis has been done on the iron bars, we do not know their origin. There are active iron mines today in Tunisia, but they are deep in the interior and it is unknown whether they were exploited by the Romans.<sup>111</sup> *Leptiminus* not far north of Salakta was engaged in primary metalworking, despite the fact that there were no nearby sources of iron ore, and it has been proposed that iron ore was being brought from overseas as a return cargo.<sup>112</sup> The overseas transport of

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(<http://ads.ahds.ac.uk/catalogue/resources.html?amphora2005>); thus 25 amphorae at 70 litres each would equal 1750 litres of oil, weighing 1575 kg.

103 See S. McGrail, "The shipment of traded goods and of ballast in antiquity," *OJA* 8 (1989) 353-58, for a discussion of stability and stowage issues related to the loading of ships.

104 See D. J. L. Gibbins and A. J. Parker, "The Roman wreck of *c.*AD 200 at Plemmirio, near Siracusa (Sicily): interim report," *IJNA* 15 (1986) 267-304; D. J. L. Gibbins, "The Roman wreck of *c.*AD 200 at Plemmirio, near Siracusa (Sicily): second interim report. The domestic assemblage 1: medical equipment and pottery lamps," *IJNA* 18 (1989) 1-25; *id.*, "The Roman wreck of *c.* AD 200 at Plemmirio, near Siracusa (Sicily): third interim report. The domestic assemblage 2: kitchen and table pottery, glass and fishing weights," *IJNA* 20 (1991) 227-46; *id.*, "A Roman shipwreck of *c.*AD 200 at Plemmirio, Sicily: evidence for North African amphora production during the Severan period," *WorldArch* 32 (= 2001) 311-34; R. J. Taylor, V. J. Robinson and D. J. L. Gibbins, "An investigation of the provenance of the Roman amphora cargo from the Plemmirio B shipwreck," *Archaeometry* 39 (1997) 9-21.

105 Gibbins 2001b (*supra* n.104) 312.

106 *Ibid.* 313.

107 *Ibid.* 315.

108 M. Bonifay, "Que transportaient donc les amphores africaines?" in E. Papi (ed.), *Supplying Rome and the Empire* (JRA Suppl. 69, 2007) 9-31.

109 Gibbins 2001b (*supra* n.104) 316-19.

110 Taylor *et al.* (*supra* n.104); Gibbins *ibid.* 326.

111 I. Schrüfer-Kolb, "Iron production debris," in D. L. Stone, D. J. Mattingly and N. Ben Lazreg (edd.), *Leptiminus (Lamta) report no. 3. The field survey* (JRA Suppl. 87, 2011) 435-53.

112 See Schrüfer-Kolb *ibid.* for a thorough discussion of iron production at Leptiminus.



iron ore from mining sites to production sites is mentioned by Diodorus Siculus (5.13.1-2):

For the island [Elba] possesses a great amount of iron-rock, which they quarry in order to melt and cast and thus to secure the iron, and they possess a great abundance of this ore. For those who are engaged in the working of this ore crush the rock and burn the lumps which have thus been broken in certain ingenious furnaces; and in these they smelt the lumps by means of a great fire and form them into pieces of moderate size which are in their appearance like large sponges. These are purchased by merchants in exchange either for money or for goods and are then taken to Dicaearchia [Puteoli] or the other trading-stations, where there are men who purchase such cargoes and who, with the aid of a multitude of artisans in metal whom they have collected, work it further and manufacture iron objects of every description ... these are then carried by merchants to every region, and thus many parts of the inhabited world have a share in the usefulness which accrues from them.

It is plausible, then, that the iron bars aboard the *Plemmirio B* could have been “locally” manufactured in what is now Tunisia from imported ores and then re-exported as ingots. This ship represents a straightforward loading pattern and is a good candidate for an export cargo of amphorae. The iron bars would have been loaded on the ship prior to the amphorae (due to their weight). Probably this took place at *Sullecthum*. Based on the wreck’s location, it has been suggested that the ship was on its way to Italy,<sup>113</sup> or perhaps it was *en route* to Sicily, which may have functioned as a collection point for N African commodities and, since it had no good local sources of iron, might have provided a ready market for iron ingots.

