Lusitanian Amphorae: Production and Distribution

edited by

Inês Vaz Pinto, Rui Roberto de Almeida and Archer Martin

Roman and Late Antique Mediterranean Pottery 10
2016

The International Congress in Tróia, Portugal (10-13 October 2013), from which this collective volume results, had the following organization and sponsors:

Organization

Centro de Estudos em Arqueologia Artes e Ciências do Património

TROIA RESORT

TROIA RUÍNAS

FCT Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA EDUCAÇÃO E CIÊNCIA PORTUGAL

Sponsors

TURISMO DE PORTUGAL

alentejo

infratróia

Associação Mutualista Montepio

TAP PORTUGAL
with arms wide open
A STAR ALLIANCE MEMBER

GRÂNDOLA
MUNICÍPIO

Lusitanian Amphorae: Production and Distribution

edited by

Inês Vaz Pinto,* Rui Roberto de Almeida and Archer Martin*****

* CEAACP – Centro de Estudos em Arqueologia, Artes e Ciências do Património / TROIA RESORT

** UNIARQ – Centro de Arqueologia da Universidade de Lisboa. Faculdade de Letras. Universidade de Lisboa. / FCT Doctoral Grant

*** American Academy in Rome / Universität zu Köln

Published on the occasion of the
30th Congress of the Rei Cretariae Romanae Fautores
(Lisbon, 2016)

R·C·R·F·

Roman and Late Antique Mediterranean Pottery 10

Archaeopress Publishing Ltd
Gordon House
276 Banbury Road
Oxford OX2 7ED

www.archaeopress.com

ISBN 978 1 78491 427 1
ISBN 978 1 78491 428 8 (e-Pdf)

Printed in England by Short Run Press, Exeter
This book is available direct from Archaeopress or from our website www.archaeopress.com

Contents

Lusitanian Amphorae on Western Mediterranean Shipwrecks: Fragments of Economic History

Sónia Bombico*

*CIDEHUS – Universidade de Évora - FCT (Fundação para a Ciência e a Tecnologia)
sonia_bombico@hotmail.com

Shipwrecks constitute a primary source for the study of the ancient economy. In this paper, we will highlight some of those whose cargo contained amphorae of Lusitanian production. These are of the utmost importance for understanding the navigation routes and the Lusitanian fish products export routes in the western Mediterranean.

KEYWORDS: SHIPWRECK; LUSITANIAN AMPHORAE; SALTED FISH; MARITIME ROUTES; UNDERWATER CULTURAL HERITAGE

Introduction

The data included in this paper are part of a wider research project that is currently underway within the scope of the author's doctoral thesis[1]. The aforementioned research project aims to study the export of foodstuffs from Lusitania – especially fish products – to the western Mediterranean basin, with a special focus on shipwrecks and navigation routes. The data presented here represent only a small sample of the data available for analysis, which correspond to more than 40 shipwreck sites. Based on the published data (Edmonson 1987; Lopes and Mayet 1990; Parker 1992a; Étienne and Mayet 1993-94; Fabião 1996; Fabião 1997), we have tried to update the inventory of shipwreck sites containing Lusitanian amphorae. In the late 1990s, Carlos Fabião (1997) presented an updated inventory with a total of 33 shipwreck sites that contained 'Lusitanian-type' amphorae, more sites than the previous inventory of 17 shipwrecks (Lopes and Mayet 1990; Étienne and Mayet 1993-94). More recently, Andrew Philip Souter (2012: 156), based solely on the above-mentioned published data, re-proposed a distribution of Mediterranean shipwrecks that contained Lusitanian amphorae. However, in the last 17 years, new underwater archaeological investigations have allowed new shipwreck sites to be added to the inventory (Bombico *et al.* 2014; Bombico 2015).

For this paper, only a small number of sites was selected that seem to correspond to different models of commerce and transport that fall largely within the east-west routes departing from the Iberian Peninsula towards Rome. The global analysis of the available data suggests a much more complex set of routes that include the central and eastern Mediterranean (Edmonson 1987; Parker 1992a; Étienne and Mayet 1993-94; Fabião 1996; Fabião 1997; Reynolds 2010: 42-44; Souter 2012: 161), but we will not address that here.

The shipwreck as a source for the study of economy

As an event that occurs at a single point in time, the shipwreck presents a very narrow chronological spectrum. Contemporaneity is one of the main characteristics of the goods transported by a ship and found in a shipwrecked cargo (Blot 1998: 118). This means that the materials associated with the loss of the ship, namely her commercial cargo, correspond to a relatively short period of time that takes place between the loading of the ship and the loss of the ship.

According to Robert Étienne '*success, for the economic history of ancient times, can only come from the sea'* (Étienne *apud* Mayet 1998: 87). And the shipwreck is of particular importance, as it is an exceptional archaeological context. *'Each underwater shipwreck site that has been excavated and published provides a snapshot of the trade of its time, as we may deduce that all objects being transported were contemporary; if not produced in the same year, they were at least sold at the same time. Each excavation may not clarify ancient economy in the same manner, but every single one of them makes that study move forward more quickly than a land excavation.'* (Mayet 1998: 83).

Amphorae play an important role in the study of maritime trade, as they are containers specifically designed for maritime transport (Carreras Monfort 2000: 32). The term *amphora* is used to calculate the tonnage of Roman ships (Tchernia 2011: 202). The importance of the amphorae found in the marine environment relates to their context and state of preservation. When preserved as a whole, which happens in many cases, it is possible to define their shape, size and capacity. They often preserve stamps and

[1] Acknowledgements: we would like to thank all the directors and *employees* of the museums and research centres involved who facilitated the study of materials: Florenze Richez, Franca Cibecchini and Lila Reboul (DRASSM – France); Hervé Alfonsi (FFESSM – Comité Départemental Corse du Sud); Paul Nebbia (Musée de préhistoire et d'archéologie Corse de Sartène); Gabriella Gasperetti (Soprintendenza per i Beni Archeologici di Sassari e Nuoro); Ignazio Sanna and Donatella Salvi (Soprintendenza per i Beni Archeologici per le province di Cagliari e Oristano – Settore Archeologia Subacquea). We would also like to thank our colleague Alejandro Quevedo Sánchez (Centre Camille Jullian – Aix-Marseille Université – LabexMed) for the Dressel 14 photographs from San Antonio Abad (Museo Arqueológico de Ibiza) and to Rui Almeida (Uniarq-Universidade de Lisboa) and Marcus Heinrich Hermanns (Instituto Arqueológico Alemán de Madrid) with whom we work in the study of the shipwreck of San Antonio Abad/Grum de Sal.

tituli picti that provide relevant information regarding origins, contents and trading processes. As remains of cargoes of wrecked ships, they permit chronologies to be established. On the other hand, they allow one to infer navigation and maritime traffic routes that can be defined not only by the shipwreck location but also, and mainly, by the combination of archaeological materials of different origins in the same load. That is to say that, in some cases, the presence of different goods on board a wrecked ship provides insight into the route of her final voyage or the use of entrepôts (Parker 1992b: 89).

Shipwrecks constitute a primary source for the study of the circulation of goods; however, they have limits. Shipwrecks have been described as closed deposits, and yet there may be elements of disturbance or contamination, especially in port contexts or ship graveyards, like some sites in the Strait of Bonifacio. In some cases, mistaken topography and insufficient information about the material found or the site itself cause serious problems for the archaeological interpretation (Parker 1981: 332).

The shipwrecks traditionally associated with the presence of 'Lusitanian-type' amphorae are, overall, ill-characterised underwater sites. These are, for the most part, sites where occasional surface sampling (with poor location records and lacking scientific rigour) took place, sites where a systematic archaeological intervention has never been carried out, and with results being only partly published. The big challenge here is to clarify those data, which, ideally, would entail the re-examination of all the amphorae that have been identified in all the shipwreck contexts. Such a challenge, however, will not be totally met within the scope of the aforesaid doctorate, mainly for reasons to do with the time available to perform the investigation and the wide geographical dispersion of the finds and collections. On the other hand, much of the material that was recovered during the 1960s, 1970s and 1980s cannot be located. Thus, and since it is not possible for us to access all the existing collections of very many storerooms and museums spread throughout the western Mediterranean, we base a large part of our investigation on the re-examination of the published data, and we also cover the data that were published for the main maritime cities of the Mediterranean.

But perhaps the biggest problem, in analysing those data as far as trade from Lusitania is concerned is the recognition of Lusitanian fabrics. Their identification has proved problematic, mainly because of developments in the archaeological research of Hispanic workshops. Today, it is known that 'Lusitanian-type' amphorae (amongst which are the forms of widespread distribution Dressel 14 and the Almagro 50 and 51 series) were also produced everywhere in southern Hispania (Bernal Casasola 1998; Bernal Casasola and García Vargas 2008; Fabião 2008). In order to do that, it is necessary to reassess the ceramic assemblages that were published in particular up until the 1990s and the inventories held in museums in the light of the new data. On the other hand, it remains difficult to identify Lusitanian products amongst the vast set of published data, as it is very common to find generic classifications of origin, such as 'South Hispanic' or simply 'from the Iberian Peninsula'. More than simply a consequence of the difficulty in identifying Lusitanian productions (mainly in the fabrics domain), those generic classifications fit into a broader study of imports, in which the designation of the macro-region of origin seems to be sufficient. The 'unknown' is also a limiting factor – reflected on the high percentage of amphorae of unclassified form and provenance – that is common to most archaeological contexts.

The data available for the study of the distribution of Lusitanian products are, for the most part, confined to the study of fish products amphorae. This fact leads one to consider fish as the main foodstuff produced and exported by the province – whether as salted-fish (*salsamenta*) or fish sauces (*garum, hallex, liquamen, muria*, etc.) – relegating possible wine export to a secondary position. The maritime economy of Lusitania seems, thus, more difficult to understand than that of Baetica or Byzacena, for example. It seems to be based almost exclusively on the export of fish products – whose epigraphic habit cannot be compared to that of olive-oil and wine transport and whose production in Lusitania is not mentioned by the classical authors, despite numerous archaeological remains indicating a significant volume of production (Fabião and Guerra 1993: 999; Étienne and Mayet 1993-94: 218). The above-mentioned limitations have contributed, for a long time, to the minimisation and overlooking of the Lusitanian export trade within the scope of the Iberian Peninsula's trade.

One should also take into account that fish products were a secondary cargo in most cases, which could be part of a subsidiary and free-trade system, whose volumes do not come close to those for wheat, olive oil, wine, metals or marble, promoted by the state and bound for the two great markets of the Roman world: Rome and the military camps (Tchernia 2011). To study the distribution of a minor product in the bulk of the trade exchanges appears difficult, therefore. The data from underwater archaeology have emphasised the presumed complementary role of the distribution of Lusitanian products with respect to other regions, namely Baetica (Mantas 1990: 170 and 191; Lopes and Mayet 1990: 299-300 *apud* Fabião 1996: 334).

