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HOW DO THE ECONOMIC, POLITICAL AND SOCIAL
CONTEXTS OF SHIPWRECKS HELP US TO
UNDERSTAND THE MARITIME TRADE NETWORKS
OF THE WESTERN MEDITERRANEAN DURING THE
LATE ROMAN EMPIRE?

By

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Abstract

The study of maritime trade on western Mediterranean during the Roman Empire has focused separately on the archaeological analysis of amphorae found in terrestrial sites, in the study of maritime infrastructures and in the analysis of individual shipwrecks and its cargo. On the other hand, a broad specialized literature has been published about the political, social and economic evolution of the Roman provinces in Hispania and North-west Africa. However, very few scholars have tried to put all these data together in order to elaborate a unique and multidisciplinary study about maritime trade networks in western Mediterranean during the Roman Empire. This Dissertation analyses the evolution of the maritime trade networks in western Mediterranean during the Late Roman Empire putting together the historical data, the archaeological data and the evidence provided by shipwrecks.

During the 1st and 2nd centuries AD the olive oil, wine and fish sauce from Hispania dominated the supply of foodstuff in western Mediterranean designing also the maritime trade networks in this area. During the 3rd century AD the goods from North-west Africa broke strongly into Rome redesigning the maritime trade networks which linked Hispania, North-west Africa and Italy. Moreover during the 4th century AD the North-west African olive oil displaced the Hispanian olive oil in Rome. The archaeological evidences seemed to indicate the decay of the Hispanian goods and the transformation of the maritime trade networks. However, the evidence provided by shipwrecks have proved that the supposed radical transformation of the maritime trade networks on western Mediterranean during the Late Roman Empire was in fact a simple evolution on the maritime commercial networks and on the methods of transport to adapt the maritime trade in western Mediterranean to the political, economic and social changes of that period.

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1. Introduction

The Mediterranean Sea during the Roman Empire period was known as the *Mare Nostrum*. This idea of inland sea enclosed by the different provinces of the Empire hid the most important role of that *Mare Nostrum*: the Mediterranean Sea as a genuine seascape of maritime 'Via', shaping an important trade network which connected the ports and anchorages of the different provinces producing agricultural goods and metals with their final markets in Rome and the *Limes*. As Horden and Purcell (2000: 23) observed, Roman Empire's cultural cohesion and Economy was 'totally dependent on communications'; particularly on its maritime communications network. In fact, 'The paradox of the Mediterranean is that the all-too-apparent fragmentation can potentially unite the sea and its coastlands in a way far exceeding anything predicable of a continent' (Horden & Purcell, 2000: 24).

This dissertation will focus in maritime trade in the western Mediterranean Sea during the *Late Roman Empire*, which defines the historical period in Roman antiquity that lasted since the Crisis of the 3rd Century (AD 235 to AD 284) until the end of the western Empire in AD 476. That was a very troubled period in the history of the Roman Empire with many and significant social, economic and Political changes (Cook et Al.,1939; Cameron & Garnsey,1998). Moreover, it is also the less studied of all the different periods of the history of classic Rome. Unfortunately, the study of the maritime activity on western Mediterranean during this period has focused traditionally on the analysis of individual shipwrecks and maritime infrastructures such as ports, harbours, anchorages or fisheries, but very few researchers have tackled a broader and contextualized analysis of the maritime trade and its commercial networks in Mediterranean during the final period of the Roman Empire.

The maritime trade in western Mediterranean during the Imperial period included a wide range of products such as grain, metals, amphorae containing olive oil, wine and fish sauce, fine ware and luxury commodities. However, this dissertation will only focus in the specific trade of Hispania and western North Africa amphorae carrying olive oil, wine and fish sauce; indeed the imposed word limit for dissertations, makes impossible to tackle all the areas and products related with maritime trade in western Mediterranean during the Late Roman Empire in only 20,000 words.

Why only the amphorae and no other commodities? First of all because amphorae carrying olive oil, wine and fish sauce represent the second main merchandise transported by sea after grain, but grain does not survive for the archaeological record; secondly because they allow researchers monitoring all the trade process, from the origin of the product, the maritime route taken and the port of destination; finally because thanks to the stamps and *Tituli Picti* it is even possible to relate the production and trade of those products to the people who produced, transported and traded with

them. Nevertheless, when the analysis of the different shipwrecks studied in this Dissertation required a detailed analysis of all their cargo, for a better understanding of their significance, then the other commodities carried in those ships will also be reported and studied.

1.1 Literature review

Managing with such work which includes a huge amount of information about different topics, different areas of knowledge, different territories and with literature written in four different languages, transformed all this research in a very interesting and daring challenge. The process of literature review which was done throughout all this research included the following works, detailed in the *List of References*:

First of all, some general literature about the history of the Roman Empire paying special attention to the 2nd, 3rd and 4th centuries AD. This included, for example, some volumes of *The Cambridge Ancient History* (Cook et Al., 1939; Cameron & Garnsey, 1998), the works of Jones (1973), Cameron (1993) and some specific works about the Crisis of the 3rd century (Reece, 1981; 2007; Fernandez Ubiña, 1989).

Secondly, the specific literature related to the economy and trade during the Roman Empire focusing on western Mediterranean during the 2nd, 3rd and 4th centuries AD. This included, for example, general works about the economy of the Roman Empire (Duncan-Jones, 1974; Green, 1990); literature about Roman maritime trade in the Mediterranean (Keay, 1984; Keay, 1992; Mattingly, 1988; Curtis, 1991; Horden & Purcell, 2000; Tchernia, 2011); and some works about the trade of Olive Oil (Blazquez, 1980; Beltrán Lloris, 1982; Remesal Rodríguez, 1982), wine (Revilla Calvo, 1998) and Fish sauce (Curtis, 1991).

Next, the literature which deal about the Iberian provinces of Lusitania, Baetica and Tarraconensis, and the north African provinces of Mauretania Tingitana, Mauretania Caesariensis, Mauretania Sitifensis, Numidia, Byzacena, Tripolitania and Africa Proconsularis. This included, for example, the works of Keay (1981; 1988) about Hispania and the Province of Tarraconensis; the work of Thouvenot (1973) about Baetica; the work of Arce (1982) about Hispania during the Late Roman Empire; and the works of Broughton (1929), Carandini (1983), Kehoe (1988), Raven (1993) and Peña (1999) about the Roman Provinces in North Africa.

Furthermore, the literature related to maritime archaeology and shipwrecks in western Mediterranean, focusing mainly in those dated from the mid-1st, 2nd, 3rd and 4th centuries AD. This included, for example, the works of Pomey (1997) and Jézégou (1997) about ancient navigation in the Mediterranean, maritime trade and routes; The work of Arnaud (2005) about ancient navigation

in the Mediterranean; the work of Parker (1992) about ancient shipwrecks in the Mediterranean; and several articles of specialized journals such as *Gallia*, *Archaeonautica*, *the Journal of Roman Archaeology* and the *International Journal of Nautical Archaeology*.

Finally, some selected works and websites from the broad literature related with the identification and study of Roman amphorae. This included, for example, the works of Keay (1984), Peacock and Williams (1986), Sciallano and Sibella (1991), Py (1993) and the websites of CEIPAC (Centro para el Estudio de la Interdependencia Provincial en la Antigüedad Clásica), ICAC (Institut Català d'Arqueologia Clàssica) and the Archaeology Data Service.

1.2 The Problem

Review of the general literature discussed in the previous section, indicated that the study of the maritime activity on western Mediterranean during the Late Roman Empire has focused traditionally on the analysis of individual shipwrecks and maritime infrastructures. Moreover, very little research has been made with the aim of tackling a broader and contextualized analysis of both trade and shipwrecks within the politic, social and economic context of the Roman Provinces in the area.

On one hand, detailed scientific reports have been written about Roman shipwrecks in western Mediterranean and most of them have been published in prestigious publications such as *Gallia*, *Archaeonautica* or *International Journal of Nautical Archaeology*. However, most of the reports presented the conclusions of excavations finished in the 70's, 80's or early 90's focusing, for above all, in the analysis of pottery and the study of shipbuilding. On the other hand, a broad academic literature has been published about the political, social and economic evolution of the Roman provinces in Hispania and North Africa. However, very few scholars have tried to put all these data together in order to elaborate a unique and multidisciplinary study about trade in western Mediterranean which would be able to answer the following important questions:

- To what extent do the shipwrecks of the 2nd, 3rd and 4th centuries AD in the western Mediterranean illustrate the economic, social and political transformations which affected Hispania and Northern Africa during the Late Roman Empire?
- Can we talk about a radical change in the transported cargo and in the maritime routes during the Late Roman Empire? If so, which are the causes? There is still any kind of continuity of the previous trade dynamics?
- Is there any real change? Or is just that it is not possible to find the archaeological evidences (shipwrecks) because of a change in the methods of transport?

The aim of this dissertation is to connect in one single piece of academic work, the previous knowledge about 1st, 2nd, 3rd and 4th centuries AD shipwrecks in western Mediterranean, with the political, social and economic evolution of the Iberian provinces of Lusitania, Baetica and Tarraconensis, and the North African provinces of Mauretania Tingitana, Mauretania Caesariensis, Mauretania Sitifensis, Numidia, Africa Proconsularis, Byzacena and Tripolitania. The main objective is to assess to what extent the analysis of the cargo transported on those ships and the location of the shipwrecks confirms today a change on the maritime commercial networks in western Mediterranean at the end of the 3rd century or, on the contrary, there was not so radical change but a simple evolution on the maritime commercial networks and on the methods of transport.

1.3 Methodology

For achieving the aims and objectives of this Dissertation, a systematic research has been made guided by the following Methodology:

First of all, the review of the main literature related with the topic written in English, French, Spanish and Catalan. This included (section 1.2): History of the Late Roman Empire; Economy and maritime trade in western Mediterranean during the Roman Empire; Historical, social and economic evolution of the Roman provinces of Hispania and western North Africa; Shipwrecks in western Mediterranean; Study and identification of Roman amphorae. All these documents were obtained from the following main sources:

- University of Southampton's Hartley Library and Avenue Library for the main references and specialized literature written in English.
- DRASSM library *Bernard Liou* (Marseille, France) for the literature about shipwrecks found recorded and published in France.
- CASC library (Girona, Spain) for the literature about shipwrecks found recorded and published in Catalonia and Balearic islands.
- University of Barcelona's Faculty of History library for the references about Baetica and Tarraconensis.
- *JSTOR* website for academic articles written in English.
- *Persée* website for academic articles written in French.
- University of Southampton's *Roman Amphorae digital resource* in the *Archaeology Data Service-ADS* for the study of amphorae.
- ICAC's *Amphorae ex Hispania* for the study of amphorae.
- CEIPAC's *CORPUS* database for the study of Amphorae's Epigraphy.
- Specialised Journals such as *Archaeonautica*, *Gallia*, *International Journal of Nautical Archaeology*, *Journal of Roman Archaeology* and *Monografies del CASC*.

Secondly, a significant number of reported and published shipwrecks dating from the mid-1st, 2nd, 3rd and 4th centuries AD were selected using the work of Parker 'Ancient Shipwrecks of the Mediterranean and the Roman Provinces' (1992). The three main criteria for being shortlisted were: the cargo (Olive oil, wine or fish sauce amphorae), the origin of the products (Hispania or North-west Africa) the location of the site (west Mediterranean), and, obviously, to have been published following the academic standards for scientific publications.

Next, each shipwreck was classified into a specific trade route using the information provided by the typology of amphorae, the stamps and *Tituli Picti* found on them, the relative position of the shipwreck in the Mediterranean and the other commodities which completed the cargo of the shipwreck.

Finally, the comparison of trade routes, cargo and date of the shipwrecks, allowed us to describe the main maritime trade networks in western Mediterranean during the Roman Empire and their evolution throughout the 1st, 2nd, 3rd, 4th and 5th centuries. We have been able to determine which the changes in those maritime networks were and when they started. Moreover, the study of the political, social and economic evolution in Hispania and North Africa allowed us to connect the maritime networks and the ships that connected them with its political, social and economic context.

2. Maritime Trade in the Economy of the Roman Empire

Rome, the capital of the Roman Empire (Fig.34), had about one million inhabitants at the beginning of the second century (Tchernia, 2011: 12). Maintaining this enormous population in the Capital but also taking care of the Political and Military machinery of the Empire required a well organized and efficient trade to supply with food, metals and other goods both the city of Rome and the Roman Legions deployed all around the borders of the Empire. As Tchernia (2011: 14) clearly stated, nobody can question the importance of trade exchanges during the Roman Empire.

Trade in the Mediterranean basin during the Roman Empire means above all Maritime trade and Maritime commercial networks; indeed, according to Parker (2003: 177) maritime networks were of high importance for developing Mediterranean region in antiquity. Moreover, maritime trade was the less expensive and more effective means of transport for carrying goods in long distances (Pomey,1997: 116). Furthermore, the importance of sea routes are illustrated by Parker (2003: 177) who observed that the rulers of imperial Rome retained their political stability through importing food via maritime routes. Although maritime trade in western Mediterranean during the Imperial period included a wide sort of products such as grain, metals, amphorae, fine ware and luxury commodities, in this chapter we will only focus in the specific trade of Olive oil, wine and fish sauce carried in amphorae from Hispania and North-west Africa for the reasons already explained in the Introduction.

2.1 Olive oil, wine and fish sauce in the economy and society of the Roman Empire

2.1.1 Olive oil

Olive Oil was one of the most important commodities which were transported throughout the Mediterranean during all the Imperial period. The olive oil from Baetica was carried in Dressel 20 amphorae (Fig.1) during 1st, 2nd and 3rd centuries AD and later in Dressel 23 amphorae (Fig.2) since end of 3rd century onwards; on the other hand, the olive oil from North-west Africa Provinces was carried into several typologies of amphora from the 2nd century onwards: Africana 1 (Fig.18), Africana 2B (Fig.20) and Keay 35A (Fig.28) (University of Southampton, 2005). Only those reported in the studied shipwrecks (chapter 4) appear in this section.

Olive oil was not only used for cooking, it was also used for lighting the oil lamps and it was also highly valued as body lotion (Keay,1988: 98; Pomey,1997: 119; Mattingly,1988: 33). The

importance of olive oil for the Economy and everyday life in Rome and other parts of the Roman Empire, is clearly shown, first of all, by the huge amount of fragments from Baetican and African olive oil amphorae which in fact created the Monte Testaccio in Rome; secondly by the important number of olive oil amphorae reported in the very remote regions of the Empire such as the *Limes Germanicus* and Britannia (Tchernia,2011). Actually, Tchernia (2011: 256) wrote: 'Monte Testaccio keeps the remains of 50 million of olive oil amphorae'.

According to Mattingly (1988: 41) the Guadalquivir valley, in the Province of Baetica, was the main producer of olive oil in the Roman Empire during the 1st and 2nd centuries AD. Mattingly calculations, based in those made by Ponsich in the 70's, suggested figures of 1,250 km. sq. and 12,500,000 trees for an intensive use of only the 25% of the available land to cultivate; moreover he also proposed figures of 2,500 Km. Sq. and 25 million trees if the used land to cultivate was the 50% of the territory. All this production was transferred into amphorae Dressel 20 in the kilns next to Guadalquivir River and then transported down the river by boat into a major port. As Pomey (1997: 121) pointed out, Hispalis (Sevilla) and Gades (Cadiz) were the major trade ports in the area.

From the mid-3rd century AD, the provinces of North Africa which had improved their agricultural production during the 1st and 2nd centuries AD became the main provider of olive oil to Rome. According to Kehoe (1988: 18) the fertile lands near Cesarea (Cherchell) in Mauretania Caesarensis (Tunisia) developed a strong network of agricultural estates which were cultivated intensively. Furthermore, Mattingly (1988: 44) after analysing the wide area between Hadrumentum (Sousse) and El Djem, in Mauretania Byzacena, suggested that for an estimated area of 150 km. Sq., in this territory should have been planted about 360,000 trees.

An example which perfectly shows the importance of olive oil in the economy and every day's life in the Roman Empire is the bas-relief found in *Isola Sacra* in 1930 in which is represented a store specialized in olive oil (Fig.33). Moreover, amphorae from the three main areas producing olive oil in western Mediterranean - Africana 1 (Fig.18), Tripolitanian 3 (Fig. 32) and Dressel 20(Fig. 1) - can be clearly recognized on this bas-relief (Oscariz Gil,2008). This bas-relief also indirectly confirms the maritime trade networks which linked Hispania and North-east Africa to Rome.

2.1.2 Wine

As Revilla Calvo (1998: 181) observed, romans always considered wine as a valuable product used in most of their cultural, social and religious events; Moreover, because of its high symbolism , wine and viticulture became a good indicator for the economic, social and cultural changes within the Roman Empire. After analysing several classical literatures such as Caton's work, Tchernia

(2011: 257) calculated an annually wine consumption of about 1,170,000 to 1,460,000 Hectolitres for a city of Rome with 800,000 inhabitants and a consumption of about 1,750,000 to 2,200,000 for a Rome population of 1,200,000 inhabitants.

Most of the wine consumed in Rome and in other territories throughout the Empire during the 1st and 2nd century AD was produced in the Hispania provinces of Tarraconensis and Baetica and was transported in Tarraconensis Dressel 2-4 (Fig.10) and Baetican Haltern 70 (Fig.3) (Sciallano and Sibella, 1991). Surprisingly, by the 3rd century AD all traces of Spanish wine amphorae disappeared (Keay, 1984 and 1988; Richardson, 1998). Was this caused by production decay? Or use of new containers such as barrels? We will try to answer these questions in chapter 5.

The Rhône river Valley in Gaul began also to produce wine by the end of the 1st century AD and, as Tchernia (2011: 167) pointed out, Gaul vineyard experienced a quick expansion during the 2nd and 3rd century AD. The wine from Gaul was carried in so called *Gauloise* amphorae and its main markets were Gaul and the *Limes Germanicus*. Only evidence of type Gauloise 4 amphora (Fig.13) has been found on the studied shipwrecks in chapter 4.

Finally, similarly to the olive oil production, the Provinces of North Africa also developed an important wine production which apparently took over Hispania in providing wine to Rome and other parts of the Empire from the 3rd century AD onwards; even the province of Tarraconensis imported African wine amphorae during the last centuries of the Western Roman Empire (Keay, 1984). According to the *Roman Amphora Database* (University of Southampton,2005), North-west African wine was probably carried into the following amphorae: Africana 3A (Fig.23), 3B (Fig.24) and 3C (Fig.25); Dressel 30 (Fig.26); Spatheion 1 (Fig.27); Keay 35B (Fig.29) and Keay 62A, D & E (Fig.30).

2.1.3 Fish Sauce

One of the most appreciated products used in the Roman cuisine was a fish sauce called *Garum*. This fish sauce was elaborated in many fisheries along the coasts of Lusitania, Baetica and Tarraconensis since the 1st and 2nd centuries AD and in the fish factories of North Africa since the 2nd century AD (Keay,1988 ; Tchernia,2011). According to Keay (1988: 105), ‘Its production and trade was controlled by private individuals or corporations, and destined primarily for private consumption’. It is for this reason that the *Garum* was not only a food ingredient but also a value commodity highly appreciated by traders. Actually, as Keay (1988: 106) remind us, ‘Pliny wrote that two measures of *Garum* could fetch as much as 1000 denarii’.

According to Curtis (1991:42) *Garum* from Hispania was carried into the following typology of amphorae: *Dressel 7-11* (Fig.4), *Dressel 12* (Fig.6), *Beltran 2A* (Fig.8), *Beltran 2B* (Fig.9), *Dressel 14* (Fig. 7), *Almagro 50* (Fig.14), *Almagro 51A & B* (Fig.15), *Almagro 51C* (Fig.16) and *Beltran 72* (Fig.17).

Fish sauce from Africa was carried into: *Africana 2A* (Fig. 19), *Africana 3A, 3B and 3C*, *Dressel 30*; *Spatheion 1*; *Keay 35B* and *Keay 62A, D & E*. All these amphorae were supposed to contain either fish sauce or wine (Roman Amphora Database, University of Southampton, 2005).

The works of Etienne and Mayet (1995) and Lowe (2009) showed that most of the fish factories producing *Garum* were placed following the seacoast of southern Lusitania and Baetica, mainly on the shores of the rich fisheries of the Atlantic sea but also on the Mediterranean shores. Actually, as Keay (1988) pointed out, amphorae carrying fish sauce were loaded in trade ships at the Baetican ports of Gades, Carteia, Malaca and Carthago Nova and exported to Gaul, Britain, Germania, Italy and Tarraco.

2.2 Transport and distribution of amphorae in western Mediterranean during the Roman Empire

The raising of the demand of metals and agricultural products as well as the quick development of rural estates mainly in Hispania and North Africa demanded the development of a 'stable' network of maritime routes connecting the territories producing these goods with their final markets in Rome, Italy and the other provinces of the Empire. Since the beginning of the academic study of amphorae, scholars have tried to establish which the different trade routes were within the Empire which communicated the estates of production and their markets. To do so, they established connections between the data obtained from the archaeological excavations in Hispania and North Africa with the data of amphorae recorded at destination: Monte Testaccio; the shores of the Rhône and the Rhine; the Roman Legion forts in Britannia and in the *Limes Germanicus*. With the development of underwater archaeology a new source of information appeared: the remains of the Roman ships which never arrived at destination. With all those new data, researchers have tried to obtain the answers about maritime trade networks in western Mediterranean.

The work of Pomey (1997) and Jézégou (1997) indicated the most important maritime trade routes connecting the coasts of the Mediterranean Sea during the Roman Period (Fig.35). Some of these maritime routes were confirmed in a work of Arnaud (2005) where he proposed the maritime routes navigated in antiquity based on the study of the classical literature and not in the archaeological evidences (Fig. 36). In this section we are going to outline the maritime routes through the western

Mediterranean Sea used during the Roman Empire to connect Hispania and North Africa to Rome and to the western provinces. This is only a starting point of a deeper analysis, developed in Chapter 4, in which the shipwrecks listed on Parker's work (1992) will be divided into these maritime trade routes. The objective is to have a detailed image of the maritime trade networks in western Mediterranean since the 1st century AD until the end of the Western Roman Empire in AD 476, based on the archaeological evidence of shipwrecks.

2.2.1 Baetica and Tarraconensis to Rome through the coasts of Gaul and Italy

This classical maritime route to Rome near the coasts of Hispania Gaul and Italy was already used, but in the opposite direction, on the Republican times for carrying the Italian wine amphorae to the western colonies of Rome in Gaul and Hispania. From the 1st century AD onwards this route was taken by the cargo ships transporting to Italy and Rome the Dressel 2-4 amphorae containing Tarraconensis wine; The Dressel 20, Dressel 7-11 and Haltern 70 containing Baetican olive oil, *Garum* and wine; and the Baetican cooper, tin and lead ingots. It was also used for exporting Gauloise amphorae containing wine from Gaul and fine ware from Narbonensis (Jézégou,1997; Pomey,1997).

This main route along the western Mediterranean coasts split into two branches used for the distribution of all these commodities into Gaul, Germania and Britannia:

- The first branch left the main route at the port of Narbo (Narbonne) and redistributed goods into Southern and central Gaul and northern Tarraconensis (Solier & Moulis,1990; Jézégou,1997).
- The second branch left the main route at the Rhône river delta and took the Fossae Marianae (Vella et Al.,1999) going up the Rhône River towards the Seine and the Rhine for supplying northern Gaule, the Limes Germanicus and continuing to the Atlantic Sea and Britannia. This fluvial trade route was the main itinerary for the Dressel 20 amphorae carrying olive oil from Baetica to the Legions in Germania and Britannia. Several archaeological sites on the shores of the Rhône River show the evidences of this important fluvial route (Helly et Al.,1986); moreover we have also many evidences of the arrival of Dressel 20 and Dressel 23 amphorae to Britannia (Carreras Monfort, 1992; Funari, 1996).

2.2.2 Baetica and Tarraconensis to Rome through Balearic islands and Boniface strait

This important deep-sea trade route connected the centres of agricultural production and the mines in the province of Baetica with Rome during all the 1st and 2nd centuries AD. It also provided a direct route to Rome for the wine produced in Tarraconensis. However, in the 3rd century the traffic on this maritime route apparently began to decrease and, as it will be seen in chapter 4, no more shipwrecks transporting Tarraconensis amphorae have been found and those carrying amphorae

from Baetica also decreased (Parker, 1992). These data together with the information coming from the excavations in Ostia and Rome opened an important discussion about what seemed to be for many scholars (Thouvenot,1973; Blazquez Martinez,1968) a radical change in the maritime trade networks in western Mediterranean during the 3rd century AD but which is for others (Remesal Rodriguez,1986; Keay,1988; Carreras,1992) was a simple transformation and adaptation to the new political social and economic reality in the Roman Empire and its western provinces.