The Punta Scifo A wreck demonstrates a pattern which, while not the norm for stone cargoes, is similar to that of the amphora cargoes just discussed and paralleled by other stone cargoes carrying multiple stone types, such as Giardini Naxos (see nn. 25-26 above). The wreck was first identified off Punta Scifo near Crotona in the early 1900s and partly published in 1911 and 1921,<sup>114</sup> but the most thorough publication is P. Pensabene’s in 1978.<sup>115</sup> The original accounts suggested that there were well over 30 pieces of marble (over 150 tons), but Pensabene was only able to locate 27.<sup>116</sup> The cargo consisted predominantly of two types of marble: *pavonazzetto*, a purple and white marble from the quarries at *Docimium* (Phrygia), and Proconnesian, a white marble from Proconnesos (the island of Marmara). Most of the cargo is *pavonazzetto*; extant pieces include 5 basins, 4 stands, 8 columns in two major sizes (12 and 20 Roman feet), and 5 blocks ranging from 15 to 60 Roman cubic feet. There was also a block of white marble from the nearby quarry at *Synnada*. The 4 pieces of Proconnesian marble include two large rectangular blocks (of 60 and 69 Roman cubic feet) along with two statue bases or altars. As quarry inscriptions on a column and block of *pavonazzetto* marble include consular dates of A.D. 197 and 200, the wreck must date after A.D. 200.<sup>117</sup> The marble from *Docimium* and *Synnada* would have had to travel some distance overland before being transported either down the Maeander to the Aegean or down the Sangarius river towards the Black Sea, with a final segment overland to Nicomedia. The marble from Proconnesos would first have been shipped from the island’s own

113 Gibbins 2001b (supra n.104).

114 P. Orsi, “Crotona. Prima campagna di scavi al santuario di Hera Lacinia. Scoperte subacquee presso l’Heraeum,” *NSc Supplemento* 1911, 118-24; id., “Crotona. Nuove scoperte subacquee di marmi in parte scritti a Punta Scifo,” *NSc*: 1921, 493-96.

115 P. Pensabene, “A cargo of marble shipwrecked at Punta Scifo near Crotona (Italy),” *IJNA* 7 (1978) 105-18.

116 Ibid.

117 Ibid., cat. nos. 5-6.

harbour. The two different types of marble were surely loaded onto the Punta Scifo A ship at the same time because of the practical difficulties of transporting and stabilizing a heavy cargo of this kind. Given the prevalence of *pavonazzetto*, it seems likely that the full cargo was assembled at the first main export harbour (*Nicomedia*, *Miletos* or *Ephesos*?); the Proconnesian could have been shipped to any of those ports during its first stage of transport. The Proconnesian and *pavonazzetto* were thus probably combined at a single port on the coast of Asia Minor for export to Italy.

### Cargoes containing multiple commodities from multiple regions

The wrecks discussed above reveal a relatively clear distinction between the cargo on its initial stage of export and the cargo being re-exported (generally this equates with principal and complementary cargoes, respectively) and they carried cargoes which can be associated with a localized (or at least a provincial) zone of production. Many other cargoes, however, are heterogeneous, containing commodities that were produced in more than one province. This leads us to consider the potential impact of cross-provincial taxation on trading strategies.

#### *Import and export duties*

When a ship arrived in harbour, its cargo had to be registered.<sup>118</sup> Two separate taxes were levied on ships entering a harbour: harbour dues (municipal fees exacted for the use of harbours and their facilities) and customs fees (state taxes calculated *ad valorem*).<sup>119</sup> While there are no extant figures for municipal harbour dues in our period, they certainly existed.<sup>120</sup> The rate of such dues probably varied by harbour, depending on the facilities available. Charges also could have been levied on particular activities that took place within a harbour, such as ferry service.<sup>121</sup>

We are better informed about customs dues (*portoria*), though our knowledge is uneven and there is considerable uncertainty concerning the taxation process.<sup>122</sup> The *portorium* was applied to products being imported and exported across provincial boundaries. Customs rates varied by province; along the external frontiers the rates were as high as 25%, though within the empire the rate was commonly 2.5%, but Sicily and Illyricum seem to have had a rate of 5%.<sup>123</sup> It is possible that the ports of the Italian peninsula were free from customs

118 It is not certain whether or not every port had a customs-station. The *Lex Portoria Asiae* seems to indicate that every port along the coast of Asia had a station, but it appears that there were only three among the ports of *Narbonensis*: J. France and A. Hesnard, "Une statio du quarantième des Gaules et les opérations commerciales dans le port romain de Marseille (Place Jules-Verne)," *JRA* 8 (1995) 79-93. Arnaud (supra n.3) 66 suggests that it is unlikely that every port had a customs-station, but it would seem that all ports of moderate size had some capacity to exact customs lest evasion become too easy.

119 Cf. Arnaud *ibid.*

120 W. Scheidel, "A comparative perspective on the determinants of the scale and productivity of Roman maritime trade in the Mediterranean," in W. V. Harris (ed.) *Maritime technology in the ancient economy* (JRA Suppl. 84, 2011) 28.