We also deal with the limitations relating to the knowledge of quantification of production and its evolution throughout the time, which were partially addressed by Andrew Wilson (2006).

Nevertheless, the identification of Lusitanian amphorae in wrecked cargoes and archaeological contexts in ports contributes, undoubtedly, to deepening knowledge of the routes of circulation of those products, even though the comparison between archaeological contexts of different places and times has turned out to be rather complicated, especially when working with published data that present

different forms of quantification of ceramic materials (Reynolds 2010: 137).

On the other hand, the combination of the study of artefact distributions and wreck locations is complex. Parker (2008) has analysed its limitations.

For all the aforementioned reasons, shipwrecks are essential to the study of the ancient economy. The set of shipwrecks with amphorae of Lusitanian production on board is quite heterogeneous. There are cases in which Lusitanian amphorae constitute the main cargo and cases in which they are a secondary or supplementary cargo. There are also some examples in which their small

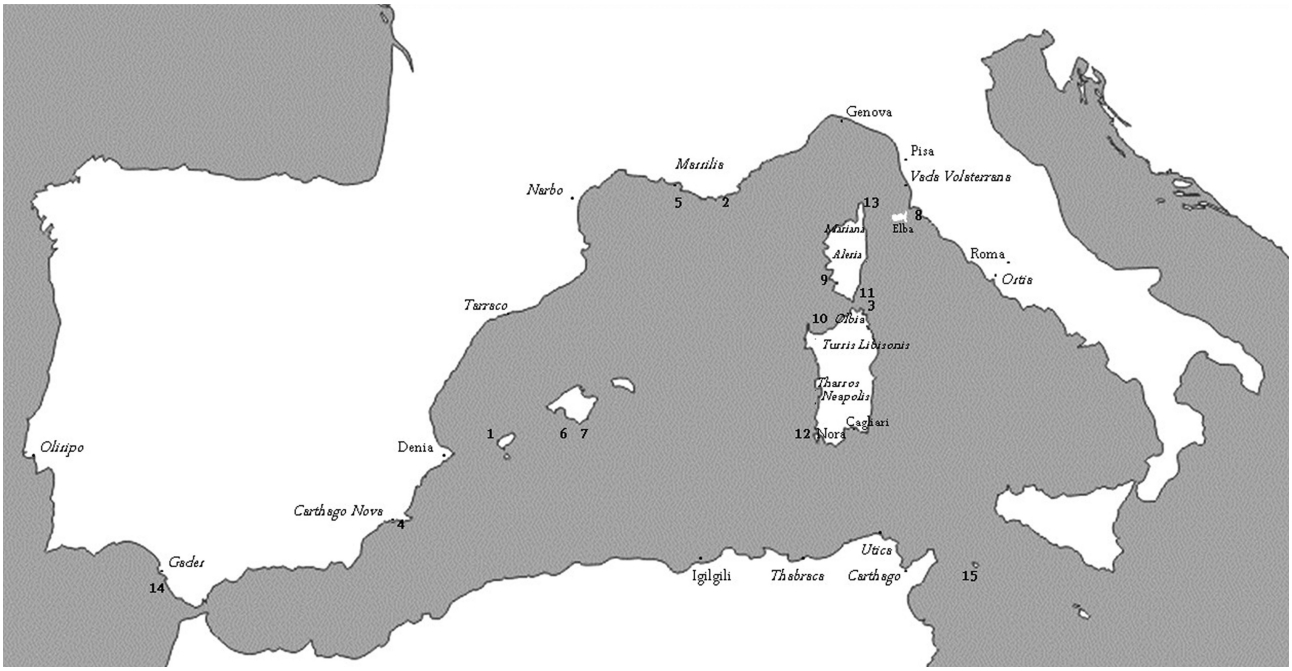

Figure 1. Shipwrecks containing Lusitanian amphorae discussed in the text:
1st-2nd century: 1-San Antonio Abad; 2-Cap Bénat 1; 3-Punta Sardegna A; 4-Escombreras 4; 5-Tiboulen-de-Maïre
3rd century: 6-Cabrera I; 7-Cabrera III; 8-Punta Ala A; 9-Porticcio A
4th-5th century: 10-Cala Reale A; 11-Sud-Lavezzi 1; 12-Fontanamare A/Gonnesa Sito A; 13-Punta Vecchia 1;
14-Sancti Petri; 15-Scauri.

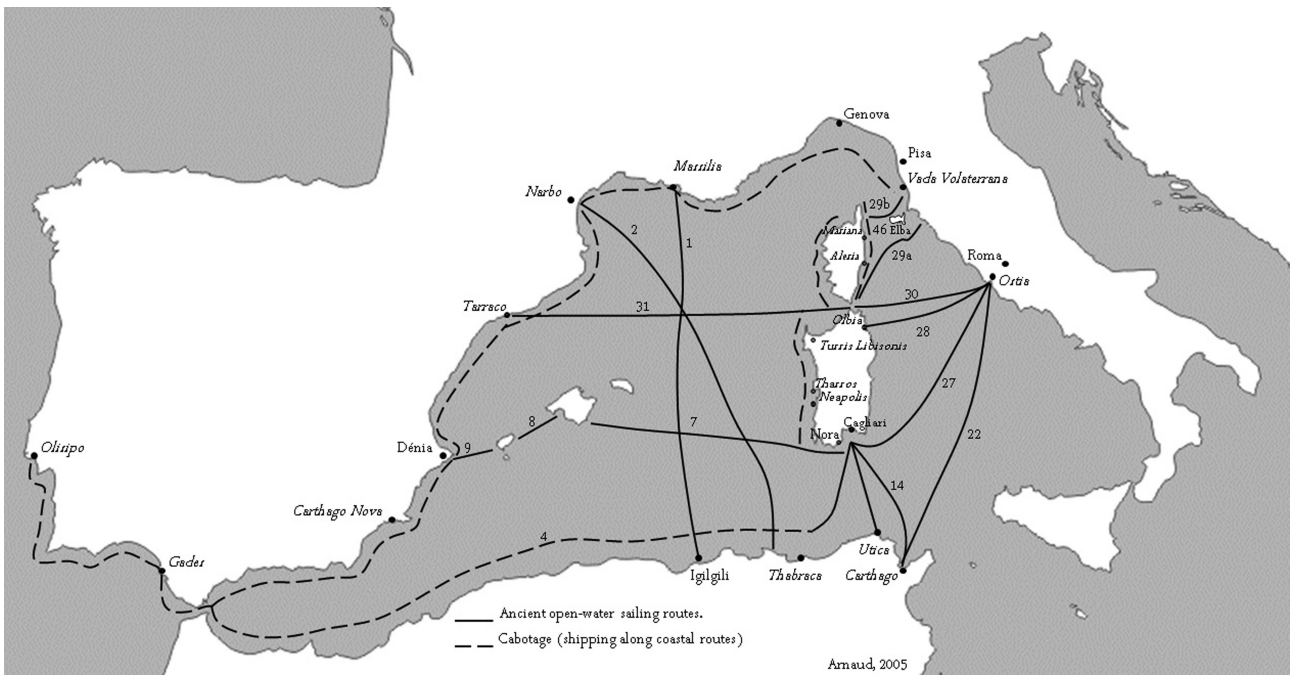

Figure 2. Ancient sailing routes mentioned in the text.

quantity seems to indicate that they are part of the objects of the crew. However, in any case, their presence allows one to establish chronologies and understand routes (direct, redistribution, long-distance, cabotage, etc.). And in some cases, the remains of the hull may allow the size and capacity of the vessel to be established.

Building models of transportation and commerce

The heterogeneity of the shipwrecks referred to in the last paragraph allowed a few models of circulation and transportation to be conjectured. We have sought to build a comprehensive image of the diversity of existing cases in long duration, i.e., from the middle of the 1st century AD to the end of the 5th century AD. Similar to the recent work of Giulia Boetto (2012: 156), we have selected a heterogeneous sample of wrecks and applied hypothetical models of 'commercial routes' to them (Figures 1 and 2).

The distribution of Lusitanian fish products must have occurred according to a model corresponding to a homogenous shipment loaded at the same time in a major port – located near the area of production of the cargo – and then sent by a direct route to another major port. However, to date, there are no underwater archaeological remains in departure or arrival port contexts that corroborate this model. This model is, nevertheless, likely to have been used for transport between, for example, the port of Olisipo and Gades or Olisipo and Carthago Nova and less likely to have been used in longer-distance routes, such as the ones between Olisipo and Rome, although the shipwreck of Cala Reale A, in northern Sardinia, with a predominantly Lusitanian cargo, may suggest such model. Yet, it is very likely that a significant part of the Lusitanian fish products may have been exported via *negotiatores* based in the port of Gades (Mantas 1998: 208 and 213; Lopes and Mayet 1990: 300; Étienne and Mayet 1993-94: 216).

Therefore, we believe that shipwrecks with predominantly Lusitanian cargoes are more likely to correspond to a model that is somewhat different from the one previously described, originating from a South Hispanic port, such as Gades or Carthago Nova – i.e., a homogenous shipment that is loaded at the same time in a major port – far away from the area of production of the majority of the goods – and sent by a direct route to another major port. The wrecks of San Antonio Abad (Ibiza), Cap Bénat 1 (Var, France) or Punta Sardinia A (Strait of Bonifacio), which are datable from the end of the 1st century to early 2nd century AD, fit into this type of route coming from the south of the Iberian Peninsula and heading to one of the large ports of the south of Gaul or to the ports of Rome.

The shipwreck site of San Antonio Abad, located in the southeast cove of Isla Conejera (Ibiza), has been known since 1960. In the summers of 1962 and 1963, archaeological seasons were carried out. Amphorae were observed within a 20m radius, at a depth of between 20 and 23m (Vilar-Sancho and Mañá 1964: 178). Several amphorae belonging to the same type and containing a

Figure 3. Dressel 14 amphorae from the San Antonio Abad shipwreck (Vilar Sancho and Mañá 1965, Lamina XLVII).