2.2.3 North Africa to Rome

This maritime route connecting the provinces of North-west Africa to Rome through the Isle of Sicily, became the most important maritime trade route in western Mediterranean from the second half of the 3rd century AD onwards. According to Jézégou (1997: 146) the archaeological data in Ostia shows a clearly increase of olive oil and fish sauce amphorae from North Africa in detriment of those coming from Baetica. Indeed, Keay (2008: 17) confirmed the preponderance of North African Amphorae in Ostia and Portus on the archaeological strata from the 3rd and 4th century. Furthermore, as Mattingly (1988: 53) rightly pointed out, this route connecting the coasts of the ancient Carthage to Italy was already a busy itinerary since the 1st century AD because of the supplying of grain to Rome.

2.2.4 North Africa to Gaul through the coasts of Italy

The journey of cargo ships coming from North Africa not always finished at Rome, on the contrary, most of those ships continued north along the west Italian coast to the main ports in southern Gaul. Although Portus and Ostia are on the coastal itinerary followed by those ships, there are no evidences about ships stopping there if their cargo was not addressed to Rome. This ancient coastal trade route already used during the Republican period and intensively used during the early Empire will recover its original *Republican* itinerary during the Late Empire for transporting goods in the east-west direction. The goods transported through this route were North African olive oil, wine and Fish products carried into the typologies of amphorae listed on section 2.1; normally these commodities were completed with African fine ware.

2.2.5 North Africa to Gaul through Sardinia

According to Jézégou (1997: 145) it was through this deep-sea route, crossing south to north the Mediterranean Sea, that were transported most of the African wine and olive oil amphorae from Mauretania Caesarensis, Bizacena and Tripolitania to southern Gaul and the Rhône. Moreover, Arnaud (2005: 160) confirmed this itinerary after studying the *Antonini Itinerarium*, a work of the 4th century AD which listed the ancient inland and maritime routes in the Mediterranean. As we will see in Chapter 4, several shipwrecks found on the east coast of Sardinia confirm this direct route from North Africa to Southern Gaul.

2.2.6 North Africa to Hispania

Import of North African olive oil, wine and even fish sauce amphorae into Hispania from the late 3rd century onwards has been observed in the works of Keay (1982; 1984) and Amores, Vargas and Gonzalez (2007) which showed the evidences obtained in several land archaeological excavations in Tarraconensis and Baetica. Indeed, as Keay (1988: 190) pointed out, the quantities of African olive oil and fish sauce imported into Hispania augmented in double from the second half of the 2nd century AD. One example of these African amphorae arrived in Tarraconensis is the disappeared archaeological site of *Mas Casanoves* (3 km inland from Roman Barcino) in Barcelona, where in 1931 was found a Roman necropolis dating between the 4th century AD and the 7th century AD with some Keay 55 and Keay 56 amphorae used as burials (Fig.37). The site was re-excavated in 1983 and briefly detailed in Keay (1984: 36).

According to Jézégou (1997: 146), archaeologists must face an enormous difficulty to firmly confirm the maritime route which connected the North Africa provinces with Hispania because of the reduced number of shipwrecks which have been found in front of African shores in the Mediterranean. However, the work of Arnaud (2005: 159) claimed the existence of this maritime coastal route between Africa and Hispania based on some authors and chronicles of Antiquity such as Strabo, Pliny or the *Antonini Itinerarium*. Moreover, some shipwrecks with African cargo excavated in southern Spain (Mas,1982) certainly confirm the existence of this maritime trade route during the Late Roman Empire.

2.3 Traders and shippers

The maritime trade in western Mediterranean demanded a substantial financing and an organised network of traders and shippers. Roman aristocracy provided this financing and developed organized family networks of agents using their slaves and *Libertus* as traders and shippers (Tchernia,2011). According to Tchernia (2011: 42) roman aristocracy used their slaves as agents for their business in two different ways: First of all as controlled agents with specific tasks and direct orders from their Master; secondly, as autonomous traders working for their Master's commercial network but managing freely the money that the Master had given to them. On this second situation Roman aristocrats obtained, on one hand, the benefits issued from the efficient autonomous administration of their slaves and, on the other hand, the whole assets from their slaves when they died. However most of those 'autonomous' slaves, will work hard and manage efficiently their Master's business to have enough money to buy their freedom and become *Libertus*. Once freed, the former Master usually offered the *Libertus* very interesting loans, business opportunities and even protection for keeping him attached to the 'family' commercial network.

As Tchernia (2011: 46) pointed out, for dealing with a long distance trade such as the one which developed in western Mediterranean during the Roman period, it is strongly necessary to have reliable agents both in the ports of origin and destination, in the cities or areas where the products will be commercialised and even on the trade ships, which belonged to the 'family' business, as *Magister Navis*. Indeed, Thouvenot (1973: 270) gave us some examples which we can easily relate with this trade structure such as *M.Fadius* who was member of an important family in Narbo but also acted as *Mercator Cordubensis* at the Guadalquivir valley in Baetica; or a Roman Knight who was presented as *Diffusor Olearius Ex Baetica* but also owned several river trade ships in the Saône River in Gaul. Moreover, Thouvenot (1973: 271) highlighted several ancient roman chronicles which talked about the important community of African and Syrian traders who lived in Hispalis and Corduba. Indeed Amores, Vargas and Gonzalez (2007: 137) also commented the existence of that important Syrian community in Hispalis.

To sum up, maritime trade in western Mediterranean, but also on the East, was controlled by powerful Roman aristocracy families devoted to trade, such as *Peticii*, *DD. Caecilii* or *Urittii* (Tchernia,2011: 68) who established strong commercial networks controlled by their slaves or freed agents all through the ports and markets where the olive oil, wine and fish sauce were commercialised. Actually, as Tchernia (2011: 68) pointed out, the name of *C.Peticius* appeared in an amphora in Carthage on the 1st century AD strata and the name of *Peticius Marsus* is engraved in a Dolium of the 1st C. AD shipwreck Diano Marina.

3. Hispania and North-west Africa during the Late Roman Empire: Politics, Economy and Society

The development of the maritime trade networks in western Mediterranean during the Late Roman Empire cannot be understood without fitting them into a broad image of the political, economic and social evolution of the western provinces of the Roman Empire. Indeed, the questions related to how maritime trade was organized, which products were commercialized, which were the producing territories and which were the final markets, cannot be neither fully answered nor totally understood without a deeper analysis of the political, economic and social conditions of the territories involved on that trade and the people who lived on them. Unfortunately, an extensive and detailed analysis of all these items will not be possible because of the constraints of the dissertation size. Nevertheless, the following sections will design a quite complete image of the political, economic and social evolution of the Roman provinces in Hispania and North-west Africa highlighting the historical events which were determining factors in the evolution of the maritime trade networks in western Mediterranean during the Late Roman Empire.

3.1 The Roman provinces in Hispania: Lusitania, Baetica and Tarraconensis

3.1.1 The wealthy years of the early Empire

Hispania (Fig.38), at the beginning of the Roman Imperial Period was a rich and dynamic territory controlled by Rome and very valuable for the Empire because of its mines and the quality of its agricultural production. As Keay (1988: 95) pointed out, the quantities of olive oil, fish sauce and wine produced on the estates of Baetica and Tarraconensis were not only high enough to cover internal consumption but also to supply the demand of Rome and the Italian market. As well as, the work of Lowe (2009) showed that during the 1st and 2nd centuries AD the Hispanian provinces of Baetica and Tarraconensis developed a considerable number of Villas devoted to an extensive cultivation of vineyards and olive trees and to the production of wine and Olive oil. Moreover, associated with these Villas, also appeared a broad network of kilns producing the amphorae needed for the transportation of these products. Apart from this, as Lowe (*ibid.*) also indicated in his work, the Atlantic and Mediterranean coasts of Baetica also began to experience a quick development of fish factories devoted to produce Garum and other Fish based products; obviously near these fish factories also appeared an extensive network of kilns producing fish sauce amphorae.

On this period, wealthy and powerful families of urban aristocracy involved in the agricultural and mine production, settled in Baetica and Tarraconensis integrating these productive areas in the Roman trade network (Keay,1988: 84). By the second half of the 1st Century AD and mainly during the first half of the 2nd Century, some of these Aristocrats from Baetica and Tarraconensis settled in Rome where they developed a strong political and economic network of influences (*ibid.*). Most of them became influential Senators and even Emperors such as Trajan (Emperor in AD 98-117) born in the province of Baetica, and Hadrian (Emperor in AD 117-138) who was born from a Baetican aristocrat family settled at Rome.

The Guadalquivir valley, the Atlantic and Mediterranean coasts of Baetica and the coasts of Tarraconensis became active commercial areas where emerged several urban centres with busy commercial Ports. Hispalis, Gades, Carteia, Malaca or Carthago Nova in Baetica; and Emporiae, Iluro, Barcino, Tarraco and Saguntum in Tarraconensis, were the most important ports in Hispania during the 1st and 2nd centuries AD; there, the amphorae with olive oil, wine and Garum or the tin, cooper and lead ingots were load into big trade ships which departed for Rome or the Rhône River (Keay,1988). However, at the end of the 2nd century AD this calm and prosperity was strongly threatened by two events the consequences of which have been extensively discussed by many scholars such as Thouvenot (1973), Arce (1982), Keay (1981; 1988), Richardson (1998) and Lowe (2009) and still today causes controversy.

In AD 171-173 the Mauri, a Moorish tribe habiting the Rif Mountains in Mauretania Tingitana, invaded Baetica causing important destruction in vast areas of the Province (Richardson,1998: 230). Although the Mauri were defeated by the troops of C.Vallius Maximianus, procurator of Mauretania Tingitana, they attacked again in 177 being successful to establish a permanent camp near Malaca; from there, they frequently harassed the agricultural estates and villas of Mediterranean Baetica and even tried to attack some estates in the wealthy Guadalquivir valley (Keay,1988: 173). The province of Tarraconensis didn't escape to the disturbing events which affected Hispania at the end of the 2nd century. According to Keay (1988: 173) during the reign of Commodus (AD 177-192) several areas of Tarraconensis suffered from the attacks of an army of Gaulish deserters led by an ancient soldier called Maternus. All these events finished with the calm and stability that Hispania had enjoyed during the 1st and 2nd century AD and, as Keay (1988: 173) argued, also caused a disruptive psychological effect in the inhabitants of those regions.

Just at the end of the 2nd century AD a political conflict about the Imperial succession came to convulse again the peaceful provinces of Hispania. In AD 195 Septimus Severus and Claudius Albinus had a military confrontation for obtaining the Emperor's throne. Finally Claudius Albinus was defeated and Septimus Severus began an implacable repression against Albinus supporters.

As Keay (1981: 462) and Richardson (1998: 233) the members of the aristocrat families who supported Claudius Albinus were killed and their villas and estates confiscated. Indeed Richardson (1998: 238) suggested that many of the confiscated properties were the rich estates which produced Olive oil in Baetica. However, it was also possible to find supporters of Septimus Severus in Hispania such as the Governor of Lusitania Caesonius Macer (Richardson,1998: 238).

To sum up, the invasions of the Mauri and Materno's army at the end of the 2nd century AD and the repression of Septimus Seveus opponents in Baetica and Tarraconensis have been seen, traditionally, as the beginning of a supposed decadence of Hispanian provinces within the Roman Empire which continued with the Crisis of the 3rd century.

3.1.2 The crisis of the 3rd Century AD in Hispania

Most of the Spaniard historians and archaeologists agree that the event which strongly disrupted Hispania in the 3rd century and has been considered as the central point of the crisis was the Frankish invasion in AD 260 (Keay, 1981: 472). Actually, some archaeologists (Thouvenot,1973: 272; Blazquez Martinez,1968: 15) related this invasion with the disappearance of the Baetican amphorae Dressel 20 in Monte Testaccio on the strata dating from AD 257. We will return to this point in chapter 5 where we will report most accurate theories (Remesal Rodriguez,1977: 120; 1986: 31; 1991: 355) about this polemic topic.

In AD 258, the political instability within the Empire and the continuous fights to become Emperor resulted in the creation of the *Imperium Galliarum* which united, under the Imperial throne of Postumus the provinces of Gallia, Britannia and Hispania. According to Keay (1988: 177) the Frankish tribes habiting on the other side of the Limes, could have taken advantage of this weakness to invade Gaul, attacking Narbonensis and arriving into Hispania in AD 262 where they devastated wide areas of Tarraconensis. But material devastation was not the only main consequence of this Frankish invasion; as Keay (1981: 466) argued, a big psychological shock and a strong feeling of insecurity spread through the provinces in Hispania and would had been the cause for the abandonment of small agricultural properties looking for the protection in larger states, although key (1981: 479) wrote that he was not able to confirm that last statement.

Life in towns also experienced important changes on this convulsive period of the 3rd century AD. As Keay (1988: 175) suggested, because of the devaluation of the silver currency by Septimus Severus which was continued by later Emperors, the urban aristocracy became suspicious about the value of their investments in towns and began to redirect their investments into their own country estates and Villas. Furthermore, as Keay (1988: 178) pointed out, these elites also became to distrust the foundations of the Empire. Consequently, without the support of the rich aristocracy

towns stopped their economic expansion (Cameron, 1993: 8). Trade was undoubtedly also affected, because as Reece (2007: 13) suggested, wealthy of the elites living in towns, wealthy of towns and trade were always closely related.

The 3rd century AD was also the period when, according to Keay (1988: 176) the exports of Tarraconensis wine stopped and the production remained in the Province for local consumption. We will return to that point in chapter 5 to introduce the idea proposed by other authors (Marlière, 2001: 191) concerning the transport of wine in barrels. Moreover, Keay (*ibid.*) also suggested that in Baetica, the production of Olive oil continued but was exported in the new amphora Dressel 23.

3.1.3 Hispania during the Late Empire

The crisis of the 3rd century is considered to have been finished with the arrival of Diocletian to the Imperial throne in AD 284. Diocletian guaranteed a long period of political stability during 21 years. However, the economic and social changes which had begun during the Crisis of the 3rd century, mainly in towns, derived in important transformations through the 4th century affecting the economic networks between towns and country and so that affecting also trade activities. The 5th century will be the time of the final crisis forced by the Barbarians invasions until the disappearance of the Western Roman Empire in AD 476.

The most important reform of Emperor Diocletian was the reorganization of the territorial structure of the Empire which had important consequences in the maritime trade in Western Mediterranean. In the west, the Provinces of the Empire were grouped into six main Dioceses (Jones, 1973: 47): Britannia, Gaul, Vienne, Hispania, Africa and Italy (Fig. 40). The six Provinces of the Diocese of Hispania were Baetica, Lusitania, Tarraconensis, Carthaginensis, Gallaecia and Mauretania Tingitana (Keay, 1988: 179). On the decision of Linking Mauretania Tingitana to Hispania, probably Diocletian took into account the close economic and commercial ties between the two shores of the Gibraltar strait.

Later on, during the reign of Emperor Constantine I (AD 306 –AD 337), the Dioceses were grouped forming *Praefecturae* ruled by a *Praefectus Praetori* (Arce, 1982: 31). In the West two *Praefecturae* were created: *Praefecturae* of Gaul (assembling the Dioceses of Britannia, Gaul, Vienne and Hispania) and the *Praefecturae* of Italy (assembling the Dioceses of Africa, Italy, Pannonia, Dacia and Macedonia). These territorial associations had important consequences in the maritime trade networks in western Mediterranean during the late Empire because, as suggested by Keay (1988: 190), from that moment the supply of olive oil to Rome will be provided almost exclusively by the North African provinces which belonged now to the same *Praefecturae* of Italy. Similarly, the olive oil production in Baetica was addressed in priority to the needs of the army in

the *Praefecturae* of Gaul. The effects of such administrative changes will be returned to in chapter 5 in the context of the discussion of the shipwreck evidences.

During the 4th century, the process of progressive abandonment of towns by the wealthy aristocratic families in order to focus their priorities on their country estates and villas continued even faster. As Keay (1988: 189) observed, withdrawing of these families provoked the decadence of Hispanian towns which stopped to be the active political, administrative and social centres that they had been during the previous centuries. As Keay (1988: 190) also commented, the trade networks between towns and agricultural estates also reduced; Villas began to establish new trade networks with other estates in the countryside to sell their surplus production and towns were forced to import African olive oil and fish sauce to cover their needs.

Finally in the 5th century, politics, economy, society and trade in the Hispanian provinces were determined by the barbarian invasions into the Iberian Peninsula. In AD 409 the Vandals, Suebi and Alans who had crossed the Rhine three years before arrived into Hispania where they settled. In AD 415 the Visigoths arrived into Hispania after having sacked Rome in AD 410 and having settled later in southern Gaul. Between AD 415 and AD 457 a continuous succession of territorial fights among Vandals, Suebi, Alans and Visigoths ravaged Hispania. In a work of Keay (1988) the chaotic political evolution of the first half of the 5th century in Hispania is clearly synthesized:

- In AD 415 Visigoths attacked and defeated the Vandals tribes settled in Baetica and the Alans in Lusitania and then withdraw to their territories in southern Galia.
- After withdrawer of Visigoths the Vandal tribes who were settled in Gallaecia moved to Baetica and Lusitania and took control of those territories. Leaving the control of Gallaecia under the Suebi.
- In AD 429 the Vandals crossed the strait of Gibraltar and attacked Mauretania Tingitana; in the following ten years they controlled all the western North African provinces until Tripolitania. The Suebi profited the Vandals withdrew from the Iberian Peninsula to move into Lusitania, Baetica and Carthaginensis.
- In AD 446 Rome tried it last attempt to recover Baetica, Lusitania, Gallaecia and Carthaginensis but was defeated by the Suebi. However Suebi accorded the return of Carthaginensis to Romans.
- In AD 455 the new Emperor of Western Roman Empire, Avitus, accorded with the Visigothic King Theoderic a new invasion of Hispania. Visigoths defeated Suebi and took control of Lusitania, Baetica and Carthaginensis. Tarraconensis was the only territory in Hispania controlled by the Roman Western Empire and the Suebi still controlled Gallaecia.

- Finally In AD 470 the King of the Visigoths, Eric, attacked and took control of Tarraconensis. When in AD 476 the Western Roman Empire disappeared, Hispania was a territory of the Visigothic kingdom.

All this political instability obviously affected the economic and trade network that the Hispanian provinces had built in the previous centuries. In chapter 5 we will discuss to what extent this political, social and economic instability also affected the maritime trade routes established in western Mediterranean during the previous centuries.

3.2 The Roman provinces in North-west Africa: Mauretania Tingitana, Mauretania Caesarensis, Mauretania Sitifensis Numidia, Africa Proconsularis, Byzacena and Tripolitania

3.2.1 Stabilization and growth during the 1st and 2nd centuries AD

The 1st century AD in the territories controlled by Rome in North-west Africa (Fig.39) was a convulsed century with political instability and military expansion still running in the region. As the work of Raven (1993) showed, Mauretania was not totally incorporated to the Empire until the first half of the 1st century and still in AD70 the Third Augustan Legion had to intervene across central Sahara. On the contrary, as Broughton (1929: 111) suggested, the earliest provinces created by Rome near the coasts of ancient Carthage such as Africa Proconsularis enjoyed the calm and stability necessary to start building the foundations of their future growth. Indeed, Africa Proconsularis already provide Rome with little quantities of grain since the last years of the Republic (Kehoe, 1988: ix). At the end of the 2nd century AD North-west Africa was already organized in three main provinces: Mauretania Tingitana, Mauretania Caesarensis and Africa Proconsularis. Numidia will be created at the beginning of the 3rd century during the reign of Emperor Septimus Severus and Byzacena and Tripolitania did not appear as independent provinces until the reforms of Diocletian at the end of the 3rd century AD.

The work of Mattingly (2011) showed that the Emperors of Rome early realize the potential of the fertile North African lands for increasing the amount of grain that the population of Rome needed and quickly integrated grain production of the provinces of North-west Africa into the structure of the *Annona* which supplied food to Rome; at the same time, the Imperial estates were reorganized in order to increase their productivity. Following those changes, the Roman aristocracy settled in North African provinces who owned rural estates in the region, looked also for increasing their productivity in order to profit from those Imperial decisions and obtain a surplus to commercialize.

According to Kehore (1988: 224) for achieving the massive growth of crops necessary to supply the needs of the population of Rome, the Roman State decided to take direct control over the agricultural production in the provinces of North-west Africa creating an extensive network of estates under the strict control of the *Fiscus* (Emperor's Treasury) which imposed to the *Coloni* (farmers) the products and the production.

As Raven (1993: 87) suggested, when the calm and stability arrived to the North Africa provinces at the end of the 1st century, the time was arrived for the *Fiscus* and for private landowners to take the decision of grow other kind of products, with an increasing demand in Rome, which needed a long term exploitation to be profitable and consequently needed also a political stability in the zone: the olive trees and the vineyard. Indeed, as Keay (1984; 408) commented, the first evidences of African olive oil amphorae in Rome appears, according to the archaeological excavations, during the reign of Emperor Hadrian (AD 117–138).

A study by Kehoe (1988) indicated that by the 2nd century AD the *Fiscus* had already invested huge amounts of money and efforts developing and increasing the agricultural production in the Roman provinces of North-west Africa but not only in crops, actually olive trees and vineyards became the main culture in those provinces favouring the production of olive oil and wine which will become the new main activity in the estates.

Since the second half of the 2nd century African olive oil and wine produced mainly in Africa Proconsularis began to arrive at Rome becoming fast one of the most demanded goods in Rome, Italy and other provinces of the Empire (Carandini, 1983: 148). But the success of the North African provinces was not only an economic triumph, as Carandini (1983: 159) and Mattingly (2011: 152) indicated Africa became the new reference for the Empire, members of the aristocratic families which had made their fortune in Africa began to settle in Rome where they developed a strong political and economic network of influences and most of them became Senators and even Emperors such as Septimus Severus (AD 193–211) who was born in Leptis Magna (Tripolitania). In chapter 5 will be discussed how this process influenced the maritime trade networks in western Mediterranean.

3.2.2. The prosperity of North-west Africa

The 3rd and 4th centuries AD supposed for Mauretania Tingitana, Mauretania Caesarensis, Numidia, Africa Proconsularis, and the new created Mauretania Sitifensis, Byzacena and Tripolitania (Fig.41) the period of maximal expansion in their agricultural production and indeed in the development of its urban areas and maritime connexions related to the olive oil, wine and Garum

trade. According to Cameron (1993: 9) the 3rd century AD in North Africa was a century of urban growth and prosperity.

However, as Millar (1967: 180) revealed, the political instability during the Crisis of the 3rd century AD also affected, briefly, the western provinces of North Africa; Indeed, in AD 238 the wealthy landowners of Thysdrus region (El Djem) rebelled against the Imperial *Procurator* of the province and also proclaimed the *Proconsul* Gordian as Emperor in Carthage. The rebellion was crushed by the *Legatus* of the province of Numidia *Capellianus* who sacked Carthage. Once the rebellion finished, the Emperor Maximinus decided to execute the rebel landowners and confiscated all their lands.

At the beginning of the 4th century, under the reign of Constantine I (AD 306–337), Mauretania Caesarensis, Mauretania Sitifensis, Africa Proconsularis, Numidia, Byzacena and Tripolitania became part of the *Praefecturae* of Italy; these administrative changes provoked that the Provinces of North-west Africa became the main provider of foodstuff to Rome moving the products from Baetica to a secondary role (Keay, 1988: 190) and transforming, consequently, the maritime trade networks in western Mediterranean during the late Empire. Furthermore, according to Keay (1984: 414) when Constantinople became the Capital of the Empire in AD 395, the provisions of crops and oil which Rome received from Alexandria turned to Constantinople; because of that, the provinces of North Africa became the main providers of the city of Rome.

The situation of the North African provinces at end of the 4th century, has been, however, object of constant controversy. In a work of Carandini (1970 cited in Keay, 1984: 416) was suggested that Africa began its ‘agricultural decline’ at the end of the 4th century AD. Years later, Manacorda (1977 cited in Keay, 1984: 416) argued that the agricultural activity in North Africa continued until the Vandal invasion in the 5th century. Furthermore, Cameron (1993: 123) claimed that the cities of North Africa at the end of the 4th century AD were in a ‘surprisingly flourishing condition’.