121 Ferry services are attested at Smyrna (*IK* 24.1, 712) and Myra/Limyra (*OGIS* 572). There were 5 corporations of ferrymen at Ostia (*CIL* XIV 409 and XIV 4144).

122 For recent discussions of Roman customs dues, see R. P. Duncan-Jones, "Roman customs dues: a comparative view," *Latomus* 65 (2006) 3-16, and M. Cottier *et al.* (edd.), *The customs law of Asia* (Oxford 2008).

123 Duncan-Jones *ibid.* 4.

duties.<sup>124</sup> Specific rates were often applied to particular products of higher value, such as slaves or purple dye.<sup>125</sup> It is probable that the entire cargo of an incoming ship would have been unloaded at the point of customs clearance.<sup>126</sup> The *Lex Portorii Asiae* states that the merchant importing or exporting had to announce verbally and declare in writing the value of the cargo and, where necessary, the quantity of goods and their weight.<sup>127</sup> Traveling outside a single customs zone would generally cause the cargo to be subject to import and export duties upon every border crossing, although there were occasional exceptions. In *Asia*, for example, it seems that if a merchant were to import a cargo, he would be liable for import dues on the cargo; if he only sold a portion of the cargo, then he must pay export dues on the unsold portion; if, however, he were to re-import the same cargo into *Asia* later in the same year, he would not have to pay either import or export duties again.<sup>128</sup> A similar situation existed at Caunus, where a merchant could re-export unsold merchandise, without being subjected to export duties for a period of 20 days.<sup>129</sup>

*Cargoes from many provinces*

The Comacchio wreck, found in 1980 in the territory of Valle Ponti, north of Ravenna, had a very diverse cargo.<sup>130</sup> The ship was 21 m long and is calculated to have had a capacity of 130 tons. Owing to its lack of a proper keel, the ship seems to be best suited to coastal and fluvial navigation.<sup>131</sup> The wreck is dated to the last quarter of the 1st c. B.C. The cargo, which was well preserved, included various amphorae as well as lead ingots. Also on board were 6 lead models of temples, several wooden boxes, assorted pieces of N Italian terra sigillata, and common wares.<sup>132</sup> The lead ingots, 102 of which were recovered in 1981, have been studied extensively<sup>133</sup> and divided into 5 basic types. Recently, 20 of these ingots, drawn from each of the 5 types, were tested using isotopic analysis and the results show that they probably came from the mines of Sierra Almegrera or Carthago Nova.<sup>134</sup> A comparison of the epigraphic evidence of these regions with the stamps and the counter-stamps on the ingots indicates that most of the ingots were probably produced at Carthago Nova. A small group (Type 5), however, seems to have been mined at Mazarrón.<sup>135</sup> Also on

124 D. Rathbone, "Nero's reforms of vectigalia and the inscription of the *Lex Portorii Asiae*," in Cottier et al. (supra n.122) 275-76.

125 E.g., in the *Lex Portorii Asiae* slaves, slave children, ore and murex shells were subject to specific rates: Cottier et al. (supra n.122).

126 A. Bresson, *L'économie de la Grèce des cités (fin VIe – Ier siècle a.C.)* vol. 2. *Les espaces de l'échange* (Paris 2008) 101-5; Arnaud (supra n.3) 67.

127 Cottier et al. (supra n.122) 106-7.

128 *Lex Portorii Asiae*, II.18. See commentary in Cottier et al. *ibid.* 108-9.

129 C. Marek, *Die Inschriften von Kaunos* (Munich 2006) 198.

130 M. Bondesan, R. Dal Cin and R. Monari, "L'ambiente in cui si arenò la nave romana di Comacchio: possibili modalità del suo naufragio e seppellimento," in F. Berti (ed), *Fortuna maris: la nave romana de Comacchio* (Bologna 1990) 13.

131 M. Bonino, "Tecnica costruttiva e architettura navale: proposte per la ricostruzione," *ibid.* 39.

132 Berti *ibid.* 65.

133 C. Domergue, "Les lingots de plomb de l'épave romaine de Valle Ponti (Commachio)," *Epigraphica* 49 (1987) 109-75; C. Domergue et al., "Retour sur les lingots de plomb de Comacchio (Ferrara, Italie) en passant par l'archéométrie et l'épigraphie," available at <http://arxiv.org/abs/physics/0605044v2> S. Dušanić, "The Valle Ponti lead ingots: notes on Roman notables' commercial activities in free Illyricum at the beginning of the Principate," *Starinar* 58 (2008) 107-18.