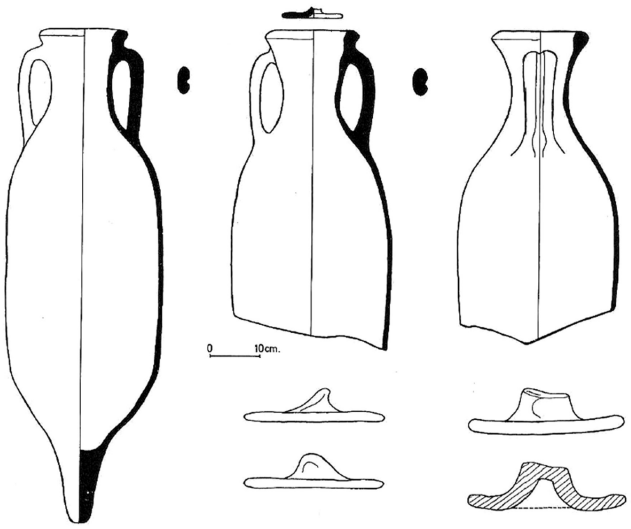

Figure 4. Dressel 14 amphorae and *operculA* from the Cap Bénat 1 shipwreck (Calmes 1973: 143).

fish-based product were retrieved from different sectors. It is hard to calculate the size of the ship's cargo. The survey performed in the 1960s was very small, and the site must have been heavily looted. Nonetheless, the authors believe that around 70 to 100 amphorae must have remained *in situ*, buried beneath the sand, with the remains corresponding to a vessel of no less than 25m in length (Vilar-Sancho and Mañá 1964: 187) (Figure 3). In the 80s and 90s, new archaeological investigations were carried on at the site. The amphorae that were retrieved during those seasons are in the storeroom of the Museo Arqueológico de Ibiza y Formentera,[2] and present Lusitanian fabrics (Hermanns, Bombico and Almeida forthcoming).

The shipwreck site known as Cap Bénat 1 is located northeast of Cap Bénat, a small rocky promontory on the coast of Var located in front of the Îles d'Hyères. Known since 1965, the site – located at a depth of 37 meters – was

[2] The referred pieces are currently under study by Marcus Heinrich Hermanns (Instituto Arqueológico Alemán de Madrid) and Rui Almeida (Uniarq-Universidade de Lisboa).

first investigated in 1971. Countless scattered amphora fragments were spotted on the seafloor, which indicates a highly looted site. With the exception of two fragments, all the materials observed and retrieved belonged to the same amphora type. Three *opercula* were also retrieved (Calmes 1973: 137-140). The formal description and the drawings allow the amphorae to be identified as Dressel 14 (Figure 4), and the description of the fabric indicates probable Lusitanian production (Calmes 1973: 142). The majority of the retrieved pieces are in the Dépôt de Saint-Raphael (Fréjus); however, we were able to examine a rim fragment and a spike of Dressel 14 in Lusitanian fabric in the Dépôt Archéologique Régional d'Aix les Milles.

The site of Punta Sardinia A is located in the Maddalena Archipelago, in the southern part of the Strait of Bonifacio, at a depth of between 6 and 8m. This place, already known from the bibliography (Parker 1992a: 359; Zucca 2003: 177), has recently been investigated by the Università di Sassari under Professor Pier Giorgio Spanu. Alessandro Porqueddu describes the site and the remains in his specialization thesis. This is a context with ceramic material scattered on the seafloor over an area of 50m by 27m. Six rims and necks and three spikes of Lusitanian Dressel 14 amphorae, a spike of a Dressel 7-11, a handle of a Dressel 20 from Baetica, a spike of an Italian Dressel 2-4 and two *opercula* were recovered from the site. Based on the work carried out on the site, we can assume that the shipwreck was a vessel carrying mostly Lusitanian amphorae for fish products, dating between the end of the 1st century and the first decades of the 2nd century AD. Its most likely destination was Rome (Porqueddu 2013: 86-90, 114-115; Porqueddu, Giarrusso and Spanu, in this volume).

In the previous cases, Lusitanian Dressel 14 amphorae seem to have constituted a homogeneous main cargo. However, until the mid 2nd century AD, archaeological records also present numerous cases in which Lusitanian Dressel 14 amphorae were a secondary cargo, a residual cargo, or simply crew objects. We will analyse two examples: Escombreras 4 and Tiboulen-de-Maïre.

The site of Escombreras 4 is located off the coast of Carthago Nova. It is presumed to be the shipwreck of a merchant ship coming from Baetica with a main cargo of Haltern 70, Dressel 8 and 9, and some Beltrán IIB and Lusitanian Dressel 14, from the second half of the 1st century AD (Pinedo Reyes and Alonso Campoy 2004: 131-133). Between 1997 and 2001, surveys and emergency excavations were carried out in the framework of the extension of the port of Escombreras. During those operations, Lusitanian Dressel 14 amphorae were recovered on the underwater site of Escombreras 4 (Pinedo Reyes and Alonso Campoy 2004: 148, fig. 159). A specimen of these amphorae, which we were able to observe, is deposited in the ARQUA-Museo Nacional de Arqueología Subacuática (Cartagena) (ESC-I/17.17/2/10354).

The site of Tiboulen-de-Maïre is located near a small island, 10km to the south of Marseille. Discovered in 1976 by Serge Ximénès, at a depth of approximately 57m, the site underwent two underwater archaeological campaigns carried out by the Département des recherches archéologiques subaquatiques et sous-marines (DRASSM) in 1977 and 1978. Since 1999, survey and excavations have been undertaken yearly at the site. It is a presumed shipwreck with a main cargo of Baetican Dressel 20 olive-oil amphorae (70%), and a heterogeneous secondary cargo including: Beltrán IIA and IIB fish-sauce amphorae (14%), Dressel 14 (2%); Gauloise 4 wine containers (4%), Dressel 28 (3%) and Dressel 2-4 from Tarraconensis (3%), two Forlimpopoli amphorae; a North African amphora, a Dressel 7-11 discovered in 2006, and nine indeterminate fragments (Djaoui 2011: 625). The archaeological investigations of the last decade have allowed the remains of the hull to be studied and a fragment of Late Italian Terra Sigillata and some glass fragments on board to be identified (Ximénès and Moerman 2006).

A double wooden stamp with the consular year establishes the t*erminus post quem* for the shipwreck as AD 116 (Djaoui 2011: 625). The cargo materials establish a chronology between AD 130 and AD 150 (Ximénès and Moerman 2006: 50). More recent campaigns, undertaken mostly after 2005, have confirmed that more than 80% of the transported goods were from Baetica, particularly olive oil. One can assume that the home port was located in that region, with the hypothetical use of a redistribution port, such as Narbonne or Marseille (Ximénès 2007: 10; Djaoui 2011: 629). At the Dépôt archéologique régional d'Aix les Milles, there is the top part of a Dressel 14 in Lusitanian fabric, retrieved from this shipwreck. However, this piece is highly deteriorated (Figure 5).

The three following cases outline the maritime exports of Lusitanian fish products throughout the 3rd century AD. These were diversified shipments that were loaded at the same time at a main redistributing port and were likely headed for another main port. Lusitanian amphorae shared

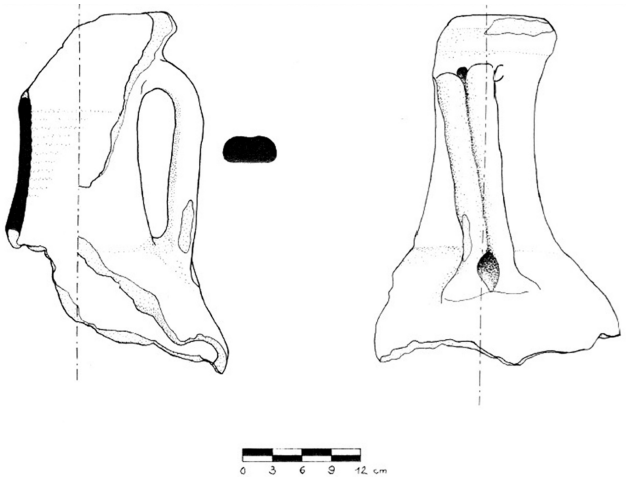

Figure 5. Dressel 14 amphora from the Tiboulen-de-Maïre shipwreck. (Photo DRASSM 1977)

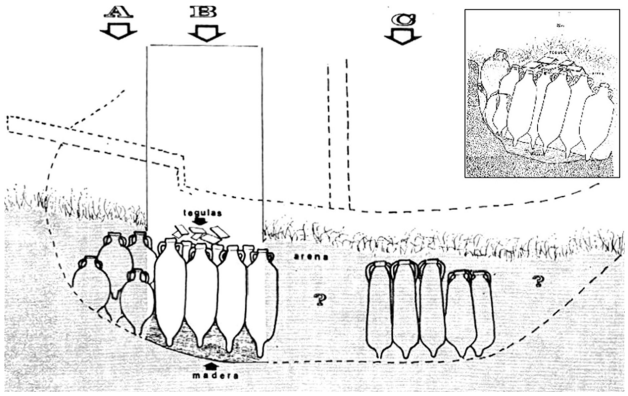

Figure 6. Archaeological investigations on the Cabrera I shipwreck (Guerrero Ayuso and Colls 1982: figs. 5 and 6).

cargo space on board the ships with Baetican and North African containers. This presents a peculiar scenario, since there are no shipwrecks at this time in which Lusitanian amphorae were the main cargo. This may be connected with the period of transformation registered in the archaeological levels of the fish-processing factories and amphora kilns in Lusitania (Fabião 2009).

The shipwrecks of Cabrera I, Cabrera III (Balearic Islands) and Punta Ala A present very similar loads, belonging to a west-east route, with their likely origin in one of the ports of the southern Iberian Peninsula (Gades, most likely) and their destination in the ports of the Italian Peninsula and/or Rome. The re-examination of the ceramic materials – at least of those that are likely to be in Lusitanian fabrics – found at these shipwrecks would play an important role in shedding light on a number of issues regarding the classification and origin of these pieces. These issues have arisen as a result of a better understanding of the production of amphorae. However, as of the date of the writing of this paper, access to those materials has not been possible.

The shipwreck of Cabrera I was surveyed between 1978 and 1979 by Dali Colls. It is located at about 60m from Cabrera III. According to records from the time of the survey, it was possible to identify several amphorae of types Almagro 50 and 51C, Béltran 72, and Africana IIB and IID (Figure 6). This cargo is identical to the one of Cabrera III, and dates the shipwreck to AD 300-325 (Guerrero Ayuso and Colls 1982; Bost *et al.* 1992: 13; Parker 1992a: 80).

The data published in the 1980s seem to clearly indicate the existence of two different shipwrecks, since two hulls are preserved (Guerrero Ayuso and Colls 1982: 11, fig. 4; Mayet 1992: 17; Parker 1992a: 80). However, some doubts still remain. The GAS (Grup d'Arqueologia Subaquàtica de Mallorca) believes that the site of Cabrera I may never have existed as a shipwreck site. This is based on oral reports that the divers who took part in the surveys in the 1970s moved artefacts found on the site of Cabrera III, so that they could plunder those artefacts at a later date, and without the knowledge of the archaeologists (Colom Mendoza 2013: 90). These questions may soon be answered, as a team from the SIAS (Societat d'Investigadors d'Arqueologia Subaquàtica), has been performing survey missions and undertaking relocalization efforts for the shipwrecks of Cabrera (Projecte Cabrera 2013).