3.2.3 The Vandal Invasion

In AD 429 the Vandals crossed the strait of Gibraltar and invaded Mauretania Tingitana; in the following ten years they controlled all the provinces of North-west Africa conquering Carthage in AD 439. As Merrills (2004: 52) observed, the Vandals devastated in their way to Carthage the main cities of North-west Africa; only Cirta and Hippo Regius resisted the attack of the vandals. However, Raven (1993: 196) argue that the main objective of the Vandals in Africa was not the pillage and destruction but to find a prosperous land to settle and establish their kingdom.

According to Raven (1993: 199) Carthage, after falling under control of Vandals in AD 439, still remained an active commercial port in western Mediterranean with a flourish community of traders and shippers who still maintained some of their maritime trade networks mainly with the new Visigothic kingdom in southern Gaul. However, as Merrills (2004: 53) pointed out, the Vandal king Gaiseric used the ships and the shipyards captured in Carthage for preparing a war fleet and invading Sicily in AD 441. The Emperor Valentinian III incapable to defeat the Vandals signed with Gaiseric a peace treaty in AD 442. According to Courtois (1955, cited in Merrills,2004: 54) the vandals obtained Africa Proconsularis, Byzacena, Tripolitania and parts of Numidia; the Western Roman Empire kept the control under Mauretania Caesarensis, Mauretania Sitifensis and the rest of Numidia.

After the death of Emperor Valentinian III the vandals restarted their hostilities against the remaining provinces of the Western Roman Empire in Africa and against Sicily. As Raven (1993: 199) pointed out, the vandals finished by controlling the Balearic Islands, Corsica and Sardinia and consequently controlling all the western Mediterranean Sea. Furthermore, in AD 455 the vandals invaded Italy and plundered Rome during fourteen days.

From the beginning of the second half of the 5th century onwards, navigation and trade in western Mediterranean remained under control of the vandals. After the end of the Western Roman Empire in AD 476 the remaining maritime trade networks were reorganized according to the new political powers in the area (Visigoths, Vandals and Goths) until the intervention of the Byzantine Empire under Emperor Justinian in the first half of the 6th century AD. But this period exceeds the limits of our research and it will not be studied in this Dissertation.

4. Maritime trade routes in western Mediterranean during the Roman Empire: The evidence of shipwrecks

It has been shown, in the previous sections, the high importance of maritime trade for the economy of the Roman Empire and for the supply with food and metals of Rome, Gaul, and the Roman Legions stationed in the *Limes Germanicus* and Britannia. We also have seen how, during the Imperial Period, Hispania provinces first and North African provinces later became the main providers of olive oil, wine and fish sauce within the Roman Empire.

In this section we will analyse the Roman cargo shipwrecks identified in western Mediterranean to confirm the routes and the maritime trade networks which, during the Empire, connected the areas of production in North Africa and Hispania with their final markets in Rome, Gaul, the *Limes Germanicus* and Britannia. The main source of information will be the Parker's list of '*Ancient shipwrecks on the Mediterranean and the Roman Provinces*' (1992).

As Pomey correctly stated (1997: 6) a shipwreck is an important source of historical knowledge which tells us about the commodities commercialised by sea in a specific time and the main characteristics of that trade; this statement clearly reminds us the classical Muckelroy's definition of shipwrecks as 'Time Capsules' (1978: 56). The analysis of the Roman shipwrecks found in western Mediterranean, combined with the archaeological data from land archaeological sites (Kilns in Hispania and North Africa, Monte Testaccio, the shores of the Rhône and the Rhine) and the epigraphy, will provide us with important information about how maritime trade was organized and which commercial networks were established.

In this section, only published shipwrecks with a clear description of its cargo will be used, focusing mainly in those carrying amphorae from the Roman Provinces of Hispania and North-west Africa. As explained in the Methodology, even if metals from Baetica and fine ware from Africa are also important features for the analysis of Roman maritime trade in western Mediterranean, the limited extension of this dissertation will not allow a deeply analysis of that important trade.

4.1. Maritime trade routes during the Early Empire

As seen in Chapter 2, several maritime trade routes in western Mediterranean connected, during the 1st and 2nd centuries AD, the agricultural regions and mine areas of Hispania with Rome, Gaul, the *Limes Germanicus* and Britannia (Jézégou,1997; Pomey,1997). These maritime routes created a real trade network among areas of production, intermediate ports and final markets.

A detailed table of all the shipwrecks studied in this section with references to Parker's (1992) work can be found in Appendix 1.

4.1.1. Baetica and Tarraconensis to Rome through Balearic Islands and Boniface strait

This maritime route connecting the Iberian Peninsula with Rome through the Balearic Islands and the Boniface strait was the most direct route to export the amphorae carrying Olive oil, wine and fish sauce from Baetica to Rome and those carrying Tarraconensis wine to Rome. It was also used to provide Rome with copper, lead and tin from the mines of Sierra Morena in Baetica.

This important maritime route has been confirmed by several shipwrecks reported on the Balearic Islands and on the Boniface strait:

Cabrera E and *Ses Salines* both sunk at Cabrera island, southern of Majorca, and both carried Iberian products such as *Garum* Amphorae Dressel 7-11 and lead ingots (Fig.42) (Parker,1974; Guerrero & Colls,1982). Moreover *Ses Salines* also carried some olive oil amphorae Dressel 20 from Baetica. Unfortunately almost all the amphorae and lead ingots from *Ses Salines* were looted (Parker, 1974). The same happened with *Cabrera E*, however Guerrero and Colls (1982) could identify a stamp in one of the amphorae, *CAL* (Fig.42), which can be related with a Baetican kiln in Villar de Brenes, near Sevilla (CORPUS CEIPAC, 2013). Guerrero and Colls (1982) argued that *Ses Salines* and *Cabrera E* were actually the same Shipwreck.

No references were available to study the sites of *Conillera*, *Porto Cristo B* and *Cabrera D* other than the information in Parker's work (1992); the only references identified were local journals of archaeology from the Balearic Islands which have been impossible to consult. According to Villar Sancho and Mañà (1965, cited in Parker,1992: 153) the roman shipwreck discovered at Conillera, in Ibiza, was carrying fish sauce amphorae Beltran 2B from Baetica. Apart from this, Colls et Al. (1977) identified another shipwreck at Porto Cristo, in Majorca, with a cargo from Baetica (wine amphorae Haltern 70 and olive oil amphorae Dressel 20) similar to those of *Port-Vendres B*, *Lavezzi A* and *Chiessi*. Furthermore, the site of *Cabrera D* is another example to confirm the importance of this maritime route through the Balearic Islands on the 1st and 2nd c. AD, but most of

its cargo was looted and only some Dressel 7 and some lead ingots were reported (Veni and Cerdà,1972 cited in Parker,1992: 82).

This maritime route through the Balearic Islands was also frequented by cargo ships carrying Dressel 2-4 wine amphorae from Tarraconensis to Rome. In *Cala Vellana* (Ibiza) Sciallano and Liou (1985) reported a shipwreck carrying Dressel 2-4 amphorae made in Oliva kilns (Valencia).

Hundreds of miles onwards, on the same direct maritime route from Baetica and Tarraconensis to Italy, four more shipwrecks were reported in the Boniface Strait with their Baetican cargo of Olive Oil, wine and fish sauce. Moreover four more other shipwrecks were reported carrying wine amphorae from Tarraconensis:

Lavezzi A (Parker,1990; Benoit,1962) and *Sud Lavezzi B* (Liou,1982; Liou & Domergue,1990) both carried a mixed cargo from Baetica: olive oil in amphorae Dressel 20, wine in amphorae Haltern 70 and Fish Sauce in amphorae Dressel 7-11. Moreover they also transported cooper and lead ingots. Apart from these, *Lavezzi B* and *Capo Testa A* (Parker, 1992) both carried similar amphorae cargo than *Lavezzi A* and *Sud Lavezzi B*.

One particular case is the *Chiessi* shipwreck at the Isle of Elba (Parker, 1992). Although the site is near its supposed port of destination in Ostia, we can still determine that it took the route through the Balearic Islands thanks to some wine amphorae PE-25/Ramon 25 (Fig.12) from Ibiza which were carried with the main cargo of Baetican Dressel 20, Beltran 2A, Beltran 2B and Haltern 70.

Some other shipwrecks carrying only products from Tarraconensis, mainly Dressel 2-4 wine amphorae, were also found lying on the seabed of the Boniface strait:

Cavallo A (Sciallano & Liou,1985) transported tarraconensis Dressel 2-4 amphorae. Most of the amphorae from *Cavallo A* are stamped *P.TE* which relates these amphorae with the kilns at Torre Llauder in Lluro (Mataró) near Barcelona; but also with its final port at Ostia where this stamp has been also recorded (Tchernia,1985). Other stamps in the amphorae of *Cavallo A* were *MALI*, which also appears in *Île-Rousse* shipwreck, and *OPTATI* which frequently appears on the Dressel 20 at Monte Testaccio and Ostia and in some Dressel 20 found in London, Lyon (France) and Mainz (Germany) (CORPUS CEIPAC, 2013).

Sud Lavezzi C (Sciallano & Liou,1985) transported tarraconensis Dressel 2-4 amphorae. All recorded amphorae from the wreck had stamps on them. Those which provide us with valuable information about the maritime trade routes in western Mediterranean are:

- *A*, also found at *Diano Marina, Grand-Rouveau, La Chrétienne H, Planier D* and relates those Dressel 2-4 with several kilns near Barcelona which produced Pascual 1 (Fig.11) wine amphorae at the end of the Republican period.
- *AC*, also found in some amphorae at *Chrétienne H* and in Republican Pascual 1 amphorae made at El Moré near Barcelona (CORPUS CEIPAC, 2013).
- *CELSI*, which has been found in Dressel 20 amphoras from *Cerro de los Pesebres* at the Guadalquivir valley (Spain) and in the gulf of Fos (France); however, Scialiano and Liou (1985: 137) wrote that this stamp come from the Kilns of *Can Tintorer* and *Can Pedrerol*, near Barcelona.
- *PHIL*, which also appears at *Pétit Conglué* shipwreck. *PHIL* is combined with *SC* and *AC* in both shipwrecks (CORPUS CEIPAC, 2013).
- *VIC*, which also appears at *Chrétienne H* (CORPUS CEIPAC, 2013).

Est-Perduto (Sciallano & Liou,1985) transported tarraconensis Dressel 2-4 amphorae but also a Ramon 25 from Ibiza was recovered from the site (Fig.25). A stamp, *APO*, found in the Dressel 2-4 relates this cargo with the Dressel 2-4 at *Chrétienne H, Diano Marina* and with the anchorage of *Les Sorres* near Barcelona (CORPUS CEIPAC, 2013).

Perduto (Sciallano & Liou,1985) transported tarraconensis Dressel 2-4 amphorae. Two stamps *CISSI* and *HIL* were identified. *HIL* was also found on Dressel 2-4 at *Chrétienne H* (CORPUS CEIPAC, 2013).

Summary

To sum up, all the shipwrecks listed in this section confirm first of all the extraordinary vitality of the agricultural estates producing olive oil and wine and the fish factories in the provinces of Baetica and Tarraconensis during the 1st and 2nd centuries AD; secondly the existence of a strong network of rich traders who exported their products not only to Rome but also up the Rhône river to Germania and Britannia; finally it has been also confirmed the relatively stable and standardised typology of amphorae (Dressel 20 for the oil from Baetica, Dressel 2-4 for the wine from Tarraconensis, Dressel 7-11 for the Garum from Baetica) used for the transport of those products.

4.1.2. Baetica and Tarraconensis to Rome through the coasts of Gaul and Italy

This route was taken by the ships transporting, to Italy and Rome, the Tarraconensis wine, the Baetican olive oil, *Garum* and wine and the Baetican copper, tin and lead ingots. It was also used for exporting wine from Gaul and fine ware from Narbonensis.

However, the main difficulty when studying this maritime route is to guess, as Jézégou (1997) rightly suggested, if the shipwrecks found in northern Spain and southern France had Rome as their final destination or, on the contrary, were heading either the Rhône river delta and then, Germania and Britannia, or the port of *Narbo* (Narbonne, France). Moreover, some of these shipwrecks with Iberian cargo reported on the coasts of Tuscani, could have taken an alternative route from south-eastern Gaul, then sailing across the gulf of Genes and arriving to the north of Corsica to head afterward to Elba Island and finally Ostia (Tchernia, 1985).

Several shipwrecks have been reported in the south-eastern coasts of France with a cargo of products from Baetica: *Planier B* (Parker, 1992; Amar & Liou, 1984) near Marseille; *Saint Honorat* (Parker, 1992) near Cannes; and *Villepey* (Parker, 1992; Benoit, 1960) south-west of Fréjus. All of them were transporting, supposedly to Italy, Dressel 20 amphorae containing olive oil and in *Planier B* also copper ingots from Sierra Morena (Baetica). We can also find several shipwrecks which were carrying exclusively products from tarraconensis, mainly Dressel 2-4 wine amphorae:

Planier A (Sciallano & Liou, 1985) near Marseille with a cargo of Dressel 2-4 wine amphorae stamped *A*, *M* and *M·S·PVP* (Fig. 44).

Pétit-Conglué (Sciallano & Liou, 1985) near Marseille with a cargo of *Dolia* and Dressel 2-4, some of them stamped: *AMAND*, *GE*, *SC*, *PLOC* (Fig. 45). The stamp *AMAND* was also found in one Dressel 2-4 at Ostia; *SC* was found in several Dressel 2-4 at *Sud Lavezzi C* and *Chrétienne H* (CORPUS CEIPAC, 2013). According to Sciallano & Liou (1985) *PLOC* relates *Pétit-Conglué* to Castro Pretorio in Rome; but also, according to Carreras (2009: 10), to the kilns near Barcino.

Grand Roveau (Sciallano & Liou, 1985) near Toulon, with a cargo of tarraconensis 2-4 amphorae stamped *A*, *ALB*, *AM*, *B*, *BAL*, *M*, *OA*, *PF*, *QVA*, *TCL* and *TRA* (Fig. 46). According to CORPUS database (CEIPAC, 2013), the stamp *A* was also found at *Diano Marina*, *Sud Lavezzi C*, *La Chrétienne H*, *Planier D* and associates those Dressel 2-4 with several kilns near Barcelona; *ALB* comes from the kilns at Can Pedrerol, near Barcelona; *AM* was also found at *Sud Lavezzi C* and *La Chrétienne H*; *B* connects those Dressel 2-4 with the kilns at Torre Llauder, Iluro (Mataró, near Barcelona) and finally *QVA* appears on most of the Dressel 2-4 amphorae at *La Chrétienne H*.

La Chrétienne H (Santamaria, C., 1984; Sciallano & Liou, 1985) near Saint Raphaël, at the French Riviera, with a cargo of tarraconensis Dressel 2-4 amphorae stamped with 60 different stamps. According to Santamaria (1984) these stamps relate the amphorae of *Chrétienne H* with the two main kilns of Dressel 2-4 near Barcelona:

From Can Tintorer: *ACA*, *ADAN*, *AD*, *CALAM*, *CELS*, *CIAS*, *CLAR*, *HELE*, *LEAN*.

From Can Pedrerol: *AD, CELS, GRAE, PR*.

According to Santamaria (1984) some of the Stamps identified at La Chrétienne H appeared also in:

- *Sud Lavezzi C*: *A, AC, AD, AM, AN, PHIL, PR, S, SC, VIC*.
- *Diano Marina*: *A, APO, BAR*.
- *Grand-Rouveau*: *QVA*.
- *Est-Perduto*: *APO*.
- Rome: *QVA* and *S*.
- On the fluvial route to Germania and Britania: *A, AC, GEM* and *SAT*.

Dramont B (Sciallano & Liou,1985) near Saint Raphaël with a main cargo of tarraconensis Dressel 2-4 amphorae. Finally, *Les Fourmigues* (Sciallano & Liou,1985) at the Giens Peninsula near Toulon, with a main cargo of tarraconensis Dressel 2-4 amphorae stamped PHIL, LIC, and PH.

In front of the Italian coasts, three more shipwrecks help us to have a complete view of this coastal route from Hispania to Italy: *Diano Marina* (Sciallano & Liou, 1985) at San Bartolomeo mare, north-western Italy with a cargo of Dolia and tarraconensis Dressel 2-4 amphorae stamped *ASCL, C.P.F., HILARI, QV, RIM* and *TYR*. According to Sciallano and Liou (1985: 102), the stamps confirm that most of the amphorae came from the kilns of Can Tintorer, near Barcelona. At the Tuscan islands, *Gorgona A* (Parker,1992) carried a characteristic cargo of fish sauce amphoras Dressel 7-11 and Beltran 2B from Baetica. Finally *Cala Cupa* (*ibid.*) an uncommon cargo of Baetican Dressel 20 and Gaul wine amphorae Gauloise 4; probably that ship carried a full cargo of products from Baetica which were partially unloaded in a port in Gaul (Narbo?) and loading a new cargo of Gaul wine amphorae.

In Spain, the *Berà* shipwreck (Sciallano & Liou,1985), located at 20km north from Tarraco. The ship transported tarraconensis Dressel 2-4, probably just loaded in the ship for their long trip to Rome.

Furthermore, there are four other shipwrecks that we can include within this coastal route from Spain to Italy but, we cannot guess if they navigated to Italy or on the contrary they headed to the Rhône River and the fluvial route to the *Limes Germanicus* and *Britannia*:

Marseillan plage B near Agde and *Port-la-nouvelle* near Narbonne both transported a cargo of Baetican olive oil amphorae Dressel 20; moreover Marseillan plage also carried copper ingots (Parker, 1992).

Saint Gervais C (Fos-sur-mer) carried a cargo of olive oil amphorae Dressel 20 and fish sauce amphorae Beltran 2B from Baetica (Parker, 1992). Apart from that, it carried also Gaul wine amphorae Gauloise 4 which means that similarly to *Cala Cupa*, this ship should have made a commercial stop at Narbo.

Port-vendres B (Port-vendres, Perpignan) carried a complete cargo of almost all the products that the province of Baetica produced for the Empire (Fig. 47): Olive oil in Dressel 20 amphore; Wine in Haltern 70 amphorae; Fish sauce in Pompeii VII (Fig. 5) amphorae ; and tin, cooper and lead ingots (Colls et Al,1977; Parker & Prince,1981). Most of the Dressel 20 amphorae are stamped: *C.F.AV*; *C.I.F.*; *C.SEMP*; *C.SER.CR*; *L.AT*; *L.VAL.VIT*; *PHILO*; *Q.S.CR.*; *SATVRN*; *SISEN*. According to CORPUS database (CEIPAC, 2013):

- *C.F.AV*, *C.SEMP*, *L.AT*, *L.VAL.VIT*, *PHILO* have been found in London; *C.F.AV* also in Germany and Switzerland.
- *L.VAL.VIT* and *PHILO* have been found in Germany and in Gaul throughout the Rhône river Valley; one isolate example of *PHILO* has been found at Monte Testaccio.
- *SISEN* has been found at Colchester (UK), Narbonne and in Fos (France); *SISEN* also attaches the amphorae with that stamp to the kilns in Lora del Rio, Baetica.

Finally, there are two other sites which could be related with the coastal maritime route to Rome: *Oscellucia* and *Tour Sainte Marie A*, both in northern Corsica (Tchernia, 1969). The peculiarity of these shipwrecks is that although their cargo of olive oil, wine and Fish sauce came from Baetica, carried in Amphorae Dressel 20, Dressel 7-11, Dressel 12, Beltran 2A and Haltern 70, these two ships reached the coasts of Corsica too North for coming from the Balearic islands. A similar doubt came from the shipwreck carrying Dressel 2-4 and Dolia *île-Rousse*. According to Tchernia (1985) these ships coming from Hispania might have taken an alternative itinerary sailing across the gulf of Genes arriving to the north of Corsica and then heading directly to Elba Island. Four of the stamps found on the Dressel 2-4 amphorae (*P.TE*, *F*, *PF*, *NP*) came from Torre Llauder in Lluro (Mataró) near Barcelona (Tchernia, 1985).

Summary

To sum up, all the shipwrecks listed in this section confirm, first of all that the coastal maritime route between Hispania and Italy was an important and busy maritime route of the 1st and 2nd centuries AD in western Mediterranean probably because not only was used to carry commodities to Italy but also to Gaul, Germania and Britannia by means of the itineraries cited in section 2.2.1; actually on the Rhône river delta near the current cities of Sainte-Maries-de-la-mer and Fos developed some port facilities to shipped the cargo into fluvial barges, moreover the city of Arelate (Arles) became an important River Maritime trade centre. Secondly it also confirms, similarly to

the deep sea maritime route studied in section 4.1.1, the vitality of the provinces of Baetica and Tarraconensis during the 1st and 2nd centuries AD as main providers of olive oil, wine, Fish sauce, and metals to the Empire. Finally, the existence of a strong network of rich traders whose stamps and *Tituli Picti* have been found on amphorae carried through the deep-sea route through Boniface strait (section 4.1.1).

4.1.3. Baetica to Narbo and redistribution into tarraconensis

There is only one reported shipwreck which proves the existence of this cabotage trade route of redistribution connecting the port of Narbo (Narbonne) with the coastal towns and markets of south Narbonensis and north Tarraconensis. This shipwreck was found on the north side of Creus cape (Catalonia) and was named *Culip IV* (Nieto & Picon, 1986). It carried amphorae Dressel 20 (olive oil), Haltern 70 (wine) and Beltran 2B (Fish sauce); it also carried a cargo of fine ware *Terra Sigilata* from Gaul and oil lamps from Italy. According to Nieto and Picon (1986), also confirmed by Pomey (1997: 152) it was this diversity in the origin of the cargo which rapidly dismisses the possibility of a ship coming from Baetica; the cargo of *Culip IV* was loaded in the port of Narbo with commodities from different parts of the Empire and from there, they were re-distributed by sea to other ports in the region.

Summary

To sum up, the example of *Culip IV* shows the existence, as Pomey (1997: 154) suggests, of an important network of redistribution parallel to the main maritime route from Hispania to Italy. This redistribution trade consisted, as Pomey (1997: 154) and Arnaud (2005: 109) clearly stated, in the existence of some important ports along the coasts of north Tarraconensis, Narbonensis and northern Italy which were the final destination for the journey of the trade ships. From those ports, the different commodities were loaded in local ships and redistributed by means of cabotage all through the nearest region. *Culip IV* also attests the significance of the port of Narbonne in the maritime trade networks on western Mediterranean as proved by one of the mosaics on the Square of the Corporations at Ostia (fig.48).

4.2 Maritime routes during the Late Empire

In chapter 3 we have seen that the north African provinces of Mauretania Caesarensis, Numidia and Africa Proconsularis developed during the 1st and 2nd centuries AD an extraordinary network of agricultural estates which initially supplied Rome with grain. These estates quickly developed a production of olive oil and wine which was finally able of meeting the demand of these products in Rome from the second half of the 3rd century AD onwards.

As we also observed in chapter 2, new maritime trade routes were established to connect the centres of agricultural production in North Africa with their markets in Rome and other provinces.. Nevertheless, as we will see in this section, the Hispania Provinces continued with their agricultural and mine production exporting their products through the maritime routes referred in section 4.1.

The research about the maritime trade networks during the 1st and 2nd centuries AD was facilitated by the published literature about shipwrecks, the standardised typology of amphorae and the wide bibliography about Dressel 20 amphorae and their stamps. In contrast, when the same Methodology of study has been applied to the maritime trade during the Late Empire, we have realized, first of all, that there is very few literature about shipwrecks from this period, secondly the typology of amphorae is much more diverse and less standardised, next we also face the problem of an hypothetical reuse of some typology of amphorae and finally the reduced number of stamped amphorae on this period has also reduced the number of researchers interested in publishing about Late Roman Empire amphorae. Fortunately those who decided to accept the challenge have published very detailed works about maritime trade networks on western Mediterranean during this period.

A detailed table of all the shipwrecks studied in this section with references to Parker's (1992) work can be found in Appendix 1.

4.2.1. North Africa to Rome

This maritime route which connected the North-west Africa provinces to Rome through the Isle of Sicily has been confirmed by several shipwrecks reported in Sicily and the south-western coast of Italy (Parker,1992). However for the reasons already explained in the Introduction, we are going to study only those which have been scientifically published.

The shipwreck of *Plemmirio B* (Gibbins & Parker,1986) in the south-eastern coasts of Sicily, near Syracuse, is one of the earliest examples of this maritime trade route which transported North African amphorae containing olive oil and wine to Rome and Italy. The *Plemmirio B* transported olive oil into amphorae Africana 1 and wine into amphorae Africana 2A. According to Gibbins & Parker (1986: 279), the cargo also included some wine amphora Dressel 30 from the kilns of Tubusuptu in Mauretania Caesarensis. The Africana 1 and Africana 2B of *Plemmirio B* related this shipwreck with *Punta Cera* shipwreck in Elba Island.