134 Domergue et al. *ibid.*

135 *Ibid.* 19.

board was a wide variety of amphorae: Koan, Chian, Cnidian and Dressel 6A.<sup>136</sup> While the Dressel 6 were commonly manufactured along the Adriatic coast, in the general region of the wreck, the other amphorae came from the Aegean. This ship was thus carrying cargo from Spain (ingots), the Aegean (amphorae) and N Italy (amphorae and finewares). It is unlikely that the ingots or the Aegean amphorae would have been loaded directly on this keel-less ship; rather its loading probably occurred at an Adriatic port where the cargo was assembled from previously unloaded cargoes. Possibly it constitutes a return cargo acquired from an emporium such as Aquileia.

Skerki Bank Wreck D, dated between 80 and 50 B.C., is one of 8 discovered in a series of deep-water surveys (850 m) off Skerki Bank (c.80 km northwest of Sicily).<sup>137</sup> The bulk of artefacts was concentrated in two large heaps, with only a few scattered artefacts in the near vicinity. The investigators propose that the two heaps of cargo lie as they would have sat in the ship itself, and that the absence of artefacts in the middle of the area can be explained by an organic cargo or the jettisoning of the easily accessible cargo located in the midship section of the hold.<sup>138</sup> Excavation was not carried out, although the seabed was carefully surveyed by a Remotely Operated Vehicle and a sampling of artefacts was retrieved. While the cargo seems incomplete, there are several artefacts of interest. Visible on the seabed in the two heaps taken together are c.70 amphorae representing at least 12 different types originating from a variety of locations (Italy, N Africa, Greece, probably Gaul). Their presumed contents include wine, oil, and either pickled fish or fruit. Also on board were a number of finewares that were probably part of the cargo, a large deposit of lamps (noticed after the survey and not fully investigated), and various pieces (cooking pots, a quern, etc.) that were part of the crew's belongings. The majority of amphorae (27) visible are Dressel 1B. There are also 4 Dressel 1A wine amphorae (the earliest dated ones), 1 Dressel 1C, associated with *garum*, and 1 Dressel 12, also identified with *garum*. Other types include 11 Lamboglia 2 wine amphorae, 6 Koan wine amphorae, 3 Dressel 26 Tripolitanian oil amphorae, and 1 Neo-Punic (van der Werff 1) amphora of unknown contents.<sup>139</sup> The assemblage is thus quite diverse. The initial problem with interpretation is the fact that the wreck is missing a significant portion of its original cargo, but the amphorae are still quite informative. Petrological analysis of the Dressel 1B indicates that those noted at Wreck D originated in Albinia near Cosa, while a number of the cooking vessels believed to be part of the crew's kit seem to be from Cosa or Viterbo, leading to the proposition that the ship originated in Cosa.<sup>140</sup> The investigators suggested that this is perhaps an example of tramping,<sup>141</sup> but the notion is illogical. Skerki D contained cargo from NW Italy, the E Italy, Greece and N Africa. Further, based on the wreck's location, its destination is proposed as N Africa. This is also unlikely: a journey with such a relatively small cargo over such great distances makes little sense economically. A more likely explanation is that the entire cargo was loaded at Cosa, a proposal strengthened by the fact that many of the crew's items, such as their cooking pots, seem to have originated near that town.

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136 Bondesan *et al.* (supra n.130) 70.

137 A. M. McCann *et al.*, *Deep-water shipwrecks off Skerki Bank: the 1997 survey* (JRA Suppl. 58, 2004) 41.

138 *Ibid.* 53.

139 *Ibid.* 53-54.

140 *Ibid.* 54-55.

141 *Ibid.* 65.