The site of Cabrera III, located at an approximate depth of 22m, was also surveyed by Dali Colls in 1979 and then was excavated in 1985 and 1986. The shipwreck was dated to AD 257, based on the hoard of coins aboard the ship. According to naval architecture data, this was a ship of about 35m in length. The cargo was stacked in two layers and was composed of Baetican Dressel 20 and Tejarillo I olive-oil amphorae, Africana IIB and IIC, Almagro 50 and 51C from Lusitania and a small number of Beltrán 68 and Beltrán 72 (Figure 7). The cargo also included African Red Slip Ware A and C (Guerrero Ayuso and Colls 1982; Bost *et al*. 1992; Parker 1992a: 81). A Lusitanian origin for the Almagro 50, 51C and Beltrán 72 was quite likely. However, the presence of the ANGE stamp (Annius Genialis) on some of the Almagro 50 and Beltrán 72 has raised doubts regarding the Baetican origin of these amphorae (Fabião 1997: 62-67; Fabião and Guerra 2004: 226), and it is most probable that both are Baetican types, and that the first one is Keay 16 and not Almagro 50 (=Keay 22). Therefore, here we have the problem of differentiating between the Almagro 50 and Keay 16 amphora types whose production is confirmed as having existed in both provinces (Bernal Casasola and García Vargas 2008; Almeida and Raposo 2014a; Almeida and Raposo 2014b). On the other hand, we were able to confirm that the two Almagro 51c exposed in the Cabrera Museum were of Lusitanian origin.

The archaeological investigations carried out led to the conclusion, on the basis of the disposition of the containers, that all had been brought on board at the same time. So, considering the apparent Iberian provenience of much of the cargo and the location of the wreck in the Balearic Islands, it seems that the ship was en route from the Iberian Peninsula to Italy, with Gades as its most probable port of departure and Ostia/Portus as its likely destination (Bost *et al.* 1992: 200-202).

The site of Punta Ala A is located north of Rome, off the Tuscan coast. The shipwreck was excavated between 1973 and 1974; however, the materials retrieved remained unpublished until 2006. The cargo establishes a date for the shipwreck in the mid 3rd century AD. This date is corroborated by some coins found on board, two of which can be dated to AD 241 and AD 244 (Dell'Amico and Pallarés 2006: 150). The archaeological investigations revealed remains of the hull structure and some crew objects. The authors have identified the Lusitanian amphorae types Almagro 51A-B and Almagro 51C (Figure 8); Beltrán 72, Dressel 20 and 23 from Baetica; and the North African types Africana II and Keay 25. On board were also some *dolia*, flat-bottomed containers and African Red Slip Ware C.

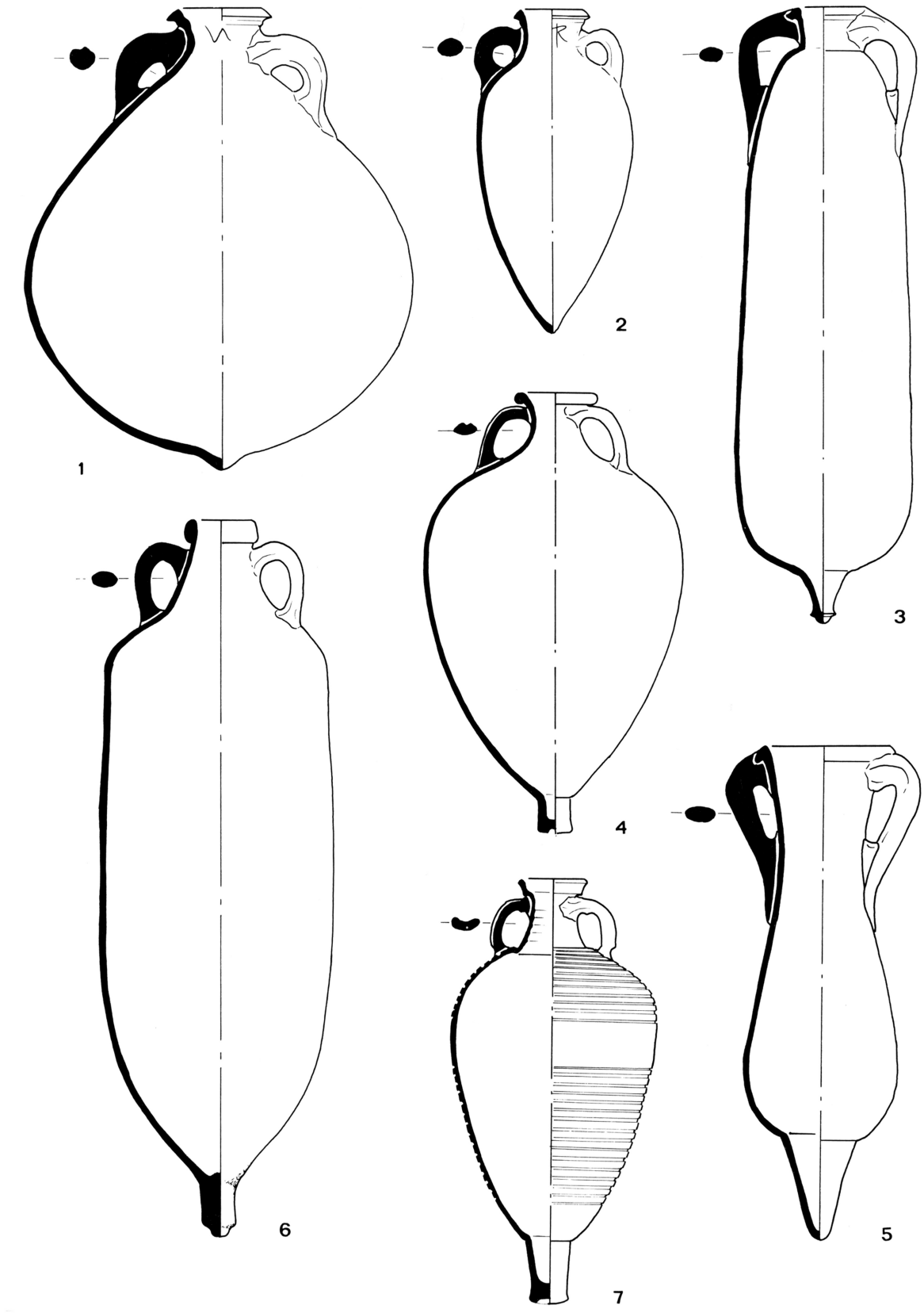

Figure 7. Amphorae from the Cabrera III shipwreck: a-Dressel 20; b-Tejarillo I; Keay 16; d-Almagro 51C; e-Beltrán 72; f-Beltrán 68; g-Africana IIC (Bost *et al.* 1992: fig. 16).

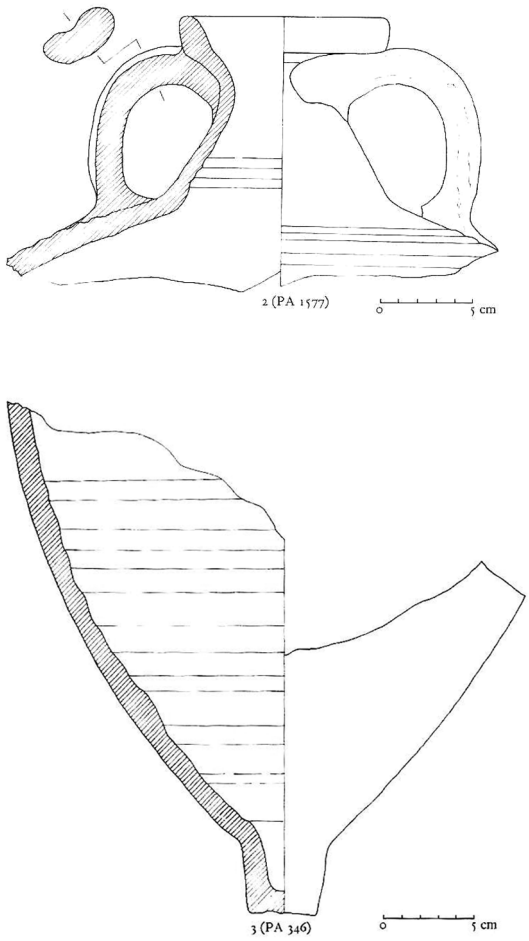

Figure 8. Almagro 51C amphorae from the Punta Ala A shipwreck (Dell'Amico and Pallarés 2006, figs. 5 and 13).

The published drawings and descriptions allow us to elaborate on the classification of the amphorae by the authors, with greater accuracy regarding those associated with Lusitanian fabrics. We believe, based solely on the formal characteristics available in the graphic records, that form Almagro 51A-B is not present. Likewise, there are some pieces classified as Lusitanian Almagro 51C that we believe to be formally closer to the Baetican Beltrán 68 type (Dell'Amico and Pallarés 2006: 57, fig. 11). We also cannot rule out the possible existence of Almagro 51C of non-Lusitanian – Baetican and/or South Hispanic – production and maybe some Dressel 30 from North Africa. However, in order to carry out a definite analysis, it is necessary to re-examine the ceramic materials.

The 3rd century reveals yet another interesting shipwreck context: the site of Porticcio A, located off the west coast of Corsica. This shipwreck contains a very heterogeneous cargo, likely loaded at the same time at a main redistributing port and transported along a redistribution route to a secondary port. The location of the shipwreck and the characteristics of its cargo suggest that this was a cargo that had been ordered. The site was discovered in 1990, at an approximate depth of 5m, and has been subjected

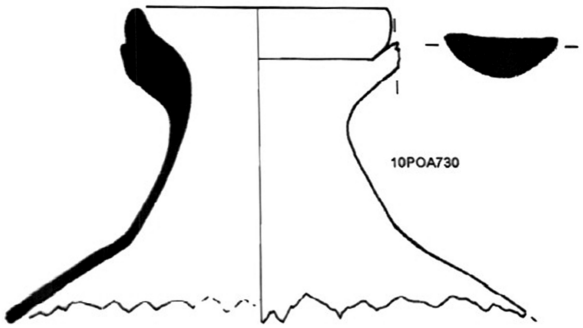

Figure 9. Almagro 51C amphora from the Porticcio A shipwreck (Alfonsi, Rapport 2010- DRASSM).

to archaeological investigation since 2001. The quite heterogeneous cargo includes amphorae form the eastern and western Mediterranean, African Red Slip Ware C, coarse ware and African cooking ware, some *mortaria*, one lamp, more than 100 glass objects and several fragments of marble statues (Alfonsi 2008a; Alfonsi 2010; Bombico *et al.* 2014).