Femina Morta (Parker,1992) is another example of this trade route. The cargo of Femina Morta was composed by olive oil amphorae Africana 1, Africana 2B-D (olive oil or fish sauce), and pottery Chiara D; moreover fish sauce amphorae Almagro 51C from Baetica were also reported on

the site. The presence of Baetican amphorae, which was also reported in other late Roman Empire shipwrecks excavated in Sicily, introduce an interesting question: Were the fish factories of Baetica, and Mauretania Tingitana exporting their products to the port of Carthage and from there to Rome in mixed cargo ships with African commodities?

South from *Plemminio B*, near Passero cape, lie the *Marzamemi D* (Parker, 1992), and *Marzamemi F* (Parker, 1981; 1992). The first one carried a cargo of African fish sauce in Africana 2D amphorae, and Baetican wine in amphorae Beltran 68 (Fig. 31). The second one carried a cargo of Baetican fish sauce amphorae Almagro 51C; African fish sauce amphorae Africana 2B-D; and African wine Amphorae Dressel 30. Similar assemblage to *Marzamemi F* was carrying the *Levanzzo I* (Royal and Tusa, 2012) a shipwreck discovered in deep waters in 2005 in the Egadi Islands. *Levanzzo I* was carrying amphorae Africana 2C-D, Africana 1, Dressel 30 and Almagro 51C. This shipwreck was recently published and consequently does not appear in Parker's list.

West of cape Passero, it was found the *Randello* shipwreck (Parker, 1986) with a cargo of Lusitan Almagro 50 fish sauce amphorae. Moreover, near Ognina cape, was found another shipwreck called *Ognina A* with a mixed cargo of African olive oil amphorae Africana 1, Baetica olive oil amphorae Dressel 20 and Baetican fish sauce amphorae Beltran 2B.

Summary

To sum up, all the shipwrecks listed in this section confirm the raising of North African Provinces as new main suppliers of Olive oil and Fish sauce to Rome. The process of agricultural development (section 3.2.1 and 3.2.2) achieved by the North-west Africa provinces during the 2nd and 3rd centuries AD and the increase of their production of olive oil, fish sauce and wine, is clearly showed by shipwrecks evidence. Moreover the administrative reforms of Diocletian and Constantine also contributed to the development of new maritime trade networks between Italy and North-west Africa (section 3.2.2) and consequently to the increase on the activity of trade ships in the area. Apart from this, all these shipwrecks carrying mixed Hispania an African cargo raise again the issue of a probable coastal maritime route from Hispania all through the coasts of North Africa to Carthage; there, the Hispanian amphorae were probably load in ships carrying African products to Italy and Rome.

4.2.2 North Africa to Southern France through the coasts of Italy

Several shipwrecks carrying African commodities have been reported near Elba Island and Giglio Island, but also at the south eastern coasts of France. These evidences confirm the revival of the ancient maritime route which in Republican times connected Italy with the Roman colonies in southern France and Hispania. As we have also seen in the previous section, this itinerary was also

used, but in opposite direction during the 1st and 2nd centuries AD to supply Rome with Hispanian products. Although Portus is on the coastal itinerary to the north, there are no evidences about ships stopping there if their cargo was not addressed to Rome; but this cannot be rejected neither.

The five shipwrecks found in the area between Elba Island and Giglio Island probably came from Carthage with a cargo of olive oil and wine produced in Africa Proconsularis and Byzacena according to the amphorae they carried.

- **Giglio Porto** and **Punta Cera** carried Africana 2A (Parker, 1992).
- **Punta del Fenaio** (Parker,1992; Bound,1987) carried Africana 2B and a main cargo of Tubi Fittili (vaulting tubes).
- **Porto Azzurro A** carried Africana 2D (Parker,1992).
- **Pian di Spille** carried Africana 3 (Parker,1992).

Different stamps were reported in *Giglio Porto* (*LAS* and *FLP*) and *Punta Cera* (*CPC*). *LAS* and *CPC* have been only previously found in Dressel 20 amphorae (CEIPAC-CORPUS, 2013).

The three other shipwrecks belonging to this coastal maritime route were discovered on the south-east coast of France:

- **Monaco A** with a cargo of Africana 2A (Parker,1992).
- **La Luque B** (Parker,1992) with a cargo of fish sauce amphorae Africana 3A and a secondary cargo of African oil lamps.
- **Dramont E** (Santamaria,1995) with olive oil in Keay 35A amphorae (Fig 28), fish sauce in Keay 35B and olives in Spatheion 1 and Africana 3C. All this cargo came from Africa Proconsularis and was dated between AD 425 and AD 455 (Santamaria,1995: 191).

Summary

To sum up, a detailed analysis of all the shipwrecks listed on this section not only confirms the coastal trade route connecting Africa Proconsularis with southern Gaul through the coasts of Italy, but also would confirm a maritime trade network connecting the Port of Carthage, with Narbo or Massilia (Marseille) during the late Roman Empire. Moreover some of these ships going to Gaul could also have taken the alternative itinerary from Elba Island heading to the north of Corsica and then sailing across the gulf of Genes to southern Gaul. Apart from this, Santamaria (1995: 191) argued that the dating of **Dramont E** would confirm the use of this ancient trade networks by the new Vandal kingdom in North Africa. Indeed, the Vandals, after taken Carthage in AD 439, still maintained some of the maritime trade networks with the Visigothic kingdom in southern Gaul (section 3.2.3).

4.2.3 North Africa to Southern France through Sardinia

The deep-sea maritime route connecting North Africa with Gaul proposed by Jézégou (1997: 145) could be confirmed by the *Fontanamare A* and *Sant'Antioco A* shipwrecks which were found on the south-western coasts of Sardinia and by the *Isis* shipwreck (Ballard & Archbold,1990) discovered in deep-sea waters between Sicily and the southern coast of Sardinia. As Arnaud (2005: 56) pointed out, the deep sea itinerary connecting Gaul to North Africa was only possible to sail in the direction north-south; probably for that reason the ships heading Gaul from Africa followed the route through Sardinia and Corsica. *Fontanamare A* and *Sant'Antioco A* both carried amphorae Africana 2 and a secondary cargo of African fine-ware. The *Isis* shipwreck carried Africana 3, Key 53 and Key 32 amphorae.

However, only three shipwrecks cannot be considered enough information to confirm a trade route about which we do not have any other references. Moreover, as Parker (1992: 180; 384) pointed out, *Fontamare A* and *Sant'Antioco A* have been only briefly reported. Nevertheless what these shipwrecks can confirm is the wealthy situation of the agricultural production in North Africa during the 4th century AD and the existence of an important community of traders probably in Carthage which maintained their commercial networks with other regions of western Mediterranean such as Gaul.

4.2.4 North Africa to Hispania

The main difficulty to confirm the characteristics of this coastal trade route between North Africa and Hispania is the lack of reported shipwrecks in the North African coasts (Jézégou,1997: 146). In spite of this, there is no doubt about the existence of a maritime trade network connecting North Africa to Hispania; this has been confirmed by the presence of North African Amphorae in Tarraconensis (Key, 1982; 1984) and in Baetica (Amores, Vargas and Gonzalez, 2007).

Two shipwrecks can confirm this maritime route, *Las Hormigas* in southern Spain not far away from Carthago Nova and the North African Shipwreck of *Cap de Garde* (Algeria).

According to Parker (1992) *Cap de Garde* shipwreck was carrying a cargo of fish sauce in Africana 2D amphorae. Although these amphorae are usually produced in the kilns of Byzacena (South east Tunisia), Parker (1992: 102) suggested that probably these amphorae belonged to a local coastal trade with reused amphorae.

La Hormigas shipwreck (Mas,1982: 167; Parker,1992) was carrying a complete cargo of African olive oil amphorae Key 35A. The supposed itinerary of the ship would confirm a technical stop in Carthago Nova, probably to unload part of the Cargo before continuing north to some other port in

Hispania. This shipwreck also confirms that the Vandals continued with the maritime trade activity in North Africa after taking control over the territory on the first half of the 5th century.

4.2.5 Lusitania, Mauretania Tingitana and Baetica to Italy through the coasts of Tarracoensis and Gaul

The coastal maritime route which in the past was used to carry commodities from Hispania to Rome (section 4.1.2), will still be used, during the Late Roman Empire, to carry the Baetican olive oil and fish sauce to Narbonne, southern Gaul and north of Italy.

Several shipwrecks found in southern France carrying Baetican and Lusitanian fish sauce amphorae also carried cylindrical North African amphorae; this could be explained for two main reasons:

- According to Keay et al. (2001: 118), could have exist a little production of Africana 2A at *Celti* (Peñaflor) in the Guadalquivir valley.
- *Carthago Nova* (Cartagena) recieved at that time African commodities from Mauretania Caesarensis and even Carthage. Some of the African amphorae which arrived into Carthago Nova could have been loaded later in other ships mixed with Baetican cargo.

Les Catalans shipwreck (near Marseille) and *La Chrétienne D* shipwreck (near Saint Raphael) both carried Lusitanian fish sauce in amphorae Almagro 51 A and C and Beltran 72 (Liou,1973: 586); according to Parker (1992) they also carried olive oil in Dressel 23. No other information have been published about the Dressel 23 on these shipwrecks, actually Liou (1973: 586) didn't talked about Dressel 23 but only about an amphora which 'in its upper section looks like a Dressel 20 type'.

Near Saint Tropez was discovered the *Pampelonne* shipwreck; this ship was carrying fish sauce into Lusitanian amphorae Almagro 51 C, Baetican/Lusitan Beltran 72, and North African Africana 3A.

In front of the coasts of Narbonne the *Mateille A* shipwreck carried a similar assemblage of cargo than *Les Catalans*. The cargo of the *Mateille A* shipwreck was composed of Lusitanian amphorae Almagro 51A, African amphorae of an undetermined type from Byzacena (Solier et al.,1981: 177) and 413 coins dating from the later 4th century AD (Solier et al.,1981: 208). Although Parker (1992: 271) suggest the presence of amphorae Dressel 23, Solier et Al. (1981: 177) only talks about type Almagro 51 amphorae similar to those in *Les Catalans* shipwreck.

Finally, **Port-Vendres A** which carried Lusitanian fish sauce amphorae Almagro 50 and Almagro 51C (Fig.49). Although most of the literature written about Port-Vendres A focused on the study of the well preserved hull and not in the study of the cargo, the information for this section have been obtained from the original rapport of the excavation, the work of Chevalier & Santamaria (1971) and the work of Parker (1992: 329).

Summary

To sum up, all these shipwrecks confirm the surviving of the traditional maritime coastal trade route from southern Hispania to Italy during the late empire. Although Carreras (1992) and Remesal Rodriguez (1986) confirmed with the archaeological evidences in land the supply of Germania and Britannia with olive oil from Baetica carried in Dressel 23 amphorae, none of the evidences can confirm amphorae Dressel 23 in these shipwrecks. On the contrary, the main product carried was fish sauce coming from Lusitania. This proves, as we will see in chapter 5, that Lusitania also profited from the changes and transformations that Baetica and its commercial network suffered during the 4th and 5th centuries. Finally, the unusual African cargo of amphorae from Byzacena reported by Solier et al. (1981: 177) could be explained by three different theories explained in this section. We will return in chapter 5 to the theory of the reuse of the amphorae suggested in the works of Callender (1965), Beltrán Lloris (1970) or Paterson (1982).

4.2.6 Hispania to Rome through Balearic Islands and Boniface strait

The shipwrecks dating from the 3rd, 4th and 5th centuries AD which have been found in the Balearic Islands, northern Sardinia and the Boniface strait prove the survival, during the Late Empire, of the previous 1st and 2nd centuries AD deep sea route from Hispania to Italy. Moreover, the typology of amphorae which was carried in those ships has been used by some scholars (Remesal Rodriguez, 1986; Carreras, 1992) to support they theories about the survival of a Baetican olive oil and Garum production addressed to Rome which traditionally had been considered finished by some other scholars (Blazquez Martinez,1968; Thouvenot,1973) based on the data obtained from Monte Testaccio in Rome.

Near Majorca Island were excavated three shipwrecks dating from the 3rd and 4th centuries AD with a similar assemblage of cargo: **Cabrera A** (Parker, 1992) was carrying Lusitanian fish sauce amphorae Almagro 50 and Almagro 51C together with Baetican/Lusitan fish sauce amphorae Beltran 72 and Africana 2B-D amphorae. Some of the North African amphorae were stamped (*COL*, *MAL*, *TOP*, *MAE*, *FAN*, *FORT*). According to the Corpus Database (CEIPAC, 2013) *TOP* relates these amphorae with other African amphorae found in Monte Testaccio; *COL* was found in a Dressel 20 in Lincoln (UK). The shipwreck of **Cap Blanc** was also carrying a mixed cargo of

Lusitan Almagro 51C, Baetican Beltran 72 and Africana 2B-D. On the other hand, amphorae Africana 2A were reported in the *Dragonera A* Shipwreck (Parker,1992).

One more Balearic shipwreck merits to be considered in this list, the shipwreck *Cabrera C* which carried a full Baetican cargo of olive oil in Dressel 20 and Dressel 23 amphorae, Fish sauce in Beltran 72 amphorae and wine in Beltran 68 amphorae. If we considered the logical assemblage of the cargo, we could suggest the Beltran 72 belonged also to Baetica Kilns and not to Lusitanian ones; however a petrology analysis would be necessary to confirm this statement.

Two more shipwrecks with a mixed cargo of Baetican and Lusitanian amphorae were reported on the Boniface strait and north of Sardinia: *Sud Lavezzi A* carried a cargo of Baetican Olive oil in Dressel 23, and Lusitanian Fish products in Almagro 50, Almagro 51A , Almagro 51C and Lusitania/Baetica fish sauce in Beltran 72. The shipwreck of *Lazzaretto* carried an assemblage similar to Sud Lavezzi A (Almagro 50 and Almagro 51C) together with North African amphorae Africana 2D and Dressel 30.

Summary

To Sum up, the shipwrecks analysed in this section confirm the survival of the maritime route connecting Hispania to Italy through the Balearic Islands and the Boniface strait during the Late Empire. Although the cargo of the analysed shipwrecks was composed mainly by Lusitania fish sauce and North African amphorae, the evidence of Dressel 23 and Beltran 72 such as those in Cabrera C and Sud Lavezzi A would confirm the survival of a little production of Baetica olive oil and *Garum* addressed to the Italian market.. The case of all those African amphorae produced in the kilns of Africa Proconsularis or Byzacena found in ships coming from Lusitania and Baetica takes us to the classical discussion about the reuse of the African amphorae during the later Roman Empire (Callender,1965; Beltrán Lloris, 1970; Paterson,1982). We will use this theory to consider that the African amphorae described in this section were in fact reused amphorae which had arrived probably into the port of Carthago Nova and were reused later to carry Baetican products to other destinations. We will return in chapter 5 to this debate.

5. Discussion. Effects of the political, economic and social transformations during the Late Roman Empire on the maritime trade networks in western Mediterranean.

According to the analysis of the data presented in the previous chapters of this Dissertation, it is possible to identify three main periods in the evolution of the maritime trade networks in western Mediterranean during the Roman Empire clearly determined by the political, economic and social transformations on the western Provinces but also by the political changes and economic decisions of the central government of the Empire in Rome: First of all the 1st and 2nd centuries AD when the Roman provinces in Hispania became the engine for the growth of the maritime trade in western Mediterranean and its related networks; Secondly the 3rd and 4th centuries AD when Hispania was overtaken by the Roman provinces of North-west Africa and maritime trade networks in western Mediterranean adapted to that new situation; and finally the first half of the 5th century AD when the western Roman Empire collapsed and maritime trade networks in western Mediterranean were not ruled anymore by the ancient Roman logic but for the needs of the new barbarian Kingdoms.

However, for a too much time this image of the evolution of maritime trade networks in western Mediterranean during the Roman Empire was based, first of all on the data provided by the texts of the chroniclers and geographers of the Antiquity, as showed by Arnaud (2005: 149-171); and secondly on the literature about the archaeological excavations in Rome, Hispania and North-west Africa, such as the works of Blazquez Martinez (1968) and Thouvenot (1973). All these data put together with the historical studies about the Roman Empire such as those of Cook et Al. (1939), Cameron & Garnsey (1998), Jones (1973) or Cameron (1993), revealed a coherent image of the evolution of the maritime trade in western Mediterranean which seemed to fit logically all together; At least until the first scientific data about shipwrecks in western Mediterranean began to be published (chapter 4).

During the last 30 years the initial image of the maritime trade in western Mediterranean has been completed by the studies of maritime archaeologists such as Parker (1992), Pomey (1997) and Jézégou (1997) who have introduced the evidence of shipwrecks and have confirmed or adjusted the characteristics of the maritime trade networks on western Mediterranean.

With all these data, which have been synthetized in the previous chapters of this Dissertation, it is possible to redefine much more accurately the initial vision of the evolution of the maritime trade networks in western Mediterranean obtaining a complete and coherent image which includes in one single piece of academic work, the data obtained from all the different sources: the Classical

literature, the archaeological excavations, the Historical data and the evidence revealed by shipwrecks. Unfortunately, in this Dissertation this image has not been a complete image because of the word-limit and we only have focused in the specific trade of Olive oil, wine and fish sauce carried in amphorae from Hispania and North-west Africa as already explained in the Introduction.

5.1 Reconsidering the decline of Baetica and Tarraconensis trade

The 1st and 2nd centuries AD were, as illustrated in chapters 3 and 4, the golden times for the mining and agricultural production in Baetica and Tarraconensis. Moreover, the Roman aristocratic families settled in Baetica and Tarraconensis established and developed strong trade networks among the main Mediterranean ports in Hispania, Gaul and Italy as shown in the works of Pomey (1997), Jézégou (1997) and Tchernia (2011) and confirmed by the evidence of shipwrecks (section 4.1).

As the revised literature (section 1.2) about the economy of the Roman Empire and Trade in western Mediterranean suggested, and the evidence of shipwrecks (section 4.1) have confirmed, the olive oil, wine and Garum produced in Baetica and Tarraconensis supplied the needs of the huge population of Rome and dominated the western Mediterranean markets of the Empire during the 1st and 2nd centuries AD. As reported in section 2.1 all this goods were transported in amphorae of different typologies and it was thanks to these amphorae (chapters 2 and chapter 4) that the maritime trade networks in western Mediterranean were first identified by land archaeology and later confirmed by maritime archaeology.

At the end of the 2nd century AD, the invasions of the Mauri and the political repression of Septimus Severus supposed, as (section 3.1.1) the first episode of instability in the calm and peaceful Baetica. Moreover, in Tarraconensis the attacks of the army of Gaulish deserters led by Maternus caused also important disruptions in the Province. All these historical events have been seen, traditionally, as the beginning of a supposed decadence of the Hispanian provinces within the Roman Empire with continuity in the Crisis of the 3rd century. Nevertheless, according to the data presented in section 4.1, the evidence of shipwrecks show the continuity on the transport of amphorae carrying Baetican products to Rome, Gaule, Germania and Britannia into the first half of the 3rd century AD.

In Tarraconensis, as the work of Keay (1984; 1988) and Richardson (1998) stated, all traces of Spanish wine amphorae disappear by the 3rd century AD. The evidence of shipwrecks (section 4.1) also indicates the end of the transport of wine amphorae from Tarraconensis. However, this radical ending of the terrestrial and underwater evidences of Tarraconensis amphorae Dressel 2-4 could be explained by a changing into barrels as Marlière (2001: 181) had already proposed for the

transport of wine in Gaul . Indeed, the work of Marlière (2001) revealed, with archaeological evidences that barrels were used from the end of the first century for transporting the Gaulish wine up to the Rhone river for supplying the roman Legions in Germania and Britannia.

But the most controversial issue about the maritime trade in western Mediterranean during the 3rd century AD have been for a long time the disappearance of the Baetica olive oil amphorae in Monte Testaccio on the archaeological levels dating from AD 257. This have been seen by most scholars as the conclusive prove of an end of the Spanish production of olive oil caused by the barbarian invasions of the 3rd century (section 3.1.2) Nevertheless the works of Remesal Rodriguez (1986), Keay (1988) and Carreras Monfort (1992) suggested the continuity of the olive oil production and its distribution in a new typology of amphorae, the Dressel 23. This evolution has been confirmed by the archaeological evidences of amphorae Dressel 23 found in Italy (Remesal Rodriguez,1986) and Britannia (Carreras Monfort,1992) but also by the evidence of shipwrecks such as Cabrera C and Sud Lavezzi A which were carrying Dressel 23 amphorae from Hispania to Italy in the 3rd and 4th centuries AD.

5.2 The raising of North-west Africa provinces

The 3rd and 4th centuries AD supposed for the Roman provinces in North-west Africa the period of maximal expansion in their agricultural production (section 3.2.2) as confirmed in the works of Cameron (1993: 9) and Keay (1984: 410). During the 3rd century AD the demand of North African olive oil, wine and Garum, in Rome and other provinces was constantly growing and consequently the maritime trade networks in western Mediterranean had to adapt to that new situation. New trade routes appeared connecting the provinces of north-west Africa to Italy, Gaul and Hispania (sections 2.2.3 to 2.2.6); moreover, the route already used to carry grain to Rome was reinforced and increased with the trade of olive oil, wine and fish sauce.

The shipwreck evidence also confirm (section 4.2) the vitality of the maritime routes exporting North African goods to Rome and the other western provinces of the empire from the 3rd century AD onwards. Moreover, the administrative reforms put into effect by Diocletian and the attachment of North-west Africa to the *Praefecturae* of Italy caused an increase of olive oil imports into Rome from Africa Proconsularis and Byzacena to the detriment of the imports of olive oil from Hispania. The maritime routes connecting Lusitania and Baetica with Italy and Gaul also continued their activity during the 4th century AD. The shipwreck evidence (section 4.2.4 and 2.2.5) show the transport of Lusitanian Fish sauce amphorae and a remaining trade of olive oil from Baetica in Dressel 23 amphorae.

Shipwrecks not always provide answers but also create new questions. As raised in section 4.2.4 and 4.2.5 some shipwrecks showed a strange association of Lusitanian and African amphorae from Byzacena in the maritime routes connecting Hispania to Italy. Researches such as Callender (1965), Beltrán Lloris (1970) or Paterson (1982) suggested the reuse of African Amphorae for carrying commodities from Baetica.

5.3 The end of maritime trade in western Mediterranean?

The maritime trade networks in western Mediterranean during the 5th century AD were totally conditioned by two decisive events: first of all the invasions of Vandals, Suebi, Alans and Visigoths into Hispania in AD 409 and AD 415 (section 3.1.3); next the Vandal invasion of the north-west Africa Provinces in AD 429 (section 3.2.3). Moreover, the political and economic decay of Rome after losing the status as capital of the empire in AD 395 also reduced its role as principal support of the trade in western Mediterranean. As the work of Keay (1988) revealed, the first half of the 5th century in Hispania was a troubled period when all the Roman provinces of the Iberian Peninsula suffered from the political instability of the Barbarians invasions. Indeed the invasions brought an economic and social crisis which affected the agricultural producing territories of Baetica and the still active trade ports of Tarraco and Carthago Nova which however continued with their activity even if reduced (section 3.1.3). Similarly, the work of Merrills (2004) also pointed out the devastation that the Vandal invasion caused in the Roman provinces of North Africa and the changes and transformations in the agricultural producing areas of Africa Proconsularis and Byzacena. Moreover, the capture of Carthage by the Vandals in AD 439 allows them to control the trade ships and shipyards which used to extend their power to the islands and waters of the western Mediterranean Sea (section 3.2.3).

The evidence of shipwrecks such as *Dramont E* would confirm, as argued in the work of Santamaria (1995), the survival of the maritime trade networks between Carthage and the Mediterranean ports of the new Visigothic kingdom in southern Gaul, probably Narbonne. Actually, the port of Carthage still remained an active commercial port with an active community of traders and shippers (section 3.2.3). Furthermore, the location and cargo of the shipwreck of *Las Hormigas* (section 4.2.4) would also confirm the trade activity of Carthago Nova, in Hispania, during the first half of the 5th century AD and the continuity of the olive oil production in the lands North-west Africa.