Cabrera III is a mid-3rd c. wreck that, like Skerki D, was discovered at a site with multiple ancient wrecks. Excavated over two seasons (1985-86), this is one of 6 wrecks discovered around the Balearic island of Cabrera, south of Mallorca.<sup>142</sup> The wreck was not fully excavated, but the majority of the site has been examined. The cargo consisted primarily of a large group of coins and amphorae. In 1985, 950 *sestertii*, originally contained inside an amphora, were recovered. In 1986, a further 15 *sestertii* and 2 *antoniniani* were discovered.<sup>143</sup> Of the total of 967 coins, 803 could be securely identified, ranging in date from A.D. 82 (*sestertius* of Domitian) to A.D. 257 (*sestertius* of Valerian dated to 256/257), giving the wreck a *terminus post quem* of 257.<sup>144</sup> Substantial coin finds such as this are rare on ships; Parker's catalogue has only 3 other wrecks which contained a large enough number to be sufficient for use during trade, and they all date to the 4th c. A.D.<sup>145</sup> The excavators of Cabrera III assert that the group of coins was not a hoard but representative of the normal circulation of small bronzes in the mid-3rd c. and evidence of Spain's prosperity.<sup>146</sup> The primary cargo aboard was olive oil and fish products transported in amphorae, of which 9 types were discovered: Dressel 20 and 23, Almagro 50 and 51, Africana Grande, Beltrán 68 and 72, and 2 unidentified types. If we count only complete examples and necks, 131 amphorae were retrieved.<sup>147</sup> Amphorae from *Baetica* are the best represented with 50 in total (34 Dressel 20 for oil, 16 Dressel 23 for oil). From *Lusitania* came 42 amphorae, including 19 Almagro 50 (thought to have contained fish sauce), 7 Beltrán 72 (thought to have contained *garum* or *liquamen*) and 16 Almagro 51c (possibly holding *garum*). Also present were 32 Africana II Grande types B, C and D from *Proconsularis* (modern Tunisia);<sup>148</sup> with the exception of two that contained whole olives, the Africana II were pitched and contained fish products. The Beltrán 68 (of which three were recovered) and the two unidentified types (a total of 7 recovered) were probably not part of the main cargo but belonged to the crew. Cabrera III thus contained a highly heterogeneous cargo from three provinces (*Baetica*, *Lusitania*, *Africa Proconsularis*). The majority consisted of olive oil from *Baetica*; the second largest part appears to be fish products from *Byzacena*. While only 30 Africana II amphorae for fish products were recovered, as compared to the 42 amphorae containing three kinds of fish products from *Lusitania*, the capacity of the Africana types is greater than that of the Lusitanian types.<sup>149</sup> Within even these 30 amphorae there is considerable diversity as several different cities are represented here by stamps (*Leptiminius*, *Sullecthum*, possibly *Thaenae*) and type (Africana IIC are thus far known only from *Neapolis* [Nabeul]). Based on the arrangement of the amphorae, the excavators concluded that the ship was loaded in its entirety at a single location.<sup>150</sup> Based on the amphora types and

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142 J.-P. Bost *et al.*, *L'épave Cabrera III* (Paris 1992) 11.

143 *Ibid.* 37.

144 *Ibid.* 35-98.??

145 The three wrecks are the Grand Bassin D (c.A.D. 313) which contained 4000 coins, the Scôle A (A.D. 365-380) which contained c.500 coins, and the Vignale (A.D. 307-310) which contained over 1000 coins: Parker (*supra* n.11) 30).

146 Bost *et al.* (*supra* n.142) 115-16.

147 *Ibid.* 117-18.

148 *Ibid.* 143. The contents of Africana IIA seem to have been *salsamenta* and possibly wine, IIB is still unknown, II C *salsamenta*, and II D *salsamenta* and possibly wine: Bonifay (*supra* n.108) 23.

149 The average capacity of Africana IIC is 55-60 litres, of II D 45-50 litres, whereas the average capacity of Almagro 51C is 25-30 litres: cf. Roman Amphorae: a digital resource, <http://ads.ahds.ac.uk/catalogue/resources.html?amphora2005> (viewed July 20, 2012).

150 Bost *et al.* (*supra* n.142) 200-1.



the wreck's location, they proposed that the ship was originally loaded at *Gades* (Cádiz) and was on its way to Italy, probably to Ostia.<sup>151</sup> It also seems quite probable that it could have been loaded at an emporium in the Balearics. A single loading is the only plausible way to explain such a diverse cargo, particularly as it represents no less than 4 different Tunisian cities amongst only 32 amphorae. Ostia could have been the intended final destination, although one could also imagine that the ship was intended for any of the other ports along the central Italian coast (e.g., Terracina, Anzio, Civitavecchia). The excavators compiled a list of 20 wrecks with cargoes they deemed similar to that of Cabrera III; some of these contained only one of the types of amphorae found on board Cabrera III, yet 6 contained a combination of N African and Spanish amphorae, which suggests that this kind of combination was relatively common.<sup>152</sup>