The shipment of amphorae is mostly Kapitän II, with a smaller amount of Africana II and Kapitän I. The great variety of types of amphora also includes a smaller presence of the following types: Africana I, Forlimpopoli, Agora M 254, Almagro 51C, Almagro 50, Dressel 20, Dressel 23, Agora F65/66, Crétoise 2, Dressel 30, Dressel 28, Beltrán 72, Amphore Égyptienne, Empoli, Tripolitana, Peacock & Williams 60 and Zemer 57, besides other unclassified types. Twenty-two types of amphora were recorded among a total of 111 individuals, retrieved between 2001 and 2010. The types with a smaller presence have a total of three fragments each (Alfonsi 2005; Alfonsi 2010).

The re-examination of the materials of the storeroom of Sartène confirmed the presence of three rims and of a spike of Almagro 51C in Lusitanian fabric (Figure 9); one rim and one bottom of Keay 16 of Baetican production; along with two other spikes whose origin is difficult to determine but can likely be classified as belonging to South Hispanic products. Amongst the marble pieces, fragments belonging to two monumental statues stand out: a bust representing Emperor Philip the Arab, who reigned between AD 244 and AD 249, and another one likely belonging to his wife, Empress Marcia Otacilia Severa (Alfonsi 2007: 93; Alfonsi 2008a; Alfonsi 2008b). Remains of the hull of the ship were also identified (Alfonsi 2003: 79; Alfonsi 2006: 94). The two coins that were discovered, one from Philip I and another from Philip II, provide a *terminus post quem* of AD 248-9 for the shipwreck (Alfonsi 2006: 91). In this specific case, the Lusitanian amphorae are residual in a very heterogeneous cargo. Considering the description of the cargo, the most likely origin of this vessel was the port of Carthage. Michel Bonifay compares this shipwreck to the one of Ognina Sud 1, dating to the first half of the 3rd century, in which a shipment of eastern Kapitän I and II amphorae completes a shipment of mostly Africana I.

According to the author, these two shipwrecks suggest that the joint commercialisation of African and eastern types could be done from the North African ports (Bonifay 2007: 257).

During Late Antiquity, the number of shipwrecks containing Lusitanian amphorae is much larger. This supports the archaeological data from Lusitania, which reveal a considerable increase in the production of fish products throughout the 4th century and until the 5th century (Fabião 2009: 571). Between the end of the 3rd century and the beginning of the 5th, a quite varied set of shipwrecks sustains the evidence of distinct cargo types and of different circulation scenarios, likely contemporaneous. Generally however, the main commercial routes that led from southern Baetica to Ostia and Portus via coastal Tarraconensis and southern Narbonensis were maintained, as well as the variants that used a process of island hopping (Balearic Islands, Corsica and Sardinia) on routes that led towards Italy via the Strait of Bonifacio (Bombico *et al.* 2014).

We will analyse three distinct types of cargo.

Firstly, the Cala Reale A shipwreck (Strait of Bonifacio), in which the Lusitanian amphorae were apparently a homogeneous main cargo. After its discovery in 1995, the site underwent a preliminary campaign headed by Pier Giorgio Spanu. From what was published, we are able to confirm the existence of amphorae belonging to types Almagro 51A-B, Almagro 51C, Beltrán 72 and Sado 3 (Spanu 1997: 111-112). Some of the amphorae still contained their original cork stoppers and also some traces of fish-based products (Spanu 1997: 112).

The archaeological investigations allowed the recovery, in addition to the amphorae, of two North African lamps, of African cooking ware, of a pitcher, of a considerable number of vitreous paste *tessellae*, and of two coins, one dated to the year 173 and one to the reign of the emperor Valens (AD 364-367). The materials that were retrieved allows a date for the shipwreck to be established between the second half of the 4th century and the beginning of the 5th century (Spanu 1997: 113).

Other campaigns took place between 1999 and 2010, with most of the materials being relocated to a new place, approximately 200m away. These campaigns confirmed the previously identified four types of amphorae (Figure 10), and the total quantification revealed a cargo of around 2000 amphorae. From roughly 40m^3 of scattered materials, the following were identified: 38,000 body fragments, 625 rims of Almagro 51A-B, 956 rims of Sado 3, 156 rims of Beltrán 72 and 64 rims of Almagro 51C (Gasperetti 2012: 301-303). No remains of the vessel were identified during the whole excavation process (Gasperetti 2012: 301).

This vessel was likely bound for the port of Ostia and sank while approaching Turris Libisonis, possibly due to stormy weather or to touching bottom in rocky shoals (Gasperetti

Figure 10. Amphorae from the Cala Reale A shipwreck. From left to right: Almagro 51A-B, Sado 3, Beltrán 72 and Almagro 51C (Gasperetti 2012: fig. 8).

2012: 303). We were able to confirm during our visit to the Antiquarium Turritano and to the Centro di Restauro e Conservazione dei Beni Culturali di Sassari that the totality of the above-mentioned forms was of Lusitanian origin.

Also located on the Strait of Bonifacio, the shipwreck Sud-Lavezzi 1, discovered in 1975, suggests a model in which Lusitanian amphorae were the main cargo, along with other Hispanic products – Baetican in this case. The archaeological investigations allowed a tumulus of compacted amphorae of 20m by 8m to be identified. A cargo of 16m in length was unearthed, with an east-west orientation and a maximum width of 5.70m, corresponding to a smallish vessel. Parts of the remains of the hull and some iron anchors were still preserved. The cargo, estimated at 450 amphorae, was arranged in two overlapping layers. B. Liou (1982: 437-444) studied this cargo, comprised of: 194 Almagro 51A-B amphorae of varied profiles and capacities; 113 flat-bottomed amphorae of different sizes; 83 amphorae with cylindrical bodies of types Almagro 50 [or Keay 78/Sado 1]; some small Beltrán 72 amphorae; six Almagro 51C and three Dressel 23 (Figure 11).

The context of the excavation, which was carried out under the concession regime and with the techniques available at that time for working at such depths, did not permit a systematic study of the site and of its materials. What we know of its cargo comes from the materials studied later by B. Liou. The splitting of the finds between the company Comex and the DRASSM resulted in a first loss of some of the assets, aggravated later by the theft of the materials stored in the DRASSM deposit in Bonifacio. B. Liou suggests a time frame for the shipwreck somewhere between the 4th century and the middle of the 5th century (Massy 2013: 132-134). A small number of pieces is stored today in the storerooms of Milles and Sartène, allowing 13 specimens to be re-examined. We were able to identify the following Lusitanian amphorae: three small individuals related to the Beltrán 72 type (Figure 11, nos. 9-11); three Almagro 51A-B (Figure 11, nos. 2-3); and

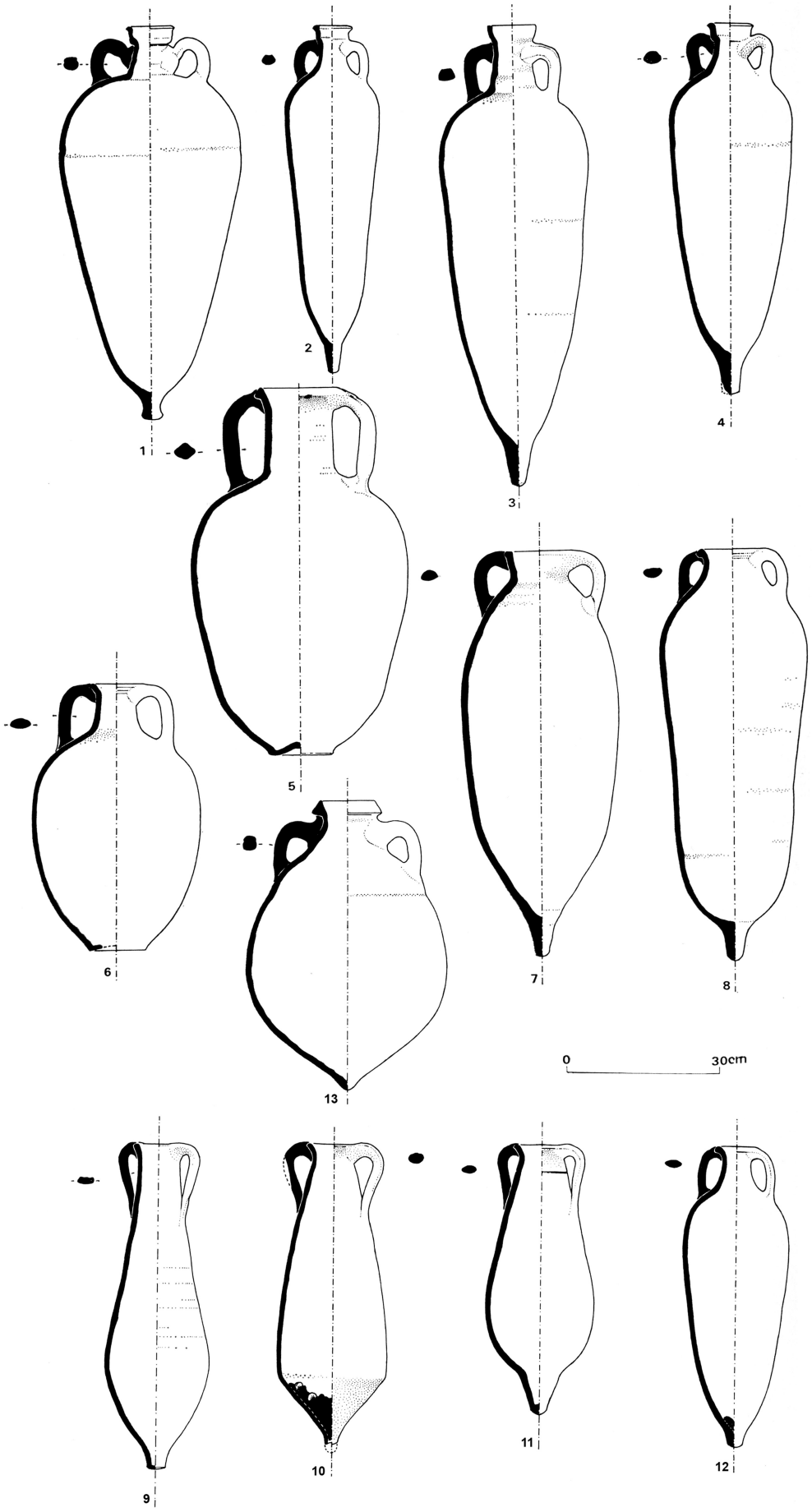

Figure 11. Amphorae from the Sud-Lavezzi 1 shipwreck. 1-4-Almagro 51A-B; 5 and 6-flat-bottomed amphorae; 7 and 8-Almagro 50/Keay 78; 9-11-Beltrán 72; 12-Almagro 51C; 13-Dressel 23 (Liou 1982).

two Almagro 50 or Keay 78/Sado 1 (Figure 11, nos. 7- 8). The re-examination of the materials allowed us to assign a probable South Hispanic origin to the specimen that corresponds to Figure 11, no. 1, assigning it to the Baetican Keay 19 type rather than the Lusitanian Almagro 51A-B type. The same origin could be assigned to a flat-bottomed amphora specimen in Figure 11, no. 6. Also present in the Sartène museum is a specimen of Dressel 23 from Baetica.