To sum up, the 1st and 2nd centuries AD were the times of the great development of the agricultural production in Baetica and Tarraconensis. Furthermore strong maritime trade networks were established among the main Mediterranean ports in Hispania, Gaul and Italy to trade with the amphorae containing olive oil, wine and fish sauce from Hispania. The archaeological evidences in *Monte Testaccio* and Ostia together with the shipwreck evidence studied in section 4.1 confirm first of all the vitality of this trade; secondly the different maritime trade routes connecting Hispania with Italy and finally the existence of a wealthy community of traders and shippers whose agents were established in the main ports of Hispania, Gaul, Italy and North Africa (section 2.3)

The 3rd and the 4th centuries AD supposed for the Roman provinces in North-west Africa the period of maximal expansion in their agricultural production. The demand of North African olive oil, wine and fish sauce in Rome and the other provinces of western Mediterranean increased conditioned by their economic and political evolution and the administrative reforms in the Empire (section 3.1.2 and 3.2.2). Consequently the maritime trade networks in western Mediterranean also adapted to that new situation and new trade routes appeared connecting the provinces of north-west Africa to Italy, Gaul and Hispania. The archaeological evidence of African amphorae in Hispania (section 2.2.6), Baetican amphorae in Germania and Britannia (section 2.2.5) and the evidence of shipwrecks (section 4.2) confirm the new maritime trade networks in western Mediterranean and the continuity of those existing in the previous centuries.

Finally, during the first half of the 5th century AD the maritime trade networks in western Mediterranean needed to adapt to the new logic and needs of the new barbarian Kingdoms. Visigoths became the new rulers of the political and economic situation in southern Gaul and Hispania and Vandals controlled the rich agricultural provinces of North-west Africa and the navigation in western Mediterranean. However, the Barbarians invasions did not finish with the maritime trade in Mediterranean as proved by the evidence of shipwrecks such as *Dramont E* and *Las Hormigas* (sections 4.2.2 and 4.2.4).

Conclusion

In conclusion, the study of the economic, political and social contexts of shipwrecks has provided, during the last decades, archaeologists and historians with new information and about the maritime trade networks of the western Mediterranean during the Late Roman Empire. Traditionally, the study of the maritime trade on western Mediterranean has focused first of all, on the analysis of the evidences found in archaeological sites normally related with the trade and distribution of amphorae and fine ware; secondly in the descriptions of geographers and chroniclers of antiquity; next in the evidence provided by steles, mosaics, bas-relief and its epigraphy; and finally, after the development of maritime archaeology, in the individual analysis of shipwrecks and maritime infrastructures. On the other hand, a broad academic literature has been published about the political, social and economic evolution of the Roman provinces in western Mediterranean. However, very few scholars have tried to put all these data together in order to elaborate a unique and multidisciplinary study about trade in western Mediterranean.

The objective of this dissertation has been to make a multidisciplinary approach to the maritime trade in western Mediterranean during the Roman Empire trying to evaluate to what extent the shipwrecks of that period illustrate the economic, social and political transformations which affected the western Roman provinces during the Late Roman Empire. Analysing the cargo transported on those ships and the location of the shipwrecks we have tried to evaluate which were the changes, transformations or simply evolution on the maritime commercial networks in western Mediterranean.

The result is an image of the evolution of the maritime trade networks in western Mediterranean divided into three periods: First of all the 1st and 2nd centuries AD when the Roman provinces in Hispania became the engine for the growth of the maritime trade in western Mediterranean and its related networks; Secondly the 3rd and 4th centuries AD when Hispania was overtaken by the Roman provinces of North-west Africa and maritime trade networks in western Mediterranean adapted to that new situation; and finally the first half of the 5th century AD when the western Roman Empire collapsed and maritime trade networks in western Mediterranean were not ruled anymore by the ancient Roman logic but for the needs of the new barbarian Kingdoms.

However, the word limit has made impossible a deeply analysis of all the different aspects that must be taken into account in the study of the maritime trade networks in western Mediterranean during the Late Roman Empire. Consequently many interesting topics are still open for further discussion or a prospective Doctoral Research.

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Figures

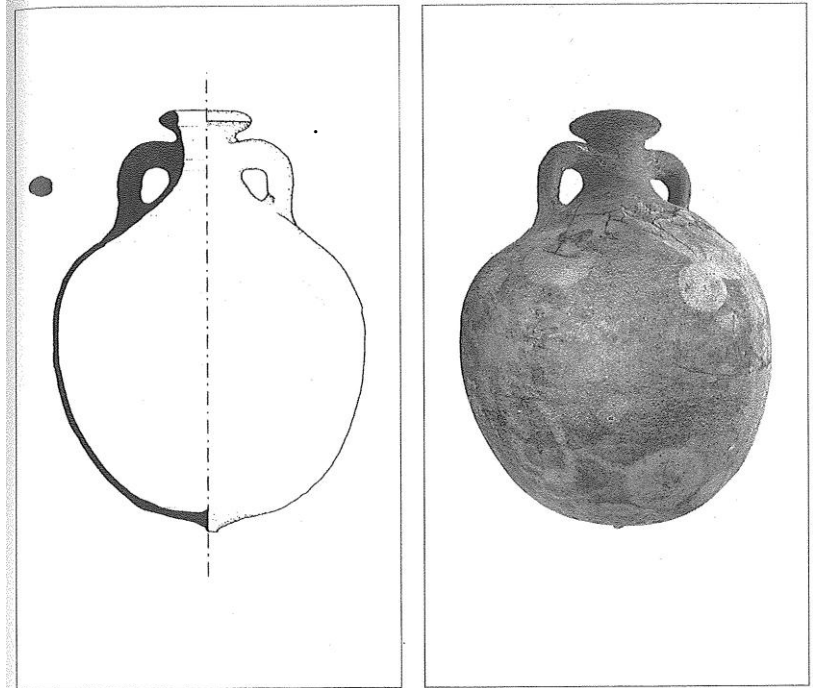
Fig. 1 Dressel 20

Origin: Baetica.

Content: olive oil.

Dimensions: 75cm high,
55-65cm wide.

Diffusion: From the 1st C. AD
to the 3rd C. AD.



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

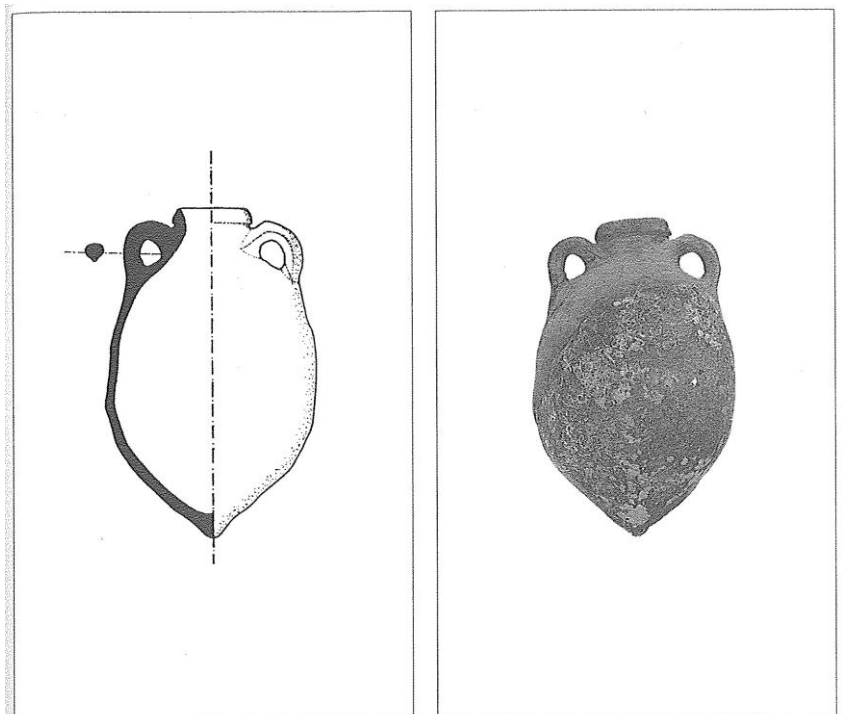
Fig. 2 Dressel 23

Origin: Baetica

Content: olive oil.

Dimensions: 55-60 cm high,
35cm wide.

Diffusion: 3rd and 4th C. AD.



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

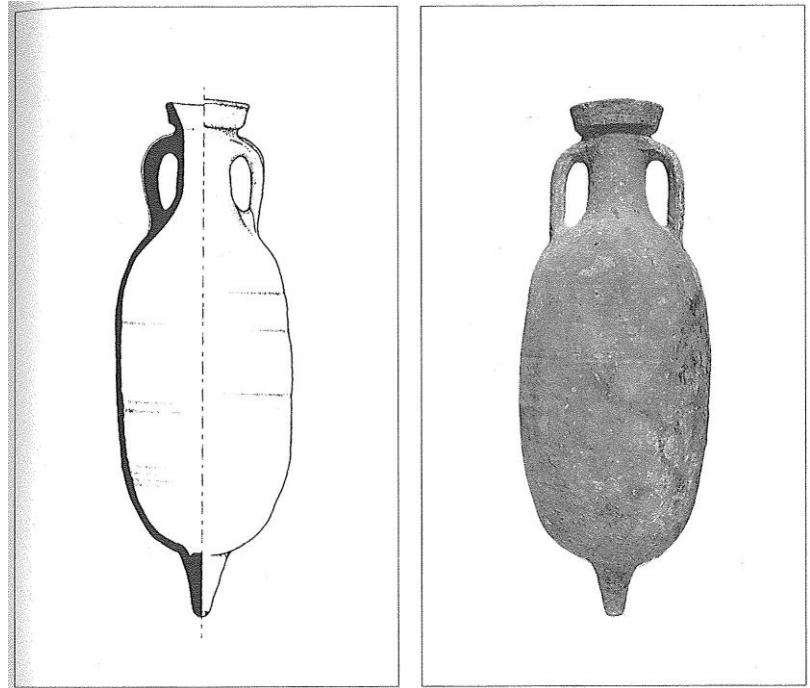
Fig. 3 Haltern 70

Origin: Baetica.

Content: Wine

Dimensions: 70 to 90cm high,
30 to 35cm wide

Diffusion: 2nd half 1st C. BC
to 2nd half 1st C. A.D



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

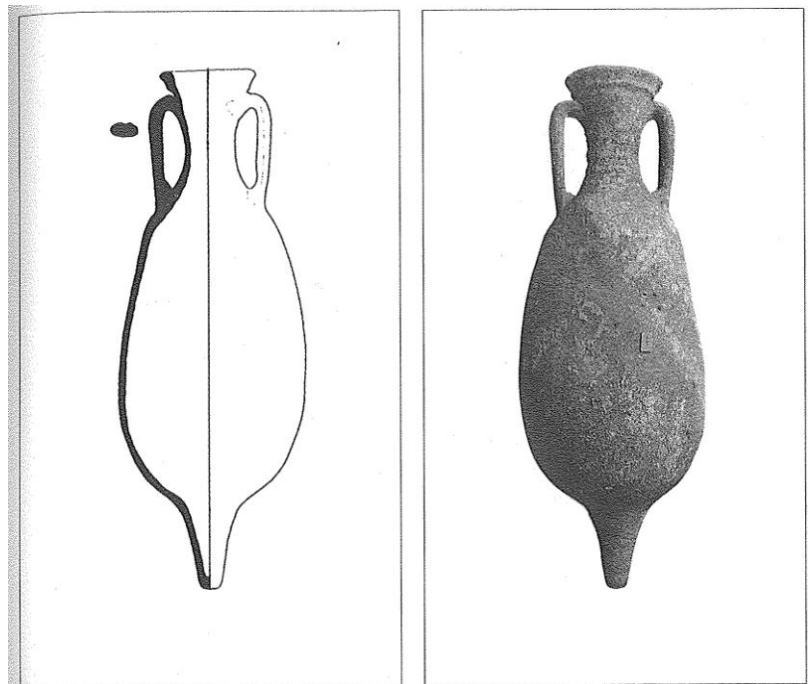
Fig. 4 Dressel 7-11

Origin: Baetica.

Content: Fish Sauce

Dimensions: 85 to 90cm high,
30 to 35cm wide

Diffusion: End 1st C. BC to
the end of 1st C. AD



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

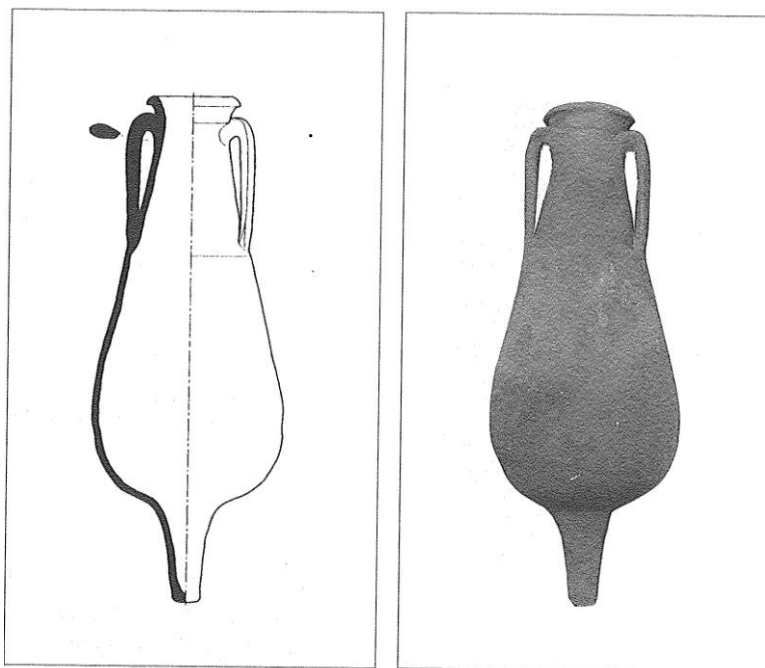
Fig. 5 Pompei VII

Origin: Baetica.

Content: Fish sauce

Dimensions: 80-90 cm high,
30-35 cm wide

Diffusion: 2nd half 1st C. AD
to end 2nd C. AD



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

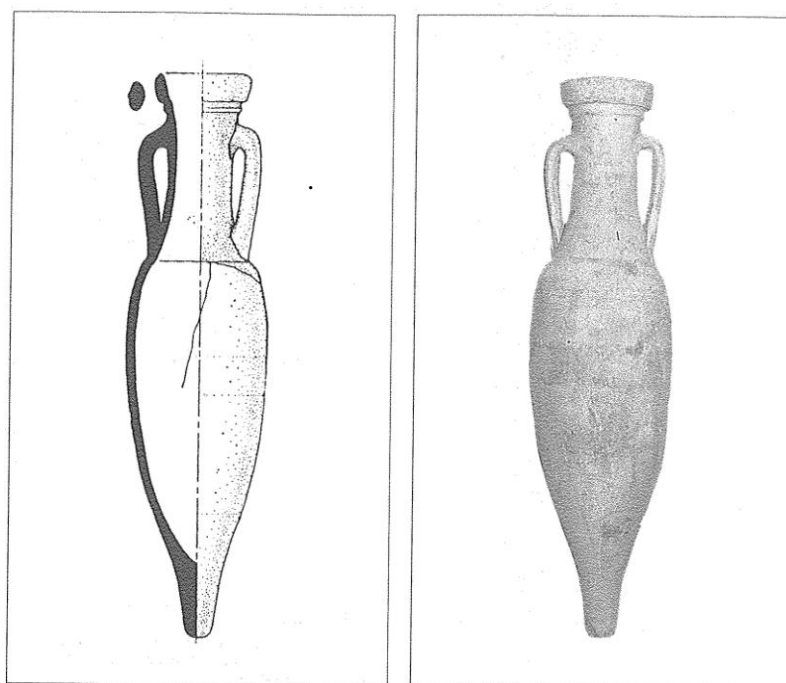
Fig. 6 Dressel 12

Origin: Baetica.

Content: Fish sauce
and Fish based products

Dimensions: 103 to 105 cm high,
25 to 30cm wide

Diffusion: Last half 1st C. BC
to last half 1st C. AD



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

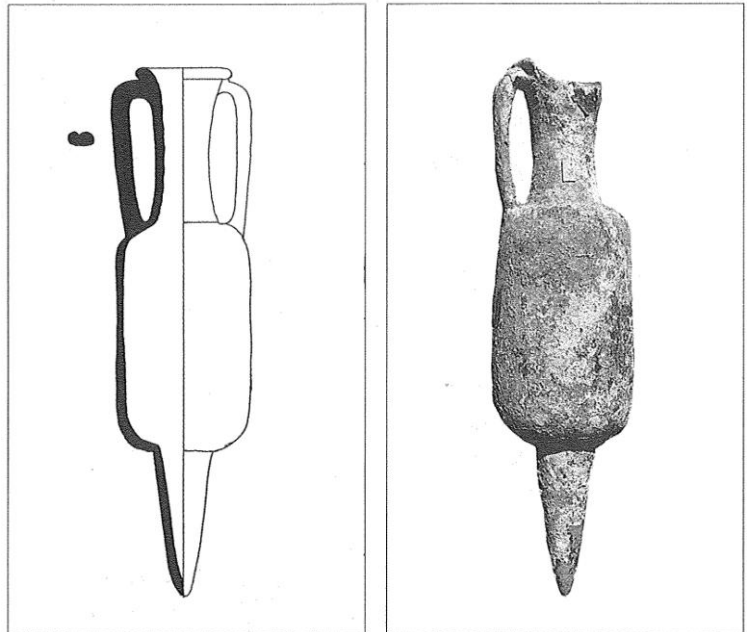
Fig. 7 Dressel 14

Origin: Baetica.

Content: Fish Sauce.

Dimensions: 100 to 110 cm high,
30cm wide

Diffusion: First half 1st C. AD. to
end of 2nd C. A.D



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud

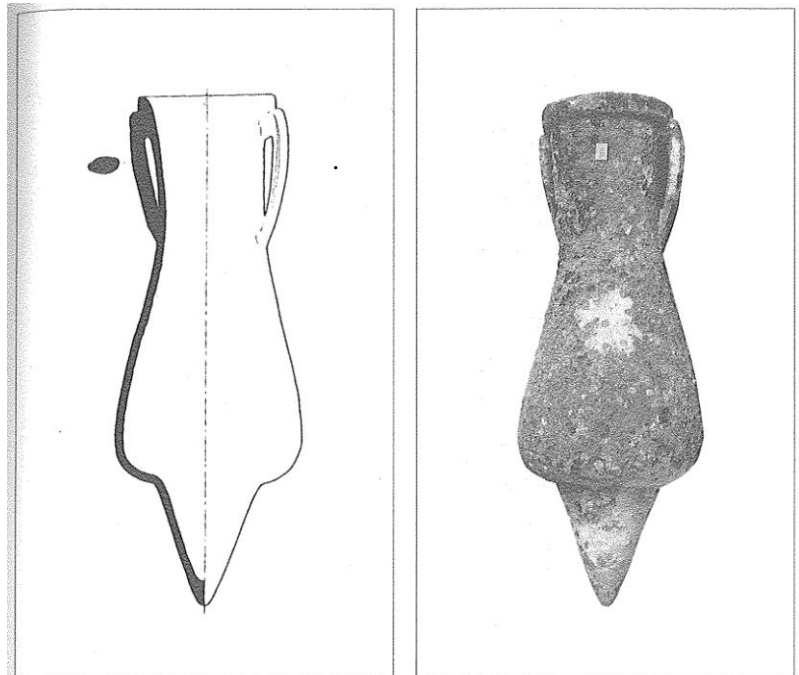
Fig. 8 Beltran 2A

Origin: Baetica.

Content: Fish sauce
and Fish based products

Dimensions: 90-100 cm high,
30-35 cm wide

Diffusion: First half 1st C. AD
to last half 2st C. AD



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud

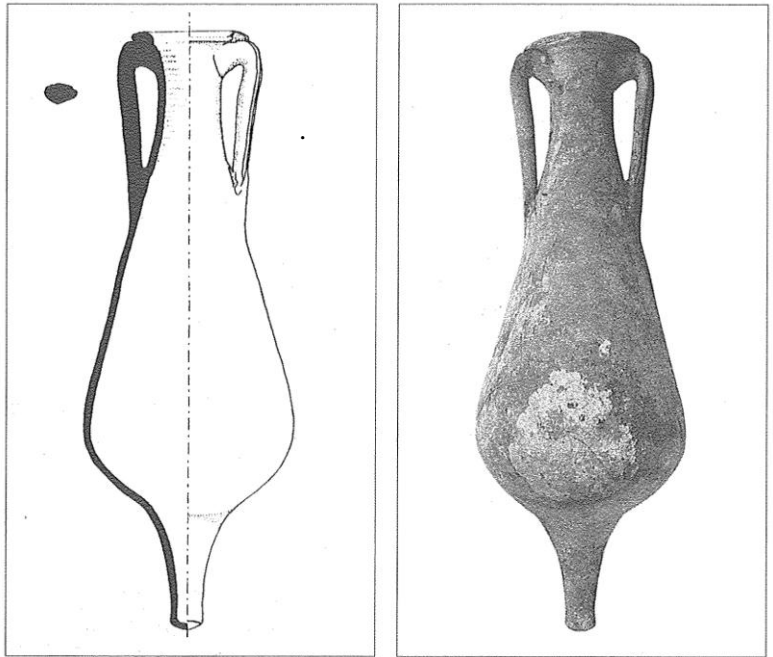
Fig. 9 Beltran 2B

Origin: Baetica.

Content: Fish sauce and fish based products

Dimensions: 100-110 cm high, 35 cm wide

Diffusion: First half 1st C. AD to first half 2nd C. AD



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

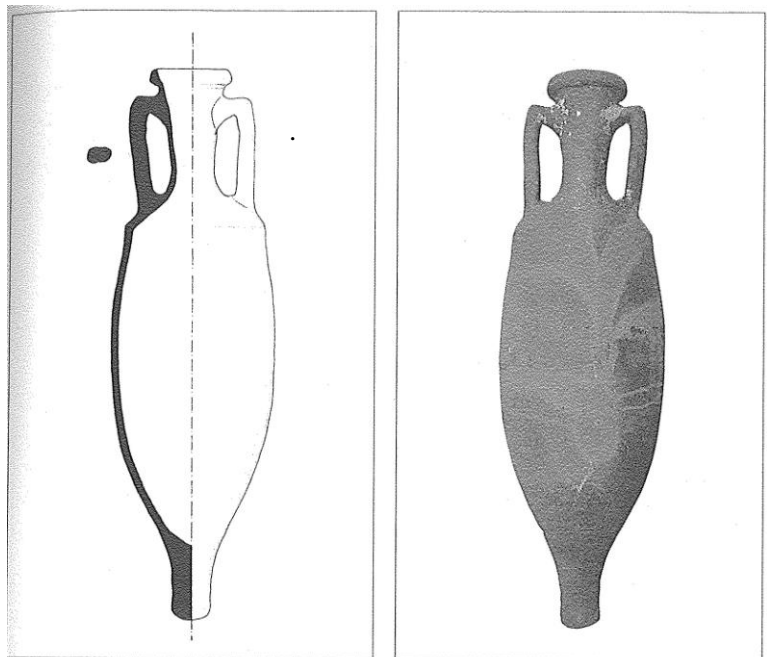
Fig. 10 Dressel 2-4

Origin: Tarraconensis.

Content: wine.

Dimensions: 95-110cm high, 30 cm wide.

Diffusion: 2nd half of 1st C. BC to 2nd half of the 1st C. AD



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

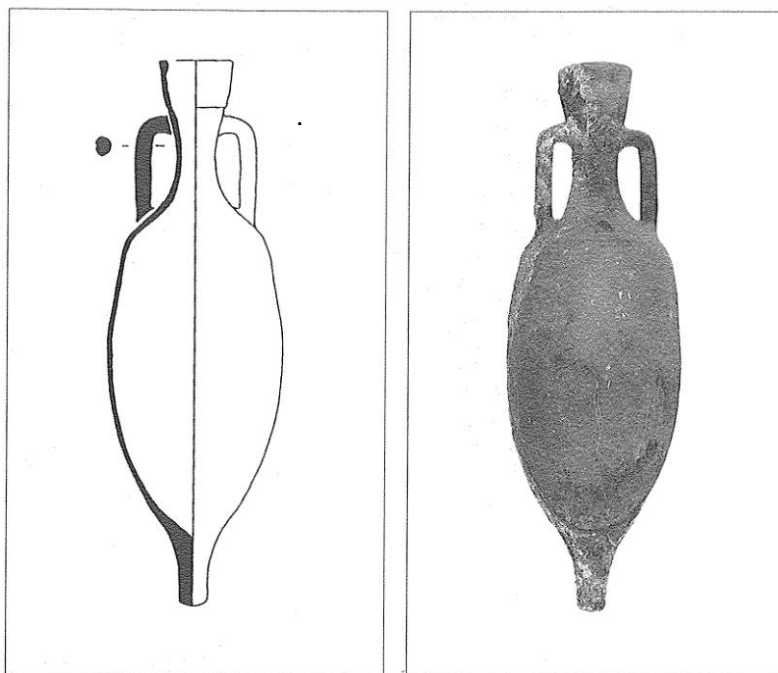
Fig. 11 Pascual 1

Origin: Tarraconensis

Content: wine.