Although there are more data for the W Mediterranean, it is worth comparing a wreck from the E Mediterranean. The small 2nd-c. A.D. merchantman recently excavated at Fig Tree Bay, SE Cyprus, is a good example of a multi-provincial cargo that, as J. Leidwanger argues, represents a direct shipment from either Cilicia or Syria.<sup>153</sup> While the wreck is not particularly well preserved, sufficient information has been obtained adequately to assess the cargo assemblage, which consisted of at least 133 amphorae of 4 types, including 86 Agora M54, probably manufactured in coastal Cilicia Pedias. These amphorae are typically associated with wine, although these particular amphorae were not pitched, which may call their contents into question.<sup>154</sup> There were also 38 Gauloise 4 and Dressel 30, which are morphologically similar but from quite different regions; Gauloise 4 was produced in S France while the Dressel 30, seemingly an imitation of the other, was produced in a variety of places around the Mediterranean. The fabric of the examples on the wreck indicates that they were probably produced in Cilicia.<sup>155</sup> Owing to the physical similarities of the two types, it was impossible to distinguish between them without raising many of them. It is thus not possible to provide an exact count of Gauloise 4s *versus* Dressel 30s. There were also 9 amphorae of the Ras al Bassit type, a very large amphora with a capacity of c.100 litres. This type is uncommon and poorly understood. Possibly it was produced at Ras al Bassit (NW Syria); the contents are also unverified, but wine has been suggested.<sup>156</sup> Even though they number less than a quarter of the 38 Gauloise 4/Dressel 30s, the total volume of their contents is rather similar (1140 litres for the Gauloise 4/Dressel 30s *versus* 915.3<sup>157</sup>), which suggests that they were an important component of the cargo. Leidwanger suggests that the ship might have been loaded at a port in E Cilicia or NW Syria, as the bulk of the cargo space was occupied by the Agora M54 type.<sup>158</sup> The Syrian and Gallic amphorae would have arrived in that port on previous journeys and were now being re-exported. This small wreck thus exhibits a pattern similar to Commachio, Skerki D and Cabrera III.

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151 Ibid. 201-2.

152 Wrecks with both Spanish and N African amphorae include: Cabrera I (3rd c. A.D.), Cap Blanc (late 3rd to early 4th c.), Gisement des Catalans (mid-3rd to 4th c.), Planier VII (mid-3rd to 4th c.), Pampelonne (first half of 4th c.), Punta Ala (second half of 3rd c.), Femmina Morta (late 3rd to early 4th c.) (ibid., 203).

153 J. Leidwanger, "Between local and long-distance: a Roman shipwreck at Fig Tree Bay off SE Cyprus," *JRA* 26 (2013) 191.

154 Ibid. 194, with a brief discussion of the potential contents.

155 Ibid. 196-97.

156 Ibid. 198.

157 Ibid., Table 2.

158 Ibid. 202.

The combination of 'original' and 'imitation' amphorae seen here with the Gauloise 4 and Dressel 30 is paralleled in Cap Béar C which contained, amongst other cargo, a mixture of Dressel 1Bs from both Italy and *Tarraconensis*.<sup>159</sup>

## Conclusions

I have sought to answer questions about the organization of Roman maritime trade in the W Mediterranean using the evidence of shipwreck cargoes; the wrecks, of various sizes and cargo arrangements, were selected because they are fairly typical of Roman wrecks in the W Mediterranean, even those with highly heterogeneous cargoes not being unusual. Shipwreck cargoes provide evidence for studying the ways in which products were transported, and in turn on how commodities were bought and sold. Several recurring patterns bear consideration for their wider applicability to the organization of trade. In many wrecks, one product forms the majority of the cargo: e.g., the wine from San Anastasia (Latium) on the Madrague de Giens. In such cases it can be suggested that the production zone of the majority of the cargo represents the location where the ship was loaded; clearly there were exceptions, but this gives us a general guideline. In other instances, the ship's initial starting point is less clear. Possibly cargo was assembled at an emporium without an easy connection to the production site: e.g., Cabrera III, on which the cargo is split between N African, Baetican, and Lusitanian amphorae.

Transport by sea is one of several processes in the movement of a product from the point of production to that of consumption. Only rarely does a product's initial movement involve a major journey by sea; the initial stage typically involves short distances, either overland or by river or sea, or a combination thereof. For products destined for maritime export, this is simply an intermediary stage necessary to bring the products to a port where they can be assembled for the main export journey. On some occasions this first step would not have been necessary. Stone, and particularly marble, seems often to have been exported directly from purpose-built harbours near coastal quarries or within a convenient distance of inland quarries, but even products produced near the coast would often have been moved to a city's harbour for export. In most of the cases discussed above, cargoes were loaded at an emporium in a single process. While it did not have to be a large emporium, cargoes were probably assembled in warehouses before being shipped long distances. This is particularly so in the case of amphora-borne commodities. Emporia acted as both regional and inter-regional collection points. Thus products might be traded between emporia at any of a number of stages in their export; goods might be on their initial stage of export or on a secondary stage or beyond; and a single cargo might include a mix of products at various stages of export.