The third model corresponds to a main cargo of Lusitanian fish products with North African products, Africana IIB and IID and African Red Slip Ware C and D. Two examples will be highlighted.

The site of Fontanamare A/Gonnesa Sito A, located off the west coast of Sardinia, was discovered in 1965 and was subsequently (and continuously) looted. In 1972, the first excavation took place. However, the material that was retrieved remained unpublished until the late 1990s (Dell'Amico, Faccena and Pallarés 2001-2002). Three types of amphorae were documented on this site: Almagro 51C (the most abundant), Almagro 50 and/or Keay 78 and Africana IID (Dell'Amico, Faccena and Pallarés 2001-2002: 23). The 1972 campaign yielded a total of 16 amphorae tops (rim, neck and handles) and 19 spikes of Almagro 51C; three amphora tops and one spike of Africana II, variant D; and three rims with handles from types Keay 78/Sado1/ Lusitana 8, with the authors defining them as Almagro 50, suggesting a parallel with some types from the Martinhal workshop (Dell'Amico, Faccena and Pallarés 2001-2002: 39). This seems correct, if one takes into consideration the form identified at the kiln of Martinhal (Algarve, Portugal) and classified recently as Martinhal 2, variant B (Bernardes *et al*. 2013: 321 and fig. 6).

Between 1997 and 1999, survey work took place on the site of Fontanamare A (Salvi and Sanna 2000). Most of the containers recovered during this time are amphora fragments belonging to the Almagro 51C type (rims, necks and handles), with a total of ten fragments. There are also 11 spikes of the same type, whose fabrics point to a Lusitanian origin. In the assemblage that was recovered there were also two fragments that could belong to the Keay 78 type [3] (Figure 12), a fragment of a rim with handles and the upper part of a body of Almagro 51A-B, a fragment of Africana II, and a spike of a possible *spatheion*. At least one-third of the cargo appears to have been African Red Slip, in this case the more typical forms of African Red Slip Ware C (second half of the 3rd century) and the older forms of African Red Slip Ware D (beginning of the 4th century AD) (Dell'Amico, Faccena and Pallarés 2001-2002: 46 and 52).

This site also revealed other interesting archaeological remains, among which: two cork amphora stoppers; two lamp fragments and some coarse ware, probably belonging to the crew; *tubuli* and *tegulae*; metal pieces; and also some remains of the ship itself (Dell'Amico,

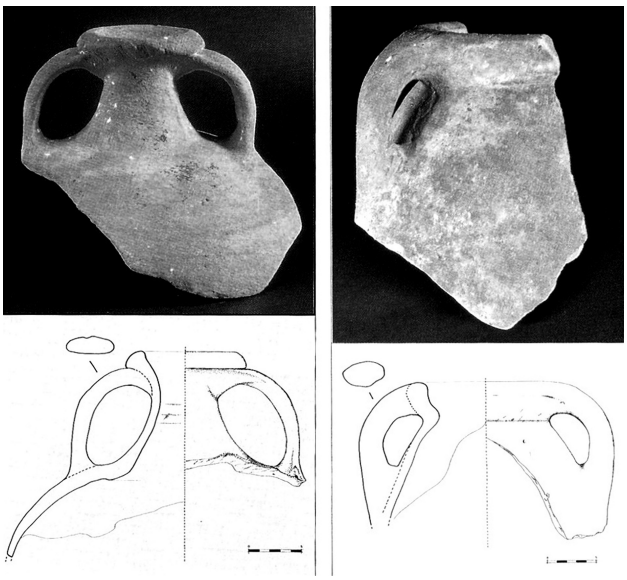

Figure 12. Amphorae from the Fontanamare A shipwreck: Almagro 51C and Keay 78.

Faccena and Pallarés 2001-2002: 45, 71 and 127). Finally, it is also worth mentioning the important monetary assemblage that was found, with a chronological range from AD 260 (Gallienus) to AD 294 (Maximianus), the coins establishing the *terminus post quem* of the shipwreck (Dell'Amico, Faccena and Pallarés 2001-2002: 83, 86-87). The joint analysis of the recovered materials indicates that the shipwreck occurred within the first few decades of the 4th century AD.

P. Dell'Amico, F. Faccena and F. Pallarés (2001-2002) suggest several hypotheses regarding where the ship that sank at Fontanamare was loaded. The first one presents the possibility that the loading took place in one of the redistribution ports on the southern coast of Spain, Carthago Nova or Gades, ports to which North African products converged via the so called 'Phoenician Route', a route that moved from east to west along the North African coast. This hypothetical scenario is similar to the one suggested for the shipwreck of Cabrera III (Bost *et al.* 1992: 200-201). Another hypothesis is that Carthage is the port of origin of the ship (Dell'Amico, Faccena and Pallarés 2001-2002: 144). In this case, the ship would have been moving in the opposite direction, meaning that Lusitanian products were being brought into the port of Carthage by routes established along the North African coast.

Numerous amphora fragments were recovered, in total 65 pieces, from the site of Punta Vecchia 1 (Cap Corse), between 2004 and 2007. Amphora tops (rims, necks and handles) and spikes of Almagro 51C of two sizes (67%) (Figure 13), one handle that could be of the Keay 78[4] form, possibly a spike of Almagro 51A-B, possibly a spike of

[3] Classified by the authors as Almagro 50.

[4] However, the authors of this publication classify it as a shape similar to Beltrán 72 or to Almagro 50.

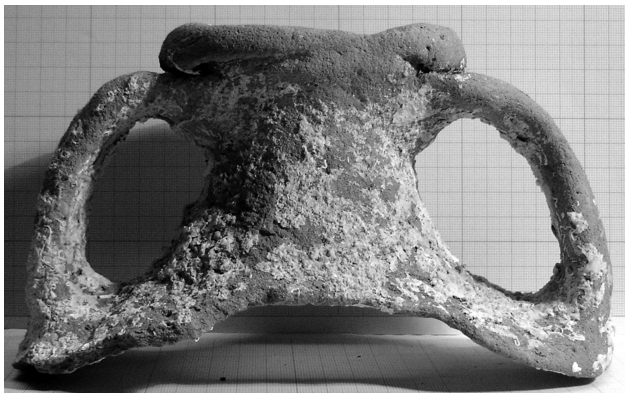

Figure 13. Almagro 51C from the Punta Vecchia 1 shipwreck (Photo Sónia Bombico).

Beltrán 72, and fragments of amphorae of Africana II, variants D and B (17%). The materials that were recovered point to the shipwreck having occurred between the late 3rd century and mid 4th century AD, with a predominately Lusitanian cargo. Small remains of wood were also identified during the investigations (Leroy de La Brière and Meysen 2004; Leroy de La Brière 2006: 87; Leroy de La Brière and Meysen 2007a: 88 and 89; Leroy de La Brière and Meysen 2007b and Massy 2013: 110-114). The re-examination of the materials performed in November of 2013 at the Depôt de Bastia (DRASSM) confirmed that the totality of the fragments of Almagro 51C were Lusitanian.

This shipwreck, along with Punta Ala A, confirms the circulation of Lusitanian amphorae on the circuits of the Tyrrhenian Sea and of the Ligurian Sea. Travelling along this route, ships would leave Rome, frequently with return cargoes or cargoes for redistribution, and would head north along the coast of Tuscany. Sailing through the Strait of Bonifacio from east to west was hindered significantly by the winds blowing from the west, so that travelling between Ostia and Gaul was done mostly via Cap Corse (Arnaud 2005: 165). Underwater archaeological data also document that there was sailing in the opposite direction, along the northern coast of Corsica and of Cap Corse. This suggests an alternative route for vessels coming not only from Gaul but also from the Iberian Peninsula to pass the Strait of Bonifacio (Arnaud 2012: 136-138). This might have been the case of the ship sunk at Punta Vecchia 1.

The continued export of Lusitanian fish products during the 5th century, already substantiated by the Cala Reale A shipwreck, is also reliably documented in two other contexts: Sancti Petri (Bay of Cádiz) and Scauri (Island of Pantelleria).

The underwater site of Sancti Petri, documented since 1992, presents material that can be dated between the second half of the 4th century and the first half of the 5th century. Among these are Almagro 50 and Almagro 51 amphorae, North African amphorae and African Red Slip, including a Hayes 67, which the authors date between AD 360 and 470. From the published figures Lusitanian Sado 3, Keay 19 and Keay 25, and possibly North African forms can be identified (Alonso Villalobos *et al.* 1994: 47, figs. 4 and 5). Sado 3 appears at the end of the 4th century or already in the 5th century and is documented in the workshop of Pinheiro (Mayet and Silva 1998: 286-287 and 299, fig. 132, nos. 14-16). The presence of these materials confirms that the port of Gades was functioning in full up until at least the first half of the 5th century AD (Bernal Casasola 2004: 47).

The identification of two Lusitanian Almagro 51C amphorae in the shipwreck of Scauri, off the Island of Pantelleria, poses some rather interesting questions. The shipwreck, from the first half of the 5th century, reveals a cargo made up almost entirely of Pantellerian Ware (77%). There are also small amounts of coarse ware and some African cooking ware, African Red Slip, lamps and amphorae from Africa Proconsularis and Byzacena, Tripolitania, the East (Crete, Asia Minor, Palestine) and the West, including two Lusitanian and two Baetican specimens (Keay 15 and 19) (Baldassari 2009a: 92 and Baldassari 2009b: 108). The residual presence of Lusitanian amphorae in a vessel thought to have sunk while leaving its port of origin but also containing such a heterogeneous shipment of amphorae, documents the circulation of Lusitanian fish products in the complex system of routes between the East and the West, with the maritime region between the south of Sicily and the port of Carthage likely to have played an important role.

In spite of the evidence revealed by these two sites regarding the continuity in the exportation of Lusitanian salted-fish preparations during the 5th century, underwater archaeology has not yet been able to provide direct proof of their circulation after the fall of the western Roman Empire.