Dimensions: 95-110 cm high,
30 cm wide.

Diffusion: 2nd half of 1st C. BC
to 1st half of the 1st C. AD



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

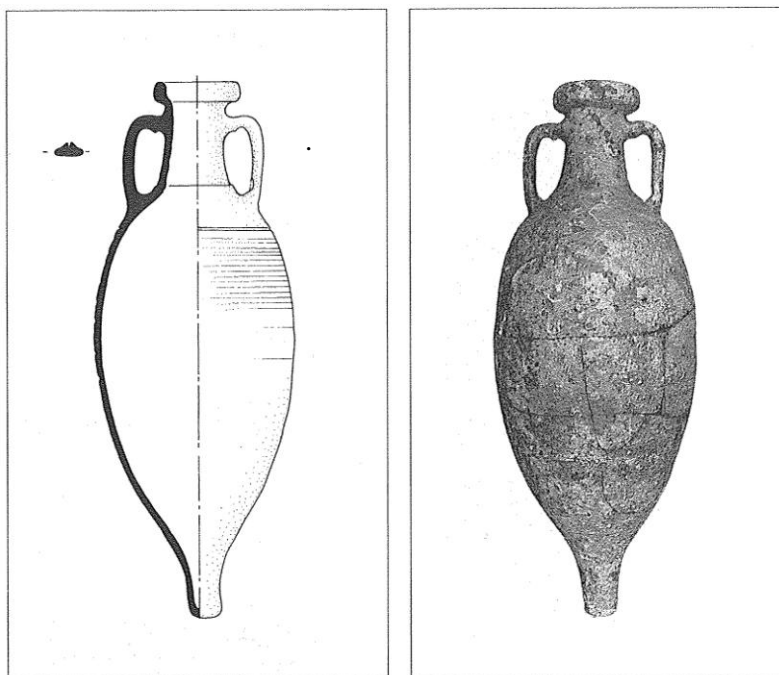
Fig. 12 Ramon 25

Origin: Ibiza, Balearic Islands

Content: wine.

Dimensions: 96-97 cm high,
35-38 cm wide.

Diffusion: End of 1st C. BC
to 1st half of the 1st C. AD



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

Fig. 13 Gauloise 4

Origin: Gaul, Narbonensis.

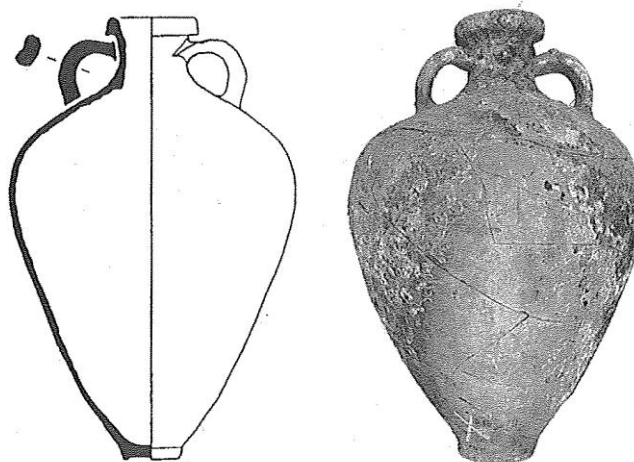
Content: wine

Dimensions: .60 to 69 cm high

36 to 42 cm wide

Diffusion: 2nd half of the 1st C. AD.

to the 3rd C. A.D



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

Fig. 14 Almagro 50

Origin: Lusitania

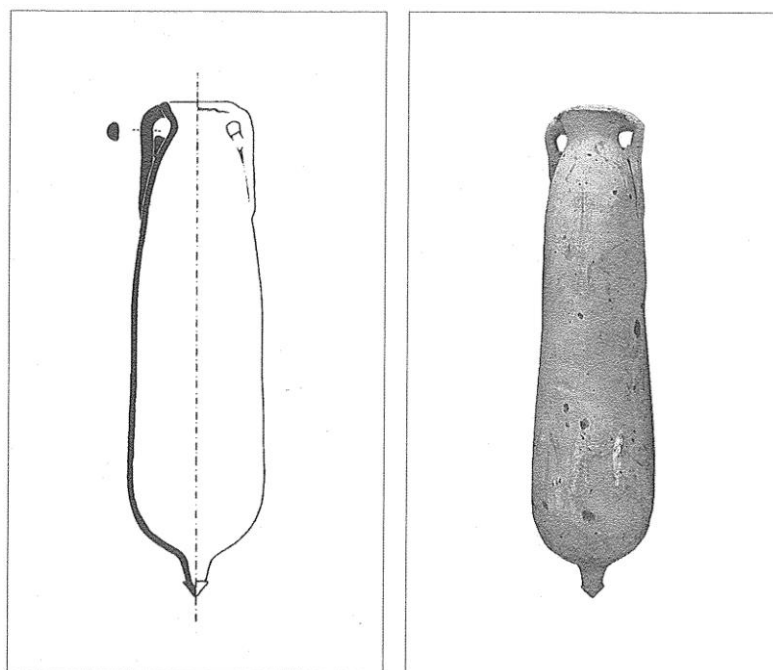
Content: Fish sauce

Dimensions: .90-100 cm high

25 cm wide

Diffusion: 3rd C. AD to

5th C. A.D



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

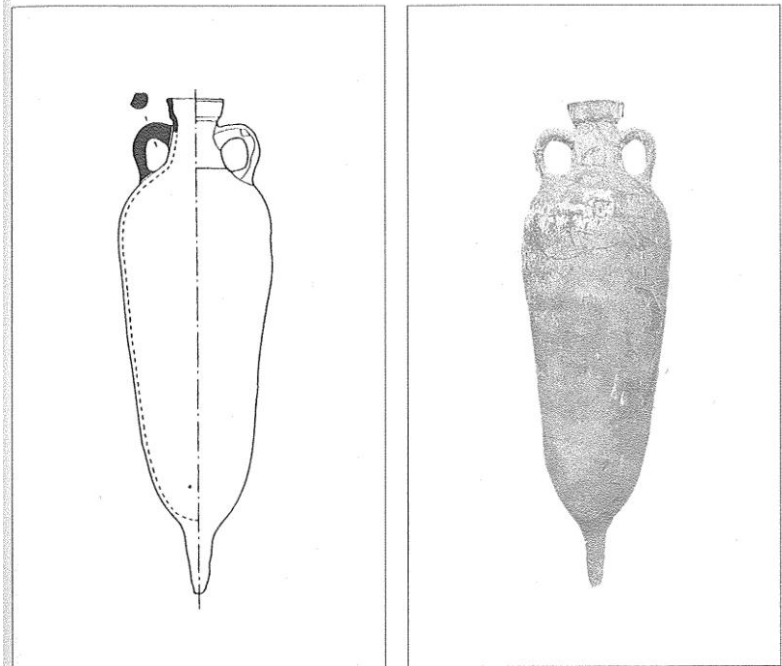
Fig. 15 Almagro 51A & B

Origin: Lusitania

Content: Fish sauce

Dimensions: .70-90 cm high
25-35 cm wide

Diffusion: End of 3rd C. AD to
First half of 5th C. A.D



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

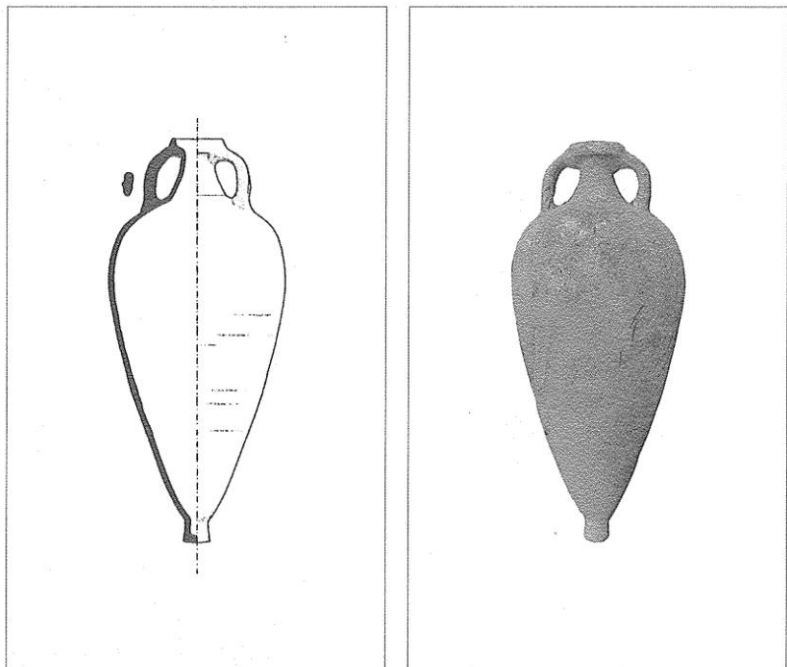
Fig. 16 Almagro 51C

Origin: Lusitania

Content: Fish sauce

Dimensions: .65-70 cm high
35 cm wide

Diffusion: 3rd C. AD to
First half of 5th C. A.D



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

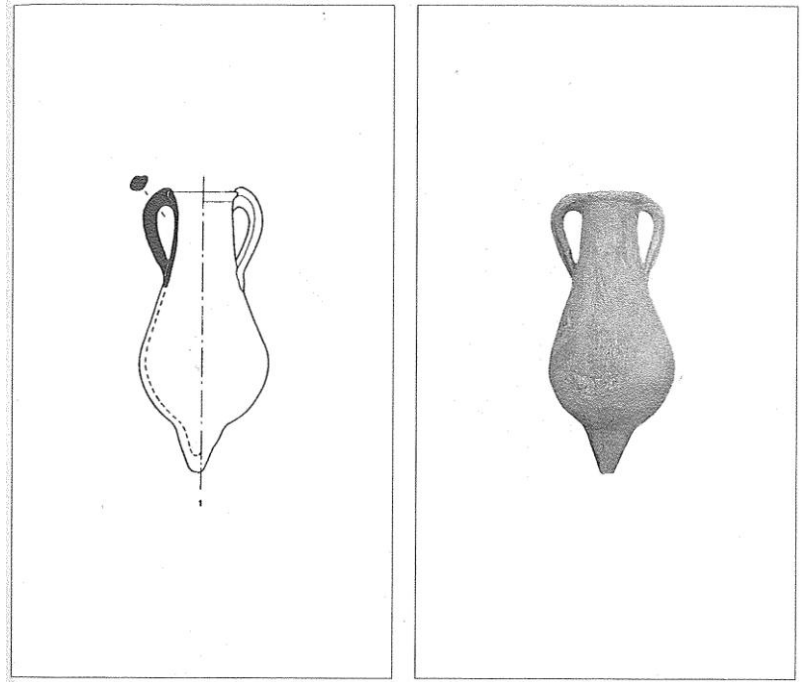
Fig. 17 Beltran 72

Origin: Lusitania or Baetica

Content: Fish sauce

Dimensions: .60-70 cm high
20 cm wide

Diffusion: 3rd C. AD to
5th C. A.D



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud

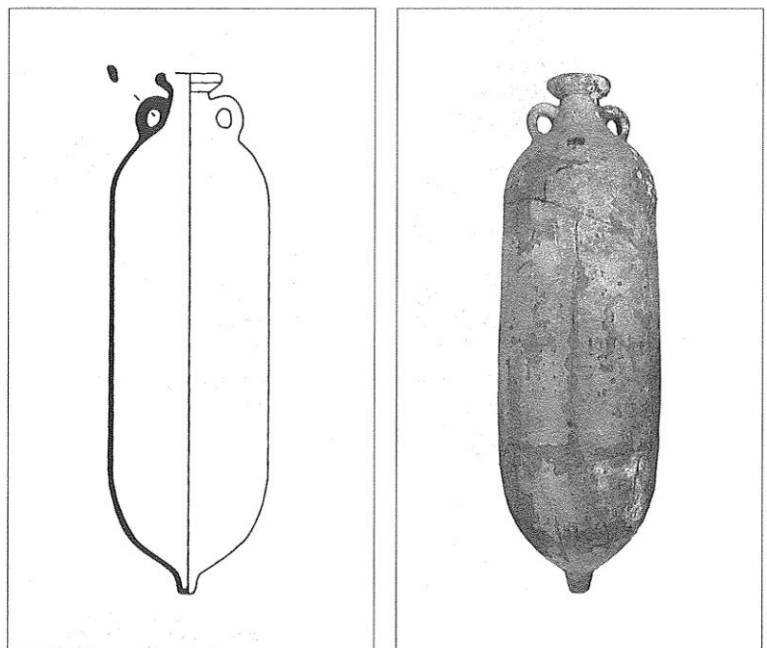
Fig. 18 Africana 1

Origin: Africa Proconsularis.

Content: olive oil.

Dimensions: 90-95 cm high,
30 cm wide.

Diffusion: 2nd half of 2nd C. AD
to the end of 4th C. AD.



Sciallano, M. and Sibella, P. 1991. Amphores comment les identifier?, Aix-en-Provence: Édisud.

Fig. 19 Africana 2A

Origin: Africa Proconsularis

Content: Fish sauce or wine

Dimensions: 100-110 cm high,
35 cm wide.

Diffusion: 2nd half of 2nd C. AD to
the 1st half of the 5th C. AD.



University of Southampton, 2005. Roman Amphorae: a digital resource. *Archaeology Data Service-ADS*.
<http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/cat_amph.cfm>

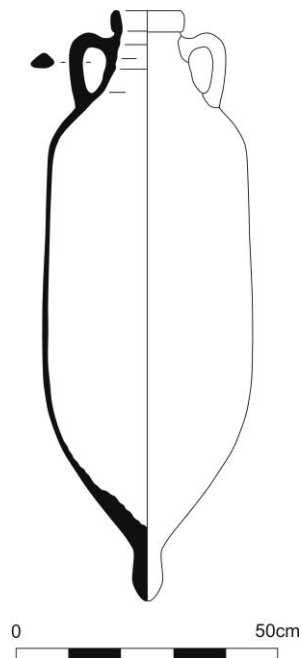
Fig. 20 Africana 2B

Origin: Africa Proconsularis

Content: Olive oil

Dimensions: 109-110 cm high,
41-43 cm wide.

Diffusion: 3rd C. AD to



University of Southampton, 2005. Roman Amphorae: a digital resource. *Archaeology Data Service-ADS*.
<http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/cat_amph.cfm>

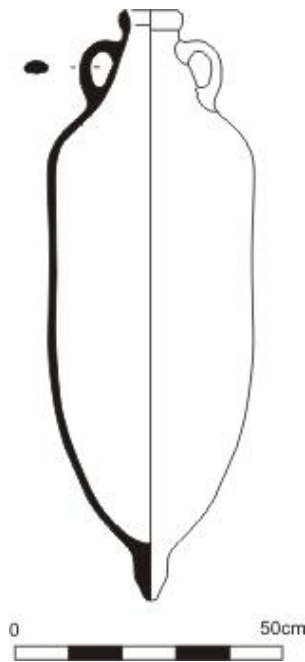
Fig. 21 Africana 2C

Origin: Africa Proconsularis

Content: Fish sauce

Dimensions: 107-121cm high,
25-38 cm wide.

Diffusion: 3rd C. AD to 4th C AD



University of Southampton, 2005. Roman Amphorae: a digital resource. *Archaeology Data Service-ADS*.
<http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/cat_amph.cfm>

Fig. 22 Africana 2D

Origin: Africa Proconsularis and Byzacena

Content: Fish sauce or wine

Dimensions: 109-117 cm high,
30-37 cm wide.

Diffusion: 3rd C. AD to 4th C AD



University of Southampton, 2005. Roman Amphorae: a digital resource. *Archaeology Data Service-ADS*.
<http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/cat_amph.cfm>

Fig. 23 Africana 3A

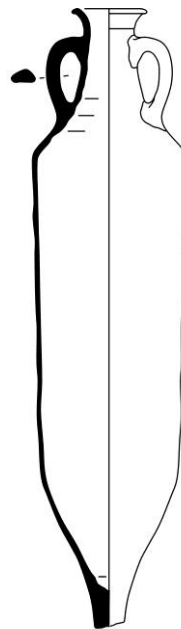
Origin: Africa Proconsularis
Content: Fish sauce or wine
Dimensions: 93-125 cm high,
22-28 cm wide.
Diffusion: 4th C. AD



University of Southampton, 2005. Roman Amphorae: a digital resource. *Archaeology Data Service-ADS*.
<http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/cat_amph.cfm>

Fig. 24 Africana 3B

Origin: Africa Proconsularis
Content: Fish sauce or wine
Dimensions: 107-112 cm high,
25-26 cm wide.
Diffusion: 4th C. AD



University of Southampton, 2005. Roman Amphorae: a digital resource. *Archaeology Data Service-ADS*.
<http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/cat_amph.cfm>

Fig. 25 Africana 3C

Origin: Africa Proconsularis and Byzacena

Content: olives, Fish sauce or wine

Dimensions: 107-112 cm high,
25-26 cm wide.

Diffusion: End of 4th C. AD to
1st half 5th C. AD



University of Southampton, 2005. Roman Amphorae: a digital resource. *Archaeology Data Service-ADS*.
<http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/cat_amph.cfm>

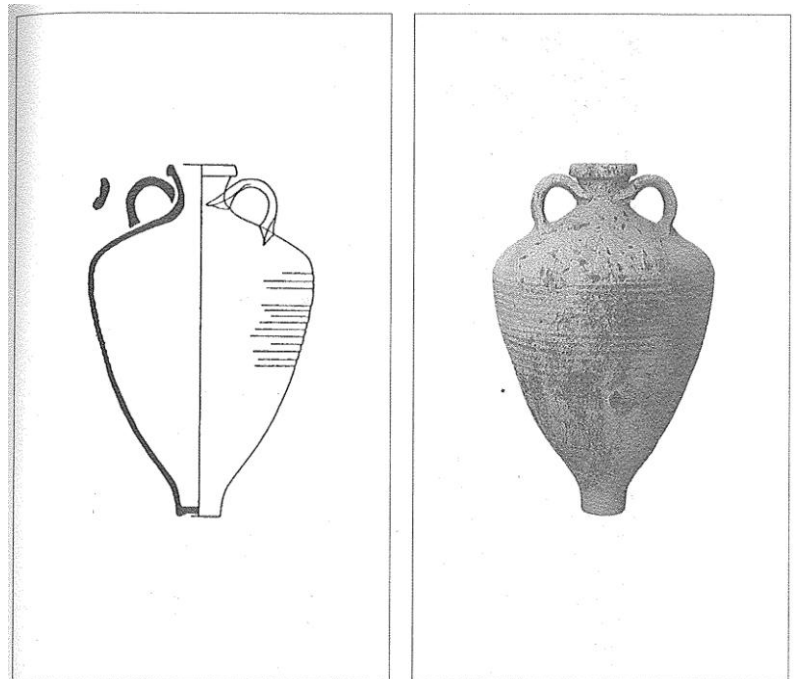
Fig. 26 Dressel 30

Origin: Mauretania

Content: wine

Dimensions: 65-66 cm high,
36-37 cm wide.

Diffusion: End of 2th C. AD to
3th C. AD



Sciallano, M. and Sibella, P. 1991. *Amphores comment les identifier?*, Aix-en-Provence: Édisud.

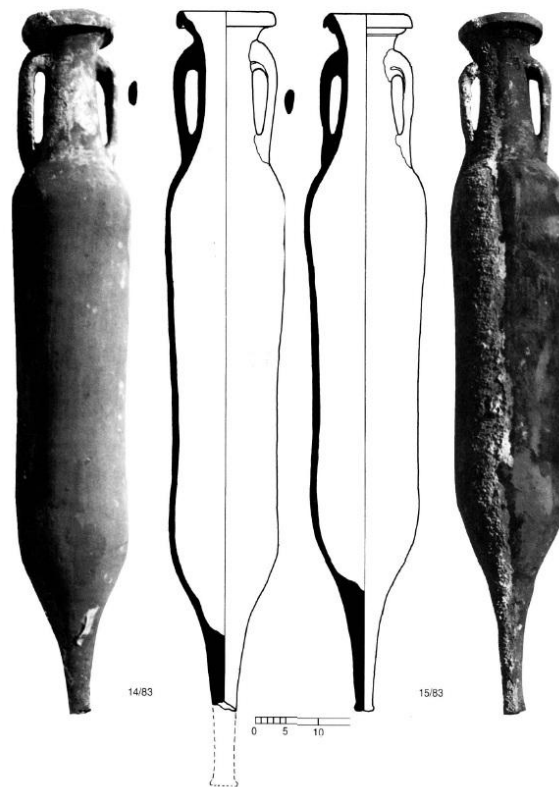
Fig. 27 Spatheion 1 / Keay 26

Origin: Africa Proconsularis

Content: olives, wine or fish sauce

Dimensions: 81-96 cm high,
14-18 cm wide.

Diffusion: End of 4th C. AD to
5th C. AD



Santamaria, C., 1995. L'épave Dramont « E » à Saint-Raphaël (Ve siècle ap. J.-C.).
Archaeonautica, 13, pp. 5-198.

Fig. 28 Keay 35A

Origin: Africa Proconsularis.

Content: olive oil.

Dimensions: 107-114 cm high,
40-42 cm wide.

Diffusion: 5th century AD

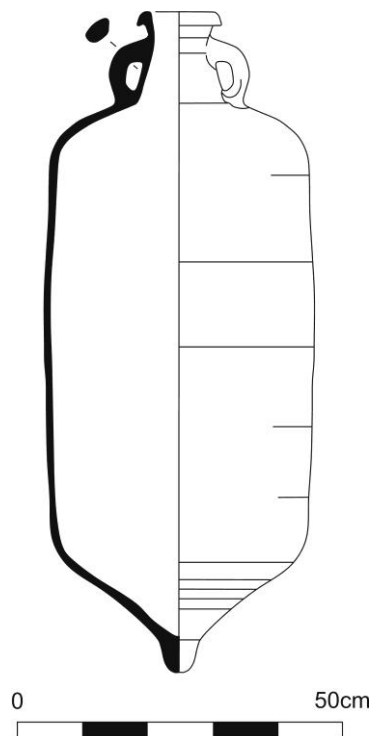


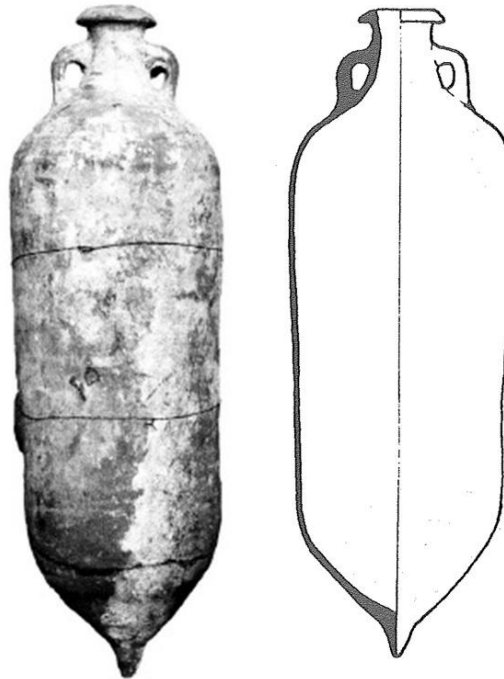
Fig. 29 Keay 35B

Origin: Africa Proconsularis.

Content: wine or fish sauce

Dimensions: 99-120 cm high,
34-49 cm wide.

Diffusion: 5th century AD



Santamaria, C., 1995. L'épave Dramont « E » à Saint-Raphaël (Ve siècle ap. J.-C.).
Archaeonautica, 13, pp. 5-198.

Fig. 30 Keay 62A, D & E

Origin: Africa Proconsularis and Byzacena

Content: wine or fish sauce

Dimensions: 103-106 cm high,
37-40 cm wide.