Three basic scenarios seem to be common. The most straightforward is that whereby a single commodity from a localized production zone is assembled at a harbour and loaded on a single ship. Cap del Volt is an example. A second scenario involves a cargo of largely local material supplemented by products (not necessarily local) gathered at the emporium market. Good examples are the Madrague de Giens with its primary load of amphorae from Latium and smaller cargo of Campanian fineware, or Chiessi with its main cargo of

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159 D. Colls, "Les amphores léétaniennes de l'épave cap béar III," *RÉA* 88 (1986) 201-15; R. Étienne and F. Mayet, "Trois clés de l'économie de l'Hispanie romaine," in iid. (ed.), *Le vin hispanique* (Paris 2000) 124-25.

Beltrán 2B and additional Dressel 20s and Haltern 70s. A third scenario involves highly heterogeneous cargoes, largely made up of commodities being re-exported between emporia and which show little or no relationship between the production zone and the port of export. Cabrera III and Punta Scifo A are potential examples.

What, then, should we conclude about tramping (“cabotage”) and the nature of distribution? The evidence does not support P. F. Bang’s statement that

Those markets [he is referring to all cities under 10,000 people, therefore the majority in the Mediterranean] were normally served by a system often referred to as cabotage: small merchant ships would more or less casually tramp along the coast from harbor to harbor in search of a good bargain.<sup>160</sup>

Heterogeneous cargoes are often explained by tramping, yet none of the ships discussed above can be labeled as a coastal tramper; most heterogeneous cargoes can be shown to have been loaded at emporia. This is not to say that tramping never occurred: tramping surely played a rôle on a local level, especially between the smallest harbours.<sup>161</sup> But tramping was not the mode of exchange responsible for the majority of traded commodities, such as the vast quantities of ceramics that moved across the sea.<sup>162</sup> Even the smallest wrecks discussed above, such as the 13 tonne Plemmirio B or the c.5.5 ton Fig Tree Bay wreck, were loaded *en masse*.<sup>163</sup> On the other hand, the small-scale, local movement of goods does not need to be viewed as haphazard: it was undoubtedly often aimed at local markets and fairs, and part of a regular system of sale.<sup>164</sup> This was not a primitive or unsophisticated mode of exchange, but a smaller-scale system of supply, of the type which still serves cities today and which is compatible with a market economy.

Shipwreck cargoes can help answer N. Morley’s question concerning the nature of distribution in the Roman period. The volume and nature of Roman trade and exchange are strikingly different from “Brownian” cabotage.<sup>165</sup> The multiplicity of cargo types and the distinctions between those cargoes that consist of one commodity from one region, multiple commodities from one region, single commodities from multiple regions or multiple commodities from multiple regions, point to a complex network of distribution routes.

It seems that the decision of what cargo to carry was in the hands of the *navicularius*. By the point of shipment, cargoes were no longer the property of the producers but of traders who frequently specialized in a particular aspect of the process. The epigraphic record of *negotiatores* supports this specialization, since 78% of Latin inscriptions of *negotiatores* (242 out of 311) indicate specialization in terms of type of trade, location, or a combination of the two (fig. 4).<sup>166</sup>

160 Bang (supra n.4) 141.

161 Cf. Arnaud (supra n.3); Wilson 2011 (supra n.3).

162 C. Rice, “Ceramic assemblages and ports,” in Robinson and Wilson (supra n.3) 81-92; M. Fulford, “Economic interdependence among urban communities of the Roman Mediterranean,” *WorldArch* 19 (1987) 58-75; id., “To East and West: the Mediterranean trade of Cyrenaica and Tripolitania in antiquity,” *LibSt* 20 (1989) 169-91.

163 See Boetto (supra n.8) for a more detailed discussion of the lack of correlation between the size of a ship and the distance covered across open waters.

164 Cf. L. de Ligt, *Fairs and markets in the Roman Empire* (Amsterdam 1993).

165 Horden and Purcell (supra n.1) 137-43. The term Brownian is drawn from the phenomenon of Brownian motion, the random movement of particles suspended in fluid, named for botanist Robert Brown who observed the phenomenon in 1827.

166 For a more thorough discussion of specialization amongst *negotiatores*, see C. Rice, “Mercantile specialization and trading communities,” in A. Wilson and M. Flohr (edd.), *Urban craftsmen and*