The shipwreck sites used to illustrate the different scenarios for the circulation of Lusitanian amphorae allow some hypotheses regarding navigation routes to be developed. Thus, using as a reference the work by Pascal Arnaud – *Les routes de la navigation antique, Itinéraires en Méditerranée* – in our opinion a work that contains all the relevant information gathered in the last decades, especially for what concerns the analysis of the works of ancient geographers such as Strabo and Pliny, we will describe four major sailing routes departing from the Iberian Peninsula with courses set for the ports of Rome (Bombico *et al.* 2014):

a. A direct route from the Iberian Peninsula, having probably developed an open-water commercial sailing route from the coastal area of Tarraco direct to Rome, passing through the Strait of Bonifacio. Route 31 (Arnaud 2005: 155 and 165).
b. A cabotage route from the Iberian Peninsula, having probably developed a coasting navigation from the areas of Carthago Nova and/or Denia relying on the Balearic Islands and from there moving toward the western coast of Sardinia. This route fits navigation

courses 9, 8 and 7 (Arnaud 2005: 155 and 159). Having reached the Sardinian coast around the Gulf of Oristano between Neapolis and Tharros, the ships would then head north along the western coast of Sardinia until they reached the Strait of Bonifacio and from there sailed for Rome (Spanu 1997: 114 and 116, fig. 19).

c. Cabotage course along the Iberian Peninsula and Gaul, heading south along Cap Corse, located in the northeast of Corsica. This route may have functioned as an alternative to the Strait of Bonifacio for the ships coming not only from Gaul but also from the Iberian Peninsula (Arnaud 2012: 136-138).

Conclusion

The shipwreck sites selected and described in this paper depict the circulation of Lusitanian fish products along the main navigation routes in the western Mediterranean. As we pointed out, the transportation models are highly diversified, being perfectly adjusted to the major tendencies in trade and to the economic transformations that took place over the years within the Roman Empire. Between the early part of the 1st century and the mid 2nd century AD, Lusitanian amphorae circulated mostly alongside Hispanic foodstuffs from Baetica and Tarraconensis, namely olive-oil (Dressel 20), wine (Dressel 2-4, Haltern 70 and Dressel 28), fish products (Dressel 7-11, Beltrán IIA and IIB, Dressel 14 and Dressel 17), as well as ingots of lead or copper. From the mid 3rd century AD, it becomes quite frequent for Lusitanian amphorae to be found alongside North African products transported in Africana IIB, IIC and IID, used predominately for fish products (Bonifay 2004). This is further supported by their discovery on the Cabrera III shipwreck, where fish remains were still visible (Slim *et al.* 2007: 40). This reflects the economic changes that transformed the African provinces into the great suppliers of Rome's foodstuffs during Late Antiquity (Rice 2011: 85). Shipwrecks such as Cabrera III may be considered the logical outcome of the institutional supplying of the capital of the Empire, based mostly on olive-oil. The Lusitanian salted fish preparations were, therefore, an additional cargo, using vacant space aboard the ships and allowing thus for the establishment of a free trade. However, as was previously demonstrated, many alternative scenarios may have to be considered, especially regarding Late Antiquity.

However, shipwrecks are only some of the pieces of the complex puzzle that is the distribution of Lusitanian amphorae throughout the Mediterranean. Recreating this global scenario is a difficult task and will necessarily have to include the archaeological data from land contexts of the main maritime cities, coastal areas, ports and mooring places. That is a work in progress that has revealed the presence of Lusitanian amphorae in the majority of archaeological port contexts throughout the western Mediterranean (Fabião 1996: 336; Souter 2012; Bombico *et al.* 2014).

Bibliographical references

Alfonsi, H. 2003. Littoral de la Corse. In Travaux et recherches archéologiques de terrain. *Département des recherches archéologiques subaquatiques et sous-marines, Bilan Scientifique 2002*: 79. Marseille

Alfonsi, H. 2005. *Fouille archéologique sous-marine de l'épave de Porticcio*, Rapport 2005. Unpublished. Marseille, Département des recherches archéologiques subaquatiques et sous-marines.

Alfonsi, H. 2006. Littoral de la Corse. Travaux et recherches archéologiques de terrain. *Département des recherches archéologiques subaquatiques et sous-marines, Bilan Scientifique 2004*: 91-94. Marseille.

Alfonsi, H. 2007. Littoral de la Corse. Travaux et recherches archéologiques de terrain. *Département des recherches archéologiques subaquatiques et sous-marines, Bilan Scientifique 2005*: 91-93. Marseille.

Alfonsi, H. 2008a. L'épave de Porticcio. *Stantari – Histoire naturelle et culturelle de la Corse* 12 (Février-Avril): 70-72.

Alfonsi, H. 2008b. *Fouille Archéologique Sous-Marine de l'épave de Porticcio*, Rapport 2008. Unpublished. Marseille, Département des recherches archéologiques subaquatiques et sous-marines.

Alfonsi, H. 2010. *Fouille Archéologique Sous-Marine de l'épave de Porticcio*, Rapport 2010. Unpublished. Marseille, Département des recherches archéologiques subaquatiques et sous-marines.

Almeida, R. R. and Raposo, J. M. C. 2014a. Almagro 50 (Lusitania occidental). In *Amphorae ex Hispania. Paisajes de producción y de consumo.* Institut Català d'Arqueologia Clàssica (http://amphorae.icac.cat/tipol/view/14).

Almeida, R. R. and Raposo, J. M. C. 2014b. Keay XVI (Lusitania occidental). In *Amphorae ex Hispania. Paisajes de producción y de consumo.* Institut Català d'Arqueologia Clàssica (http://amphorae.icac.cat/tipol/view/81).

Alonso Villalobos, C., Gallardo Abárzuza, M., Garcia Rivera, C. and Marti Solano, J. 1994. Prospecciones Arqueológicas Subacuáticas en Sancti-Petri. *Anuario Arqueológico de Andalucía 1994*, *Actividades Sistemáticas*: 44-48. Sevilla, Junta de Andalucía.

Arnaud, P. 2005. *Les routes de la navigation Antique: itinéraires en Méditerranée*. Paris, Éditions Errance.

Arnaud, P. 2012. L'Homme, le temps et la mer: continuité et changement des routes maritimes de et vers *Portus*. In S. Keay (ed.), *Rome, Portus and the Mediterranean*. Archaeological Monographs of the British School at Rome 21: 127-146. London, The British School at Rome.

Baldassari, R. 2009a. Il materiale del carico del relitto: analisi tipologica e quantitativa della ceramica locale da fuoco. In R. La Rocca, S. Tusa and S. Zangara (eds), *Il relitto tardo-antico di Scauri a Pantelleria*: 91-106. Palermo, Regione siciliana - Assessorato dei beni culturali, ambientali e della pubblica istruzione.

Baldassari, R. 2009b. Le anfore da trasporto. In R. La Rocca, S. Tusa and S. Zangara (eds), *Il relitto tardo-antico di Scauri a Pantelleria*: 107-120. Palermo, Regione siciliana - Assessorato dei beni culturali, ambientali e della pubblica istruzione.

Bernal Casasola, D. (ed.) 1998. *Excavaciones arqueológicas en el alfar romano de la Venta del Carmén, Los Barrios (Cádiz): una aproximación a la producción de ánforas en la Bahía de Algeciras en época altoimperial*. Madrid, Universidad Autónoma de Madrid.

Bernal Casasola, D. 2004. Comercio, rutas y navegación en la Hispania meridional tardorromana (ss. III-VII d.C.). Una perspectiva desde la arqueología litoral. In L. De Maria y R. Turchetti (eds), *Rotte e porti del Mediterraneo dopo la caduta dell'Impero romano d'Occidente, Continuità e innovazioni tecnologiche e funzionali. IV Seminario ANSER (Genova, 18-19 giugno 2004)*: 33-64. Soveria Mannelli (Catanzaro), Rubbettino.

Bernal Casasola, D. and Garcia Vargas. E. 2008. Las ánforas de la Bética. In D. Bernal Casasola and A. Ribera i Lacomba (eds), *Cerámicas hispanorromanas. Un estado de la cuestión*: 661-688. Cádiz, Universidad de Cádiz.

Bernardes, J. P., Morais, R., Pinto, I. V. and Dias, R. 2013. A olaria baixo-imperial do Martinhal, Sagres (Portugal). In D. Bernal, L. C. Juan, M. Bustamante, J. J. Díaz and A. M. Sáez (eds), *Hornos, talleres y focos de producción alfarera en Hispania* (I Congreso Internacional de la SECAH (Cádiz, 3-4 March 2011)) I: *317-329.* Cádiz, Universidad de Cádiz and Ex Officina Hispana, Sociedad de Estudios de la Cerámica Antigua en Hispania (SECAH).

Blot, J. Y. 1998. Arqueologia em Meio Náutico: histórico. *Al-madan* II Série, 7: 102-104.

Boetto, G. 2012. Les épaves comme sources pour l'étude de la navigation et des routes commerciales: une approche méthodologique. In S. Keay (ed.), *Rome, Portus and the Mediterranean*. Archaeological Monographs of the British School at Rome 21: 171-173. London, The British School at Rome.

Bombico, S., Nervi, C., Piccardi, E. and Allegrini-Simonetti, F. 2014. A Caminho de Roma? A Sardenha e a Córsega nos fluxos de circulação das ânforas lusitanas no mediterrâneo ocidental. In Morais, R., Fernández, A. and Sousa, M. J. (eds), *As produções cerâmicas de imitação na Hispania*. Monografias Ex Officina Hispana II (Actas do II Congresso da Sociedade de Estudos da Cerâmica Antiga da Hispânia (SECAH) (Braga, 4-6 April 2013)) II: 361-377. Porto, Faculdade de Letras da Universidade do Porto (FLUP) and Sociedad de Estudios de Cerámica Antigua en Hispania (SECAH).

Bombico, S. 2015. Salted-fish industry in Roman Lusitania: Trade Memories between Oceanus and Mare Nostrum. In F. T. Barata and J. M. Rocha (eds), *Heritages and Memories from the Sea. Conference Proceedings of the 1st International Conference of the UNESCO Chair in Intangible Heritage and Traditional Know-How: Linking Heritage* (Évora, 14-16 January 2015): 19-39. (http://www.rcaap.pt/detail.jsp?id=oai:dspace.uevora.pt:10174/16211)

Bonifay, M. 2004. *Études sur la céramique romaine tardive d'Afrique.* British Archaeological Reports International Series 1301. Oxford, Archaeopress.

Bonifay, M. 2007. Cargaisons africaines: reflet des entrepôts? *Antiquités Africaines* 43: 253-260.

Bost, J. P., Campo, M., Colls y Puig, D., Guerrero Ayuso, V. and Mayet, F. 1992. *L'épave Cabrera III. Échanges commerciaux et circuits monétaires au milieu du IIIème siècle après Jésus-Christ*. Bordeaux, Centre Pierre Paris.

Calmes, R. 1973. L'épave I du Cap Benat. *Cahiers d'Archéologie Subaquatique* 2: 37-145.

Carreras Monfort, C. 2000. *Economia de la Britannia Romana: La Importación de Alimentos*. Col.lecció Instrumenta 8. Barcelona, Publicacions Universitat de Barcelona.

Colom Mendonza, E. 2013. La Isla de Mallorca (Baleares) como Hito Marítimo del Eje Comercial procedente de la Bética en Época Romana. In *@rqueología y Territorio* 10. Revista electrónica del Máster de Arqueologia de la Universidad de Granada: 87-100. Granada, Universidad de Granada.