Diffusion: late 5th century AD
to middle 6th C. AD

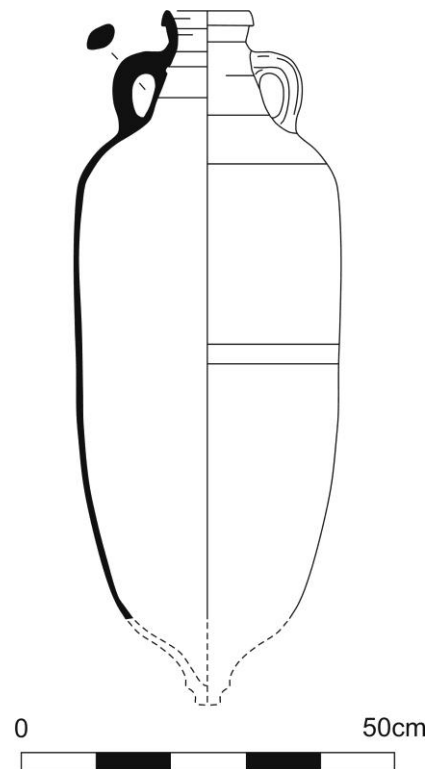


Fig. 31 Beltran 68

Origin: Baetica

Content: Wine

Dimensions: 79-80 cm high,
40-45 cm wide.

Diffusion: 2nd half 3rd century AD
to 5th C. AD



University of Southampton, 2005. Roman Amphorae: a digital resource. *Archaeology Data Service-ADS*.
<http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/cat_amph.cfm>

Fig. 32 Tripolitanian 3

Origin: Tripolitania.

Content: olive oil.

Dimensions: 115 cm high,
38 cm wide.

Diffusion: 4th century AD



University of Southampton, 2005. Roman Amphorae: a digital resource. *Archaeology Data Service-ADS*.
<http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/cat_amph.cfm>



Oscariz Gil, P., 2008. Identificación de dos locales de distribución de vino y aceite en relieves de Isola Sacra. In UNED, 2008. *Espacio, Tiempo y Forma*, Serie II, Historia Antigua, 21, pp. 235-254.

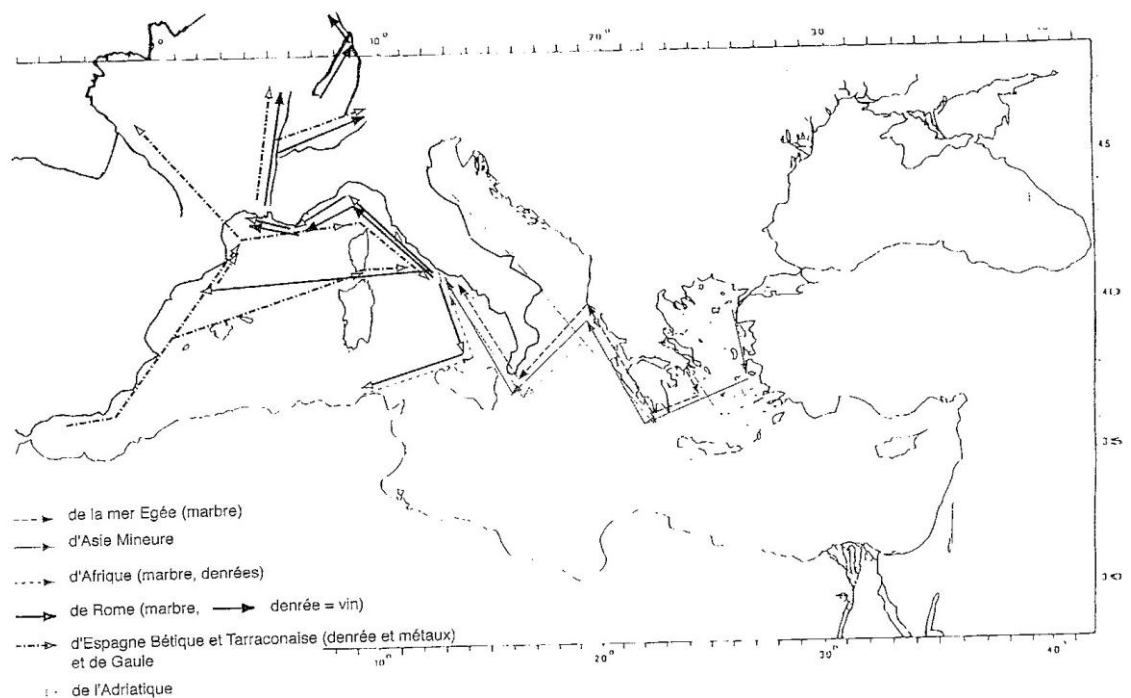
Fig. 33 Bas-relief showing an olive oil Store. Isola Sacra, Italy

On the upper half of this bas-relief we can clearly identified 5 olive oil amphorae (left) Africana 1 from Africa Proconsularis or Bizacena (Tunisia); 2 olive oil amphorae (centre) Tripolitanian 3 from Tripolitania (Lybia) and 2 olive oil amphorae (right) Dressel 20 from Baetica (Spain).



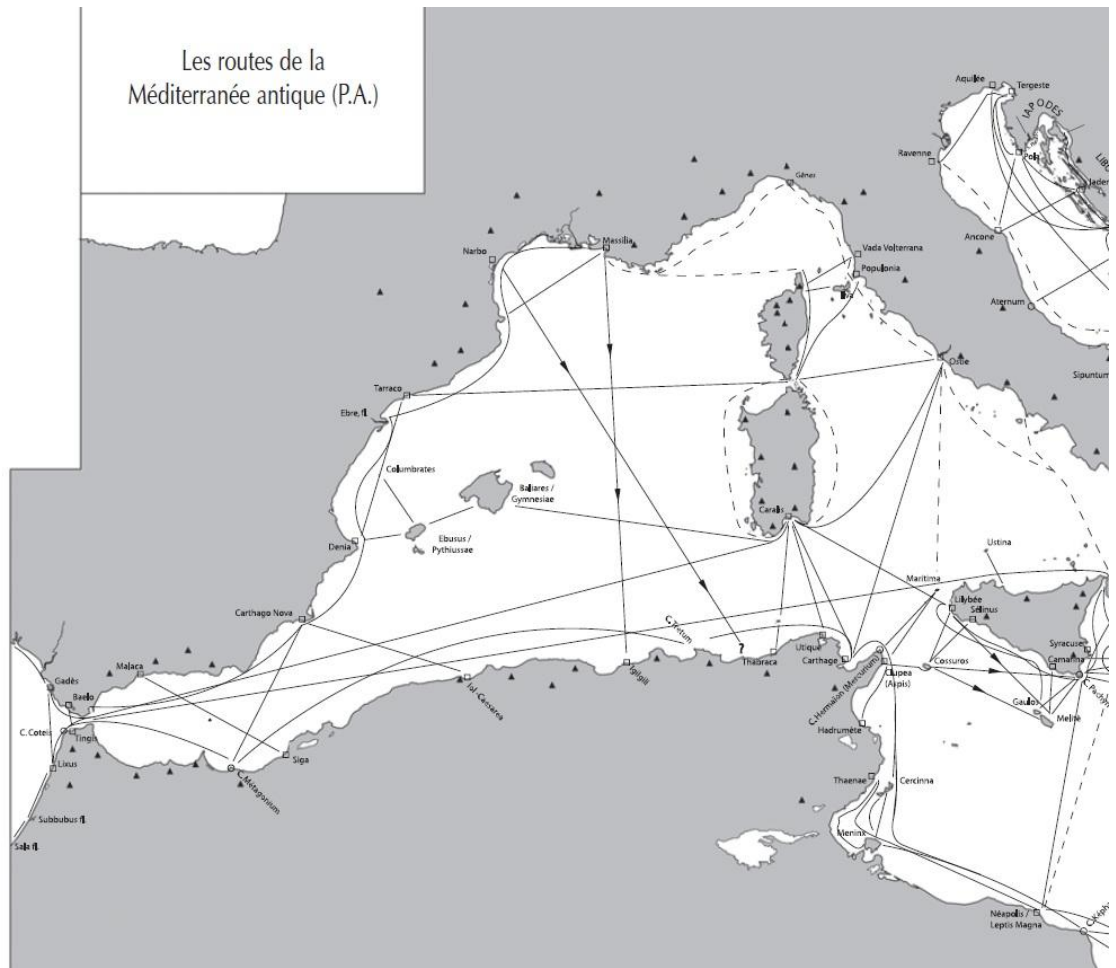
Boatwright, M.T., Gargola, D.J., Lenski, N., Talbert, R.J.A., 2011 (2nd Ed.). *The Romans: From Village to Empire – A History of Rome From Earliest Times to the End of the Western Empire* <<http://awmc.unc.edu/wordpress/free-maps/the-romans-from-village-to-empire-2nd-edition-2011/>>

Fig. 34 Roman Empire in AD 69



Jézégou, M.-P., 1997. Commerce et voies de communications dans la partie septentrionale des pyénées à l'époque Romaine. In Institut d'Estudis Ceretans, 1998. *Comerç i Vies de Comunicació, XI col·loqui internacional d'arqueologia de Puigcerdà*, pp. 139-149.

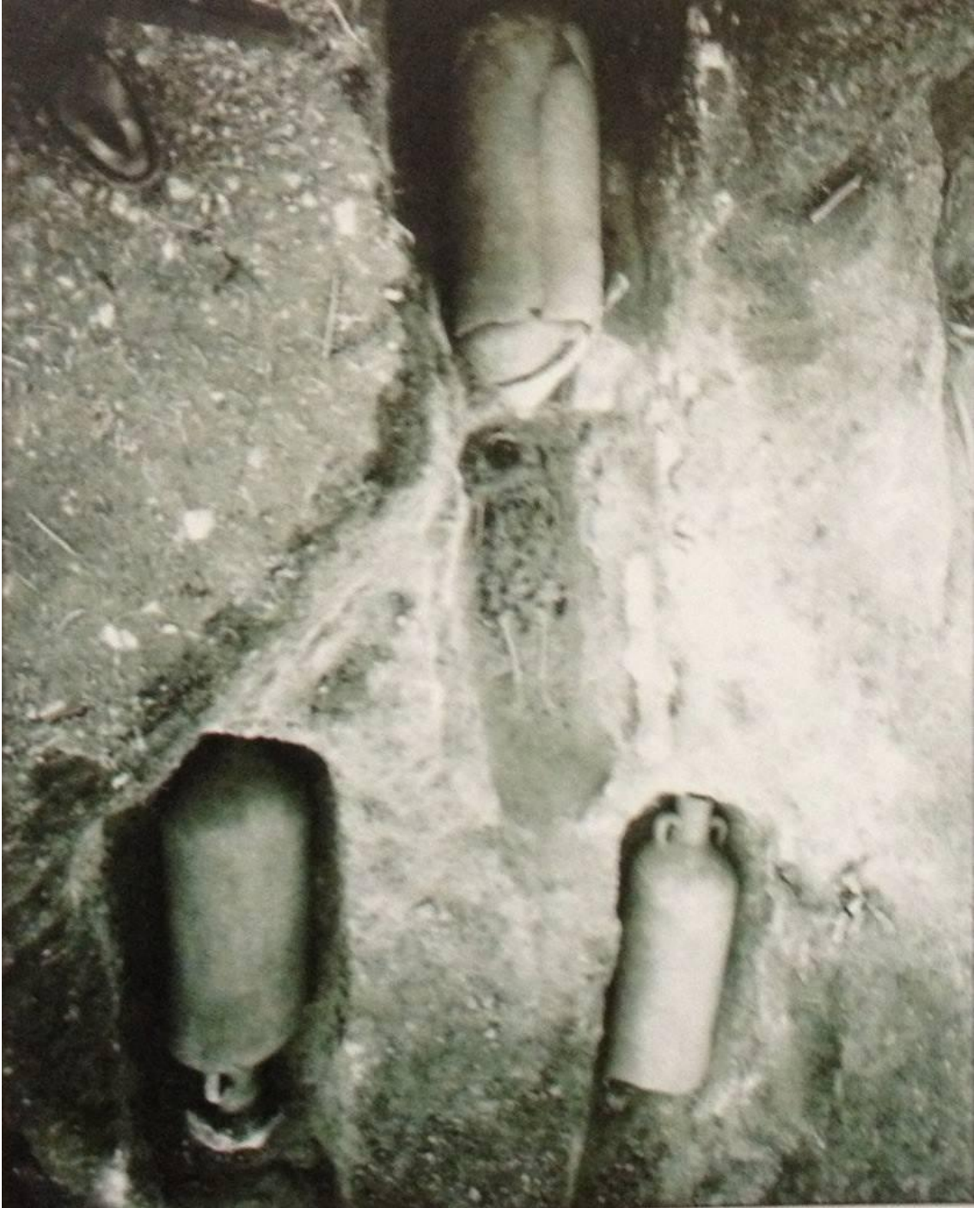
Fig. 35 Map of maritime trade routes in western Mediterranean in the Roman period



Arnaud, P., 2005. *Les routes de la navigation antique. Itinéraires en Méditerranée*. Paris: Errance.

Fig. 36 Map of sailing routes in western Mediterranean in Antiquity

Arrows indicate the direction of navigation when the route only can be used in one direction



Keay, S. J., 1984. *Late Roman amphorae in the western Mediterranean: a typology and economic study: the Catalan evidence*. BAR International Series, 196 (i & ii). Oxford: BAR.

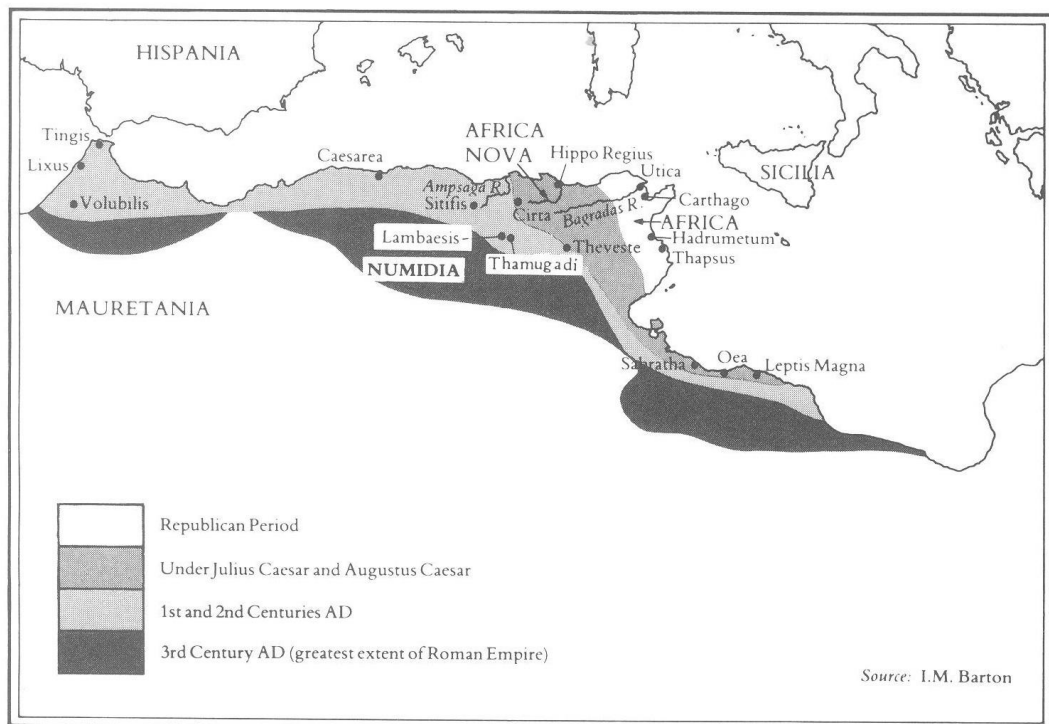
Fig. 37 Amphorae Keay 55 and Keay 56 found in the archaeological site of Mas Casanoves in 1931



Keay, S. J., 1981. The Conventus Tarraconensis in the Third Century AD: Crisis or Change. In: A. King and M. Heing (eds.), 1981. *The Roman West in the Third Century, Contributions from Archaeology and History*. BAR International Series, 109 (ii). Oxford: BAR, pp. 451-486.

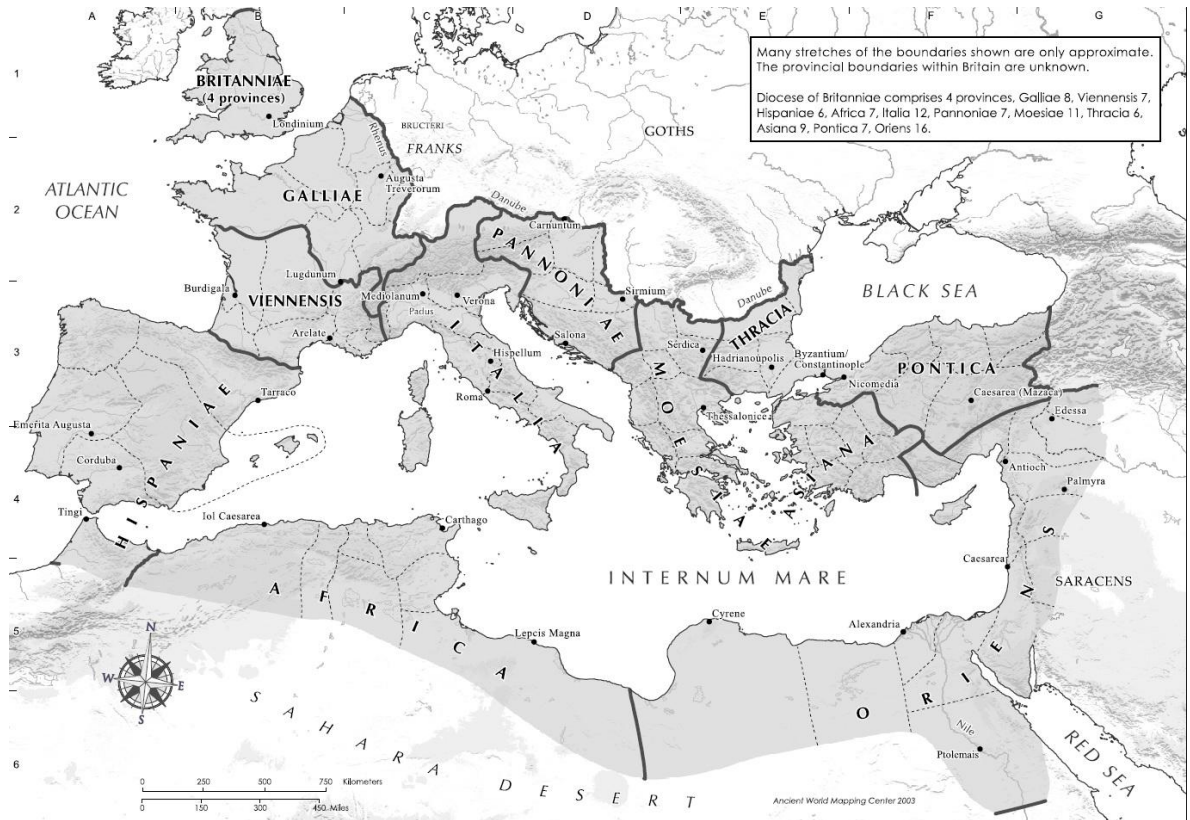
Fig. 38 Map of Hispania in the 1st century AD

This map shows the provinces of Baetica, Lusitania and Tarraconensis and the seven *Conventus* in which Tarraconensis was divided.



Raven, S., 1993 (3rd ed.). *Rome in Africa*. New York: Routledge.

Fig. 39 Map of North-west Africa from the Republican period to the 3rd century AD.



Boatwright, M.T., Gargola, D.J., Lenski, N., Talbert, R.J.A., 2011 (2nd Ed.). *The Romans: From Village to Empire – A History of Rome From Earliest Times to the End of the Western Empire* <<http://awmc.unc.edu/wordpress/free-maps/the-romans-from-village-to-empire-2nd-edition-2011/>>

Fig. 40 Roman Empire of Diocletian and Constantine

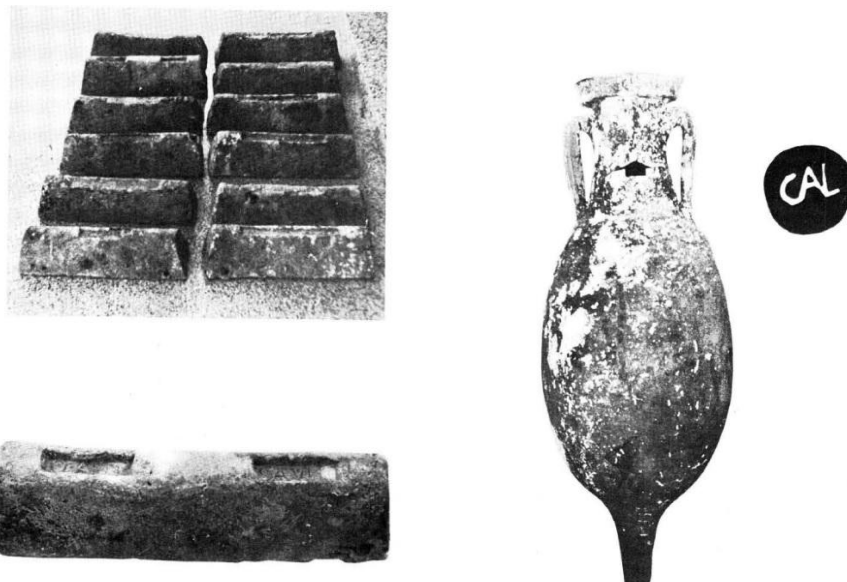
This map shows the 12 Diocese in which Emperor Diocletian organized the Roman Empire. The Diocese of Hispania included the provinces of Baetica, Lusitania, Tarraconensis, Gallacia, Carthaginensis and Mauretania Tingitana; the Diocese of Africa included the provinces of Mauretania Caesarensia, Mauretania Sitifensis, Numidia, Africa Proconsularis, Bizacena and Tripolitania.

Emperor Constantine grouped the *Diocesis* in *Praefecturae*. The Praefecturae of Gaul included the Diocesis of Hispania, Vienne, Gallia and Britannia; the Praefecturae of Italy included the Diocesis Italia, Pannonia and Moesia (ancient *Diocesis* of Dacia and Macedonia).



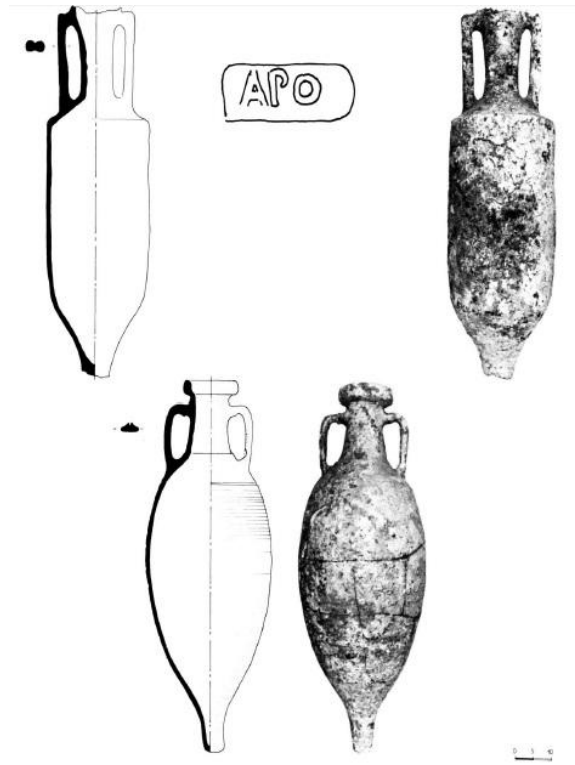
Raven, S., 1993 (3rd ed.). *Rome in Africa*. New York: Routledge.