*Negotiatores* Inscriptions

n = 311

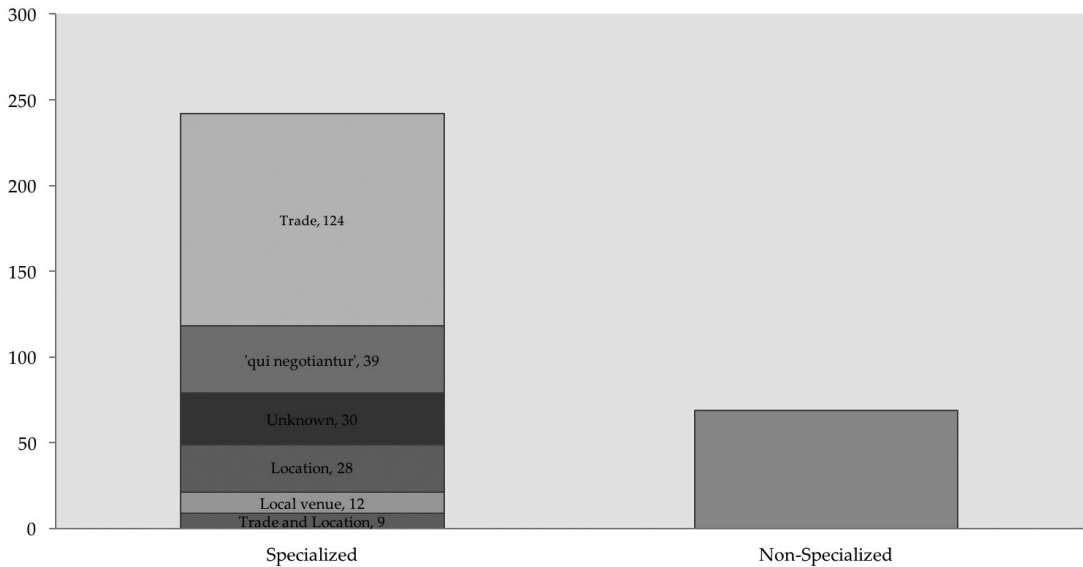


Fig. 4. *Negotiatores* inscriptions, according to particular speciality.

Consumer sites were not necessarily trading directly with the production sites. While in most cases the first stage of maritime export would have taken place from a harbour in relatively close proximity to the production site, cargoes were often re-exported. With amphora-borne cargoes, it seems to be the case that most products were directly exported to areas within a fixed range (e.g., from Spain to Italy), then re-exported further afield as part of more heterogeneous cargoes — though there are, of course, exceptions.<sup>167</sup> Even in cases involving longer sailing distances, the repetition of routes would have increased efficiency through sailing a familiar route and the establishment of regular trading contacts. This calls to mind the funerary inscription from Hierapolis, which records that the merchant Flavius Zeuxis sailed around Cape Malea to Italy 72 times;<sup>168</sup> it corresponds well with the specialization seen in the epigraphy for *negotiatores*.

The process by which goods are imported and then transhipped for further maritime transport is normally referred to as redistribution (see the works by Nieto and Boetto on trading patterns),<sup>169</sup> but this is the wrong term for the majority of commodities. Technically speaking, redistribution is a form of centrally-controlled reciprocal exchange, but most of what we are seeing in the Roman period is market exchange, except in the case of a limited number of products over which the State had control (e.g., *annona* products).

We need to change the way we think about return cargoes, for return cargoes are closely related to trade between emporia. The only arguable difference is in the focus on export

*traders in the Roman world* (Oxford 2016) 97-114.

<sup>167</sup> There are, for example, on Turkey's Aegean coast two wrecks (Yalıkavak I and Yalıkavak II) which appear to be composed of only Adriatic Lamboglia 2 amphorae: M. L. Brennan *et al.*, "Evaluation of the modern submarine landscape off southwestern Turkey through the documentation of ancient shipwreck sites." *Continental Shelf Research* 43 (2012) 55-70.

<sup>168</sup> IGR IV 841.

<sup>169</sup> Nieto (*supra* n.2); Boetto (*supra* n.8).

*versus* import: we often talk about cargoes in terms of the export of commodities, but the intent of a return cargo is simply to import products that are needed at the home port. Economically speaking, return cargoes are important because both ends of a journey were potentially profitable. Given the choice between sailing with ballast or sailing with a cargo, one would surely take on a cargo. Return cargoes are said to be responsible for the widespread distribution of many low-value products,<sup>170</sup> such as bricks, tiles and even iron ore (cf. Leptiminius), but there is no inherent link between return cargoes and low-value products, and we should avoid a strict association.

Facilitated by both infrastructural and social networks, Roman maritime trade involved advanced commercial processes operating within a market economy. Trade was a composite process in which production, transport and marketing processes were intrinsically linked. Multifarious trading patterns have been elucidated in the above, and with each the level of organization and development necessary to succeed in commerce is apparent. Specialization is apparent at all stages of the process, as producers sell their goods to merchants who in turn sell them on for maritime exchange. Cargoes and destinations were planned. Through series of well-choreographed transactions, the demand for imported products was met.

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<sup>170</sup> Cf. Tchernia (supra n.17) 124 and 344-45.