Dell'Amico, P., Faccenna, F. and Pallarés, F. 2001-2002. Fontanamare (Cagliari). Il relitto 'A'. *Bollettino di numismatica* 36-39: 9-151.

Dell'Amico, P. and Pallarés, F. 2006. *Il relitto 'A' di Punta Ala (Castiglione della Pescaia, Grosseto)*. Roma, Edizioni dell'Ateneo.

Djaoui, D. 2011. Découverte d'un double sceau en bois à date consulaire (Épave de Tiboulen de Maïre, Marseille). Étude préliminaire. In *Les Actes du Congrès d'Arles*, 2-5 juin 2011: 625-632. Marseille, Société Française d'Étude de la Céramique Antique en Gaule (SFECAG).

Edmondson, J. C. 1987. *Two industries in Roman Lusitania: mining and garum production*. British Archaeological Reports International Series 362. Oxford.

Étienne, R. and Mayet, F. 1993-1994. La place de la Lusitanie dans le commerce méditerranéen. *Conimbriga* 32-33: 201-218.

Fabião, C. 1996. O comércio dos produtos da Lusitânia transportados em ânforas no Baixo Império. In G. Filipe and J. Raposo (eds), *Ocupação romana dos estuários do Tejo e do Sado*: *actas das primeiras jornadas sobre romanização dos estuários do Tejo e do Sado*: 329-342. Lisboa, Câmara Municipal do Seixal and Publicações D. Quixote.

Fabião, C. 1997. A Exploração dos Recursos Marinhos. In A. M. Alarcão (ed.), *Portugal Romano: a exploração dos recursos naturais*: 35-58. Lisboa, Museu Nacional de Arqueologia.

Fabião, C. 2008. Las ánforas de Lusitania. In D. Bernal Casasola and A. Ribera i Lacomba (eds), *Cerámicas hispanorromanas. Un estado de la cuestión*: 725-745. Cádiz, Universidad de Cádiz.

Fabião, C. 2009. Cetárias, ânforas e sal: a exploração de recursos marinhos na Lusitânia. *Estudos Arqueológicos de Oeiras* 17: 555-594.

Fabião, C. and Guerra, A. 1993. Sobre os conteúdos das ânforas da Lusitânia. *Actas do II Congresso Peninsular de História Antiga (Coimbra, 1990)*: 995-1016. Coimbra, Instituto de Arqueologia da Faculdade de Letras da Universidade de Coimbra / Instituto de Estudos Clássicos da Faculdade de Letras da Universidade de Coimbra.

Fabião, C. and Guerra, A. 2004. Epigrafia anfórica lusitana: uma perspectiva. In J. Remesal Rodríguez (dir.), *Epigrafia Anfórica*. Col.leció Instrumenta 17: 221-243. Barcelona, Universitat de Barcelona.

Gasperetti, G. 2012. L'attività del Servizio per l'Archeologia Subacquea della Soprintendenza per i beni archeologici per le province di Sassari e Nuoro. Un caso significativo. In *Erentzias, Rivista della Soprintendenza per i Beni Archeologici per le province di Sassari e Nuoro* I: 293-305. Sassari.

Guerrero Ayuso, V. M. and Colls y Puig, D. 1982. Exploraciones Arqueológicas Submarinas en La Bocana del Puerto de Cabrera (Baleares). *Bolletí de la Societat Arqueològica Lul.liana (BSAL)* 39: 2-22.

Hermanns, M., Bombico, S. and Almeida, R. forthcoming. Reevaluando en documento del comercio de época Alto Imperial. Estudio preliminar del cargamento del pecio de Grum de Sal (Isla Conejara/Eivissa/Ibiza). In Actas do III Congreso Internacional de la SECAH - Ex Officina Hispana *Amphorae ex Hispania. Paisajes de producción y de consumo* (Tarragona, 10-13 de December 2014).

Leroy De La Brière, G. 2006. Littoral de la Corse. Travaux et recherches archéologiques de terrain. *Département des recherches archéologiques subaquatiques et sous-marines, Bilan Scientifique 2004*: 87. Marseille, Département des recherches archéologiques subaquatiques et sous-marines.

Leroy De La Brière, G. and Meysen, A. 2004. *Carte Archéologique Sous-Marine du Cap Corse, Punta Vecchia 1. Rapport de 2004.* Unpublished. Marseille, Département des recherches archéologiques subaquatiques et sous-marines.

Leroy De La Brière, G. and Meysen, A. 2007a. Littoral de la Corse. Travaux et recherches archéologiques de terrain. *Département des recherches archéologiques subaquatiques et sous-marines, Bilan Scientifique 2005*: 88-89. Marseille, Département des recherches archéologiques subaquatiques et sous-marines.

Leroy De La Brière, G. and Meysen, A. 2007b. *Carte Archéologique Sous-Marine du Cap Corse, Punta Vecchia 1. Rapport de 2007.* Unpublished. Marseille, Département des recherches archéologiques subaquatiques et sous-marines.

Liou, B. 1982. Direction des recherches archéologiques sous-marines. *Gallia* 40, 2: 437-454.

Lopes, C. and Mayet, F. 1990. Commerce régional et lointain des amphores lusitaniennes. In A. Alarcão and F. Mayet (eds), *Ânforas lusitanas. Tipologia, produção, comércio / Les amphores lusitaniennes. Typologie, production, commerce (actas da mesa-redonda de Conímbriga, 1988)*: 295-303. Conimbriga and Paris, Museu Monográfico de Conimbriga and E. de Boccard.

Mantas, V. G. S. 1990. As cidades marítimas da Lusitânia. In *Les villes de la Lusitanie Romaine. Hiérarchies et térritoires (Table Ronde Internationale du CNRS, Talence, 1988*). Collection de la Maison des Pays Ibériques 42: 149-205. Paris, Centre National de la Recherche Scientifique.

Mantas, V. G. 1998. Navegação, economia e relações interprovinciais: Lusitânia e Bética. *Humanitas* 50: 199-240.

Massy, J.-L. 2013. Archéologie sous-marine en Corse Antique. *Cahiers d'Archéologie Subaquatique* XX.

Mayet, F. 1998. Contribuição da arqueologia subaquática para o estudo do comércio romano. *Al-madan* II Série 7: 83-87.

Mayet, F. and Silva, C. T. 1998. *L'atelier d'amphores de Pinheiro (Portugal)*. Paris, E. de Boccard.

Parker, A. J. 1981. Stratification and contamination in Ancient Mediterranean shipwrecks. *The International Journal of Nautical Archaeology and Underwater Exploration* 10, 4: 309-335.

Parker, A. J. 1992a. *Ancient shipwrecks of the Mediterranean and Roman Provinces*. British Archaeological Reports International Series 580. Oxford, Tempus Reparatum.

Parker. A. J. 1992b. Cargoes, containers and stowage: the ancient Mediterranean. *The International Journal of Nautical Archaeology* 21, 2: 89-100.

Parker, A. J. 2008. Artifact distributions and wreck locations: the archaeology of Roman commerce. In R. L. Hohlfelder (ed.), *The Maritime World of Ancient Rome*. Memoirs of the American Academy in Rome. Supplementary volume 6: 177-196. Michigan, University of Michigan Press.

Pinedo Reyes, J. and Alonso Campoy, D. 2004. El yacimiento submarino de la Isla de Escombreras. In M. Pérez, J. A. Soler and P. Martinez (eds), *Scombraria. La Historia oculta bajo el mar. Arqueología Submarina en Escombreras*. Catálogo de la Exposición, Cartagena: 129-151. Murcia, Comunidad Autónoma de la Región de Murcia.

Porqueddu, A. 2013. *Prospezioni archeologiche nell'arcipelago di la Maddalena - Risultati della prima campagna di ricerche*. Tese de Specializzazione in Beni Archeologici, Anno Accademico 2011-2012. Unpublished thesis.

Reynolds, P. 2010. *Hispania and the Roman Mediterranean, AD 100-700 (Ceramics and Trade)*. London, Duckworth.

Rice, C. 2011. Ceramic assemblages and ports. In A. Wilson, and D. Robinson (eds), *Maritime Archaeology and Ancient Trade in the Mediterranean*. Oxford Centre for Maritime Archaeology Occasional Series: 81-92. Oxford.

Salvi, D. and Sanna, I. 2000. *L'acqua e il tempo. Prospezioni di archeologia subacquea nelle acque di Gonnesa*. Cagliari, Soprintendenza per i Beni Archaeologici per le province di Cagliari e Oristano.

Slim, L., Bonifay, M., Piton, J. and Sternberg, M. 2007. An example of fish salteries in Africa Proconsularis: the Officinae of Neapolis (Nabeul, Tunisia). In L. Lagóstena, D. Bernal and A. Arévalo (eds), *Cetariae 2005: salsas y salazones de pescado en Occidente durante la Antigüedad (Actas del congreso internacional (Cádiz, 7-9 noviembre de 2005)),* British Archaeological Reports International Series 1686: 21-44. Oxford, J. and E. Hedges Ltd. and Universidad de Cádiz.

Souter, A. P. 2012. Exports from Iberia: understanding the production of Lusitanian amphorae and their significance in Roman commerce between the first and fifth centuries AD. *Journal of Roman Pottery Studies* 15: 140-168.

Spanu, P. G. 1997. Il relitto «A» di Cala Reale (Asinara). In G. Volpe (ed.), *Atti del convegno Nazionale di Archeologia Subacquea (Anzio, 30-31 maggio e 1 giugno 1996)*: 109-119. Bari, Edipuglia.

Tchernia, A. 2011. *Les Romains et le commerce*. Naples, Centre Jean Bérard/Aix-en-Provence, Centre Camille Jullian.

Vilar-Sancho, B. and Mañá, J. M. 1964. Informe sobre la excavación arqueológica en la Bahía de San Antonio Abad de Ibiza. *Noticiario Arqueológico Hispánico* VI, Cuadernos 1-3: 177-188.

Wilson, A. 2006. Fishy Business: Roman Exploitation of Marine Resources. *Journal of Roman Archaeology* 19, 2: 525–537.

Ximénès, S. 2007. *Rapport final d'opération - Fouille Programmée. Épave Tiboulen de Maïre à Marseille (Bouches-du-Rhône)*. Groupe de Recherche Archéologique Sous-Marine – Centre de plongée loisir, professionnelle et tek sur Marseille.

Ximénès, S. and Moerman, M. 2006. *Rapport final d'opération - Fouille Programmée. Épave Tiboulen de Maïre à Marseille (Bouches-du-Rhône).* Groupe de Recherche Archéologique Sous-Marine – Centre de plongée loisir, professionnelle et tek sur Marseille.

Zucca, R. 2003. *Insulae Sardiniae et Corsicae. Le isole minori della Sardegna e della Corsica nell'antichità*. Roma, Carocci editore.