Fig. 41 Roman provinces in North-west Africa during the 4th century AD



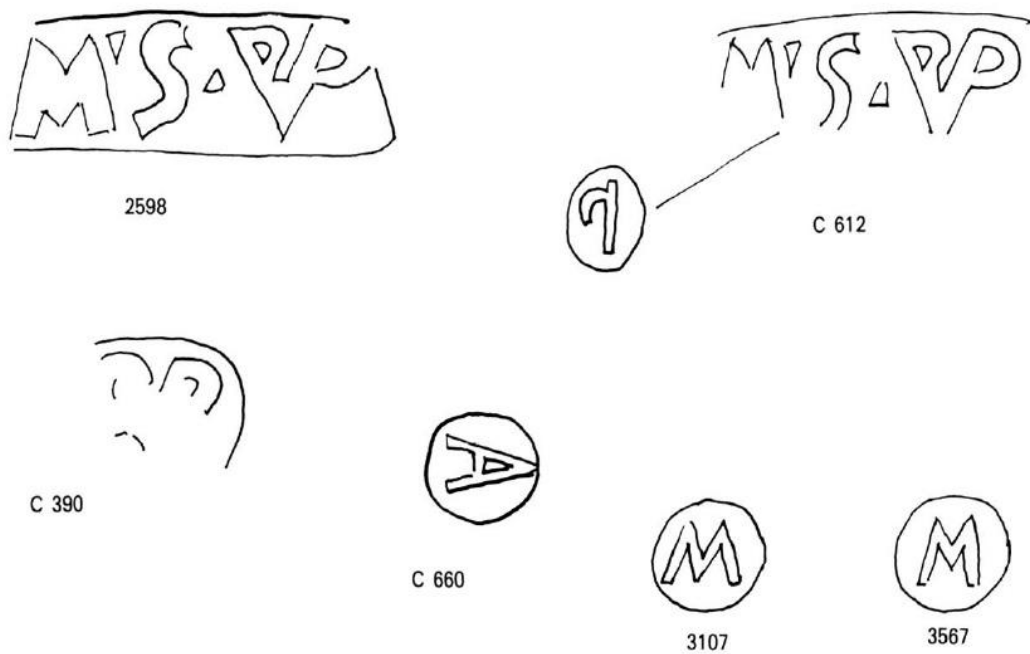
Guerrero, V. and Colls, D., 1982. Exploraciones arqueológicas en la bocana del Puerto de Cabrera. *Butletí de la Societat Arqueològica Luliana*, 39, pp. 3-22.

Fig. 42 Lead ingots and amphora Dressel 7-11 from the Cabrera E shipwreck



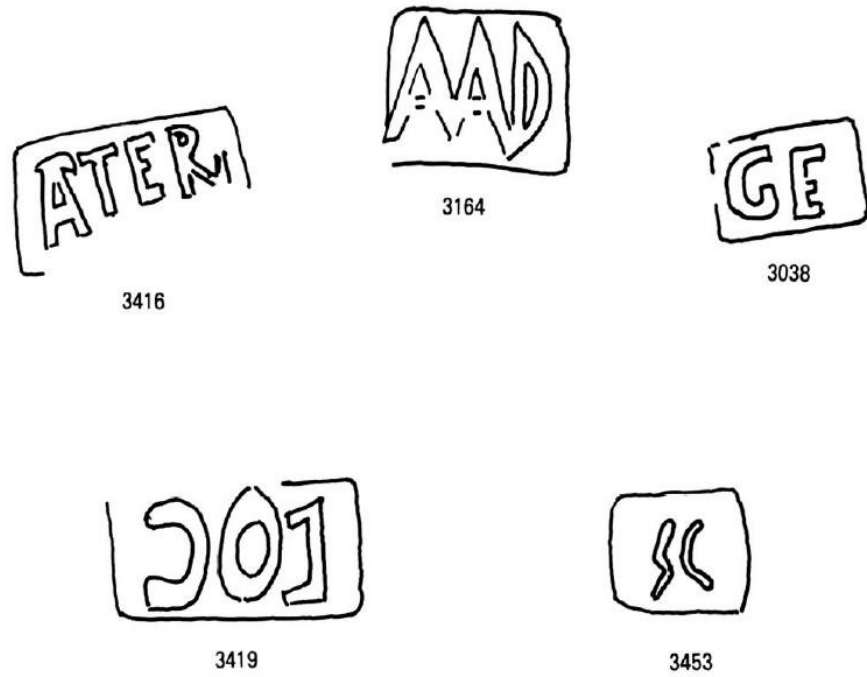
Sciallano, M. and Liou, B., 1985. Les épaves de tarraconnaise à chargement d'amphores Dressel 2-4. *Archaeonautica*, 5, pp. 5-178.

Fig 43 Amphorae Dressel 2-4 and Ramon 25 from Est-Perduto shipwreck



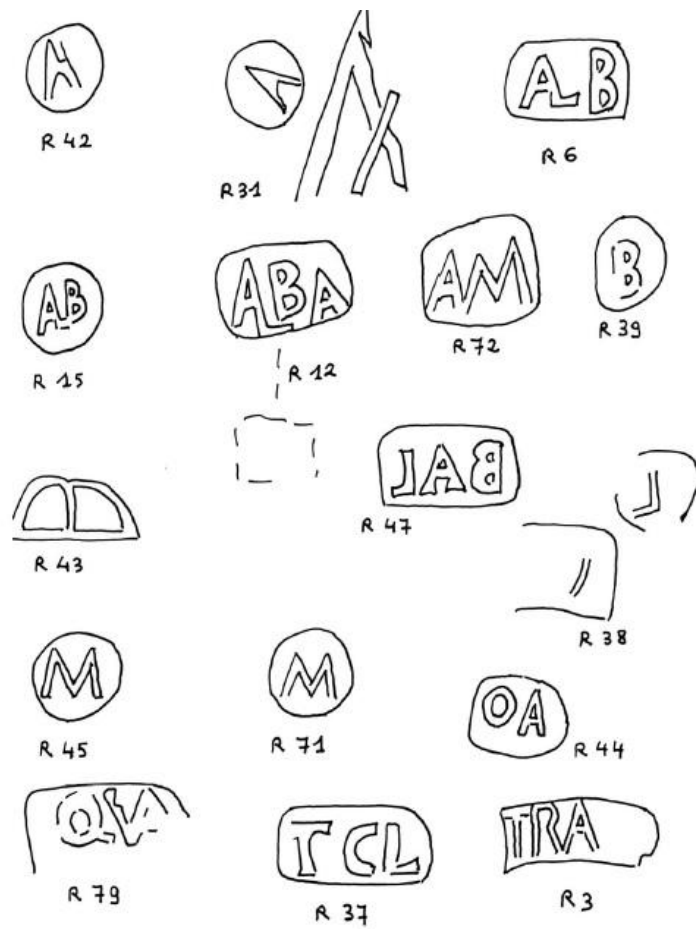
Sciallano, M. and Liou, B., 1985. Les épaves de tarraconnaise à chargement d'amphores Dressel 2-4. *Archaeonautica*, 5, pp. 5-178. **ig. 44**

Stamps on Dressel 2-4 at the shipwreckl of Plannier A



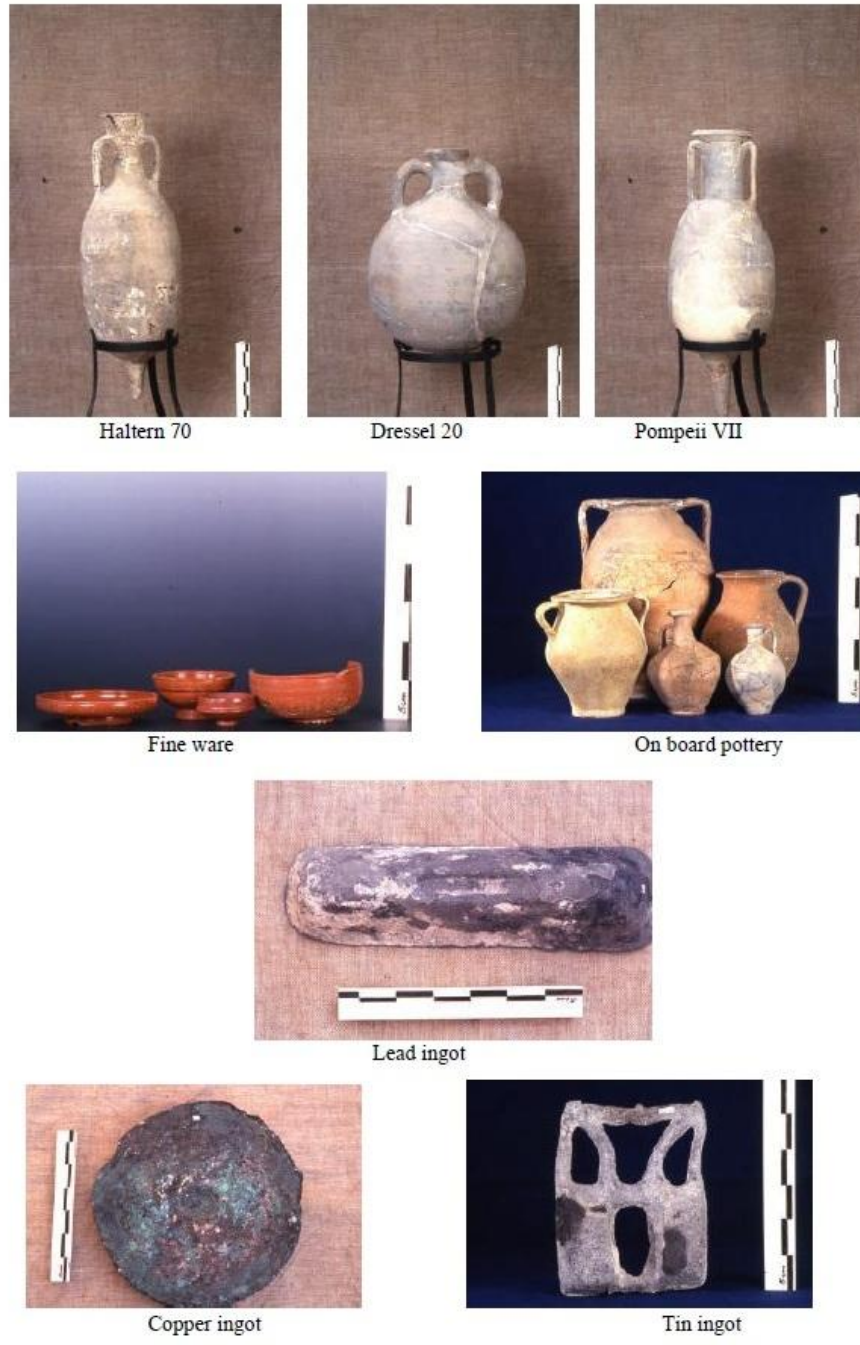
Sciallano, M. and Liou, B., 1985. Les épaves de tarraconnaise à chargement d'amphores Dressel 2-4. *Archaeonautica*, 5, pp. 5-178.

Fig. 45 Stamps on Dressel 2-4 at Pétit-Conglué shipwreck



Sciallano, M. and Liou, B., 1985. Les épaves de tarraconnaise à chargement d'amphores Dressel 2-4. *Archaeonautica*, 5, pp. 5-178.

Fig. 46 Stamps on Dressel 2-4 at Grand Roveau Shipwreck



ARESMAR, 199- Cargaison de l'épave Port-Vendres II

Fig. 47 Cargo from Port-Vendres B shipwreck



Jona Lendering, 2004. Livius: articles in ancient history.

http://www.livius.org/a/italy/ostia/corporations/ostia_piazzale_delle_corporazioni_mosaics_13.JPG

Fig 48 Mosaic at the Square of corporations, Ostia, devoted to Narbonese traders



Yves Chevalier, 1973. *Rapport de fouilles Port-Vendres I*. DRASSM

Fig. 49 Amphorae from Port-Vendres A shipwreck

Appendix 1

Parker's list of shipwrecks in western Mediterranean (1st to 5th centuries AD)

<i>Name</i>	<i>Parker's number</i>	<i>Location</i>	<i>Datation</i>	<i>Main Cargo</i>
Berà	100	41° 7' N. 1° 27' E.	Mid 1 st c. AD	Dressel 2-4
Cabrera A	123	39° 9' N. 2° 56' E.	c. AD 300-325	Almagro 50 Almagro 51C Beltran 72 Africana 2B-D
Cabrera C	125	39° 9' N. 2° 56' E.	c. AD 255	Dressel 20 Dressel 23 Beltran 72 Beltran 68
Cabrera D	126	39° 9' N. 2° 57' E	c. AD 1-15	Dressel 7-11 Lead ingots
Cabrera E	127	39° 9' N. 2° 55' E.	c. 10 Bc- AD 25	Dressel 7-11 Lead ingots
Cala Cupa	143	42° 22' N. 10° 55' E.	Late 1st early 2nd century AD	Dressel 20 Galoise 4
Cala Vellana	157	39° 57' N. 4° 16' E.	c. AD 50-60	Dressel 2-4
Cap Blanc	176	39° 22' N. 2° 47' E	c. AD 295-325	Almagro 51C Beltran 72 Africana 2B-D
Cap de Garde	185	36° 57' N. 7° 48' E.	c. AD 285-365	Africana 2D
Capo Testa A	257	41° 14' N. 9° 8' E.	c. AD 1-75	Haltern 70 Dressel 7-11

<i>Name</i>	<i>Parker's number</i>	<i>Location</i>	<i>Datation</i>	<i>Main Cargo</i>
Les Catalans	280	43° 17' N. 5° 20' E.	Mid 4th c. AD	Almagro 51 A Beltran 72 Dressel 23
Cavallo A	283	41° 21' N. 9° 15' E.	c. AD 40-60	Dressel 2-4
Chiessi	301	42° 45' N. 10° 6' E.	c. AD 60-85	PE-25/Ramon 25 Dressel 20, Beltran 2A, Beltran 2B and Haltern 70.
La Chrétienne H	307	43° 25' N. 6° 53' E.	AD 15-20	Dressel 2-4
La Chrétienne D	305	43° 25' N. 6° 53' E.	AD 325-375	Almagro 51 A Beltran 72 Dressel 23
Conillera	334	38° 58' N. 1° 12' E.	c. AD 30-190	Beltran 2B
Culip D / Culip IV	347	42° 19' N. 3° 17' E.	c. AD 70-80	Dressel 20 Haltern 70 Beltran 2B
Diano Marina	364	43° 53' N. 8° 6' E.	Mid 1st C. AD	Dressel 2-4 Dolia
Dragonera A	369	39° 34' N. 2° 20' E.	c. AD 200-275	Africana 2A
Dramont B	372	43° 24' N. 6° 50' E.	Early 1st C. AD	Dressel 2-4

<i>Name</i>	<i>Parker's number</i>	<i>Location</i>	<i>Datation</i>	<i>Main Cargo</i>
Dramont E	375	43° 24' N. 6° 50' E.	AD 420-425	Key 35 , Key 35B Spatheion 1
Est-Perduto	392	41° 22' N. 9° 20' E.	c. AD 1-50	Dressel 2-4
Femina morta	398	36° 48' N. 14° 29' E.	Early 4th century	Africana 1 Africana 2B-D Almagro 51C
Fontanamare A	415	39° 16' N. 8° 26' E.	AD 290-310	Africana 2
Les Fourmiges	426	43° 2' N. 6° 4' E.	Mid 1st c. AD	Dressel 2-4
Giglio Porto	453	42° 21' N. 10° 55' E.	c. AD 200-225	Africana 2A
Gorgona A	461	43° 24' N. 9° 54' E.	1 st C. AD	Dressel 7-11 Beltran 2B
Grand Roveau	478	43° 4' N. 5° 45' E.	Mid 1 st century AD	Dressel 2-4
Las Hormigas	506	37° 39' N. 0° 39' W.	c. AD 425 -550	Key 35A
Ile-Rousse	510	42° 38' N. 8° 56' E.	Mid 1st century AD	Dressel 2-4
Isis	517	38° 0' N. 11° 30' E.	c. AD 375-425	Africana 3 Key 53 Key 32

<i>Name</i>	<i>Parker's number</i>	<i>Location</i>	<i>Datation</i>	<i>Main Cargo</i>
Lavezzi A	584	41° 20' N. 9° 15' E.	c. AD 25-50	Dressel 20 Haltern 70 Dressel 7-11 Copper ingots Lead ingots
Lavezzi A	584	41° 20' N. 9° 15' E.	c. AD 25-50	Dressel 20 Haltern 70 Dressel 7-11 Copper ingots Lead ingots
Lavezzi B	585	41° 20' N. 9° 15' E.	c. AD 40-70	Dressel 20, Dressel 7-11
Lazzaretto	594	40° 35' N. 8° 15' E	c. AD 320	Almagro 50 Almagro 51C Africana 2D Dressel 30
La Luque B	611	43° 16' N. 5° 17' E.	c. AD 300-325	Africana 3A oil lamps
Marseillan Plage B	667	43° 18' N. 3° 33' E.	c. AD 50-100	Dressel 20 copper ingots
Marzamemi D	673	36° 45' N. 15° 8' E.	c. AD 325-350	Africa 2D Beltran 68
Marzamemi F	675	36° 45' N. 15° 8' E.	c. AD 275-300	Almagro 51C Africana 2B-D Dressel 30
Mateille A	682	43° 7' N. 3° 7' E	c. AD 400-425	Almagro 51A Undetermined Coins 4 th C. AD Dressel 23.

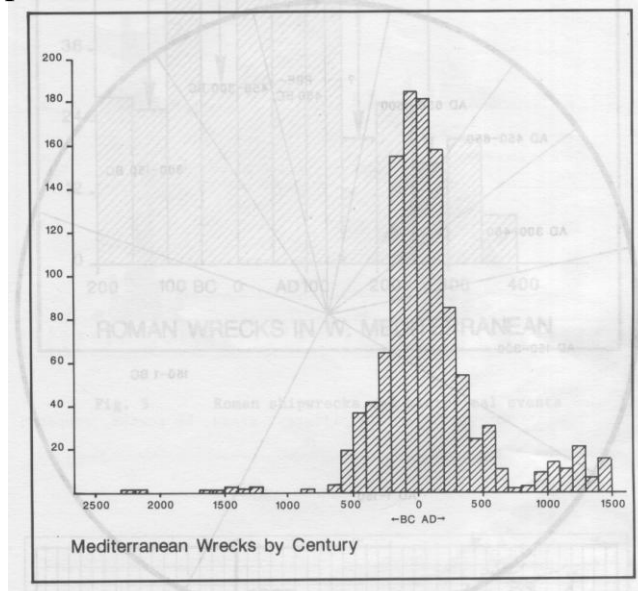
<i>Name</i>	<i>Parker's number</i>	<i>Location</i>	<i>Datation</i>	<i>Main Cargo</i>
Monaco A	708	43° 44' N. 7° 25' E.	c. AD 200-300	Africana 2A
Ognina A	755	36° 58' N. 15° 16' E.	c. AD 215-230	Africana 1 Dressel 20 Beltran 2B
Oscellucia	766	42° 34' N. 8° 43' E.	c. AD 20-50	Dressel 20
Pampelonne	783	43° 13' N. 6° 42' E.	c. AD 300-350	Almagro 51 C Beltran 72 Africana 3A
Perduto	801	41° 22' N. 9° 19' E.	c. AD 15-25	Dressel 2-4
Pétit-Conglué	806	43° 10' N. 5° 23' E.	c. AD 40-60	Dressel2-4 Dolia
Pian di spille	811	42° 12' N. 11° 40' E.	Mid 4th to 5th c	AD Africana 3
Planier A	824	43° 11' N. 5° 13' E.	c. AD 1-15	Dressel 2-4
Planier B	825	43° 11' N. 5° 13' E.	Mid 2nd century AD	Dressel 20 copper ingots
Plemmirio B	834	36° 59' N. 15° 20' E	c. AD 200	Africana 1 Africana 2A dressel 30 Iron bars

<i>Name</i>	<i>Parker's number</i>	<i>Location</i>	<i>Datation</i>	<i>Main Cargo</i>
Port-la-nouvelle	872	42° 43' N. 3° 36' E.	c. AD 1-250	Dressel 20
Port vendres A	874	42° 31' N. 3° 6' E.	c. AD 400	Almagro 50 Almagro 51C
Port Vendres B	875	42° 31' N. 3° 6' E.	c. AD 42-48	Dressel 20 Haltern 70 Pompeii VII Tin, copper and lead ingots
Porto Azzurro A	880	42° 45' N. 10° 24' E.	c. AD 250-300	Africana 2D
Porto Cristo B	886	39° 32' N. 3° 20' E.	c. AD 25-100	Haltern 70 Dressel 20
Punta Cera	916	42° 45' N. 10° 25' E.	c. AD 200-275	Africana 2A
Punta del Fenaio	925	42° 23' N 19° 52' E.	c. AD 200-235	Africana 2B Tubi Fittili (vaulting tubes)
Randello	975	36° 51' N. 14° 27' E.	Early 4th c AD	Almagro 50
Saint Gervais C	1002	43° 25' N. 4° 56' E.	c. AD 149-154	Dressel 20 Beltran 2B
Saint Honorat	1004	43° 30' N. 7° 3' E.	c. AD 160-200	Dressel 20
Ses Salines	1017	39° 18' N.	c. AD 70-80	Dressel 7-11

		3° 0' E		Dressel 20 Lead ingots
Sant'Antioco A	1030	38° 57' N. 8° 25' E.	c. AD 275-300	Africana Grande
Sud Lavezzi A	1117	41° 18' N. 9° 15' E	c. AD 375-425	Dressel 23 Almagro 50 Almagro 51A Almagro 51C Beltran 72
Sud Lavezzi B	1118	41° 18' N. 9° 15' E.	c. AD 10-30	Dressel 20 Haltern 70 Dressel 7-11 Copper and lead ingots
Sud Lavezzi C	1119	41° 19' N. 9° 15' E.	c. AD 15-25	Dressel 2-4
Tour Sainte Marie A	1171	43° 0' N. 9° 29' E.	c. AD 30-55	Dressel 7-11 Dressel 12 Beltran 2A Haltern 70
Villepin	1219	43° 24' N. 6° 42' E.	c. AD 110-160	Dressel 20

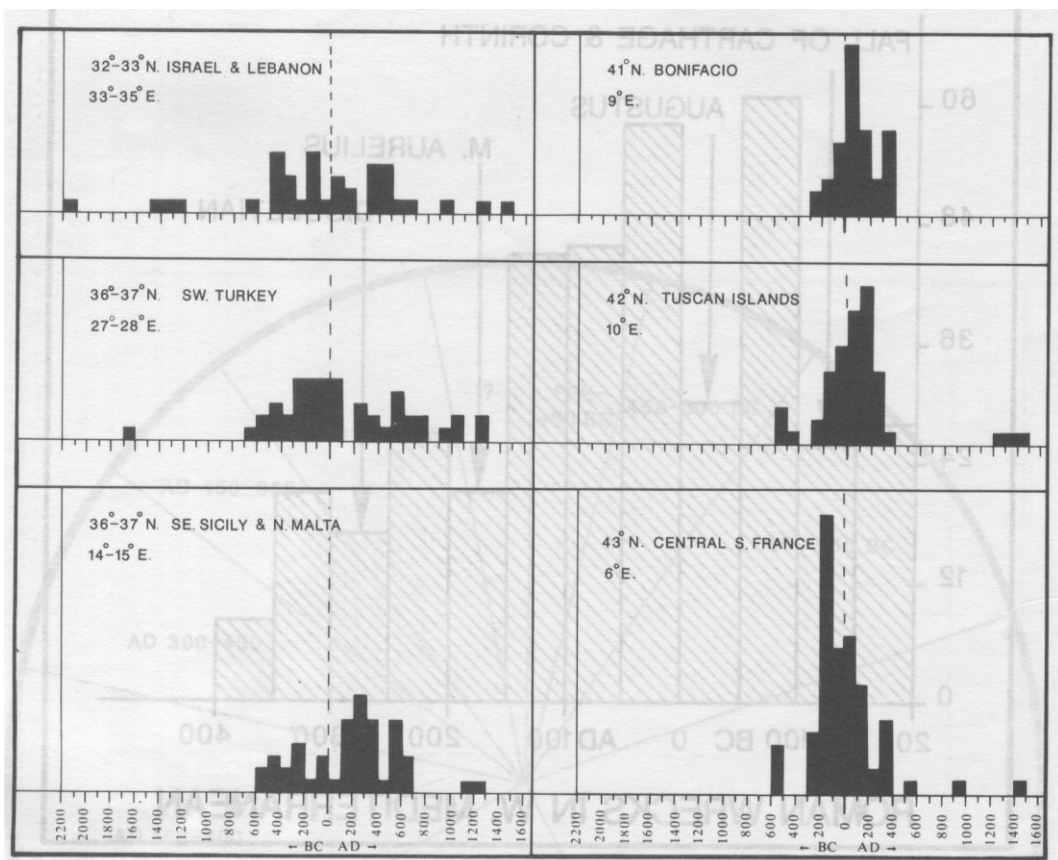
Appendix 2

Ancient shipwrecks of the Mediterranean Sea grouped by centuries and by geographical area (Parker, 1992)



Ancient shipwrecks in the Mediterranean grouped by centuries

Parker, A.J., 1992. *Ancient Shipwrecks of the Mediterranean and the Roman Provinces*. Oxford: BAR International Series 580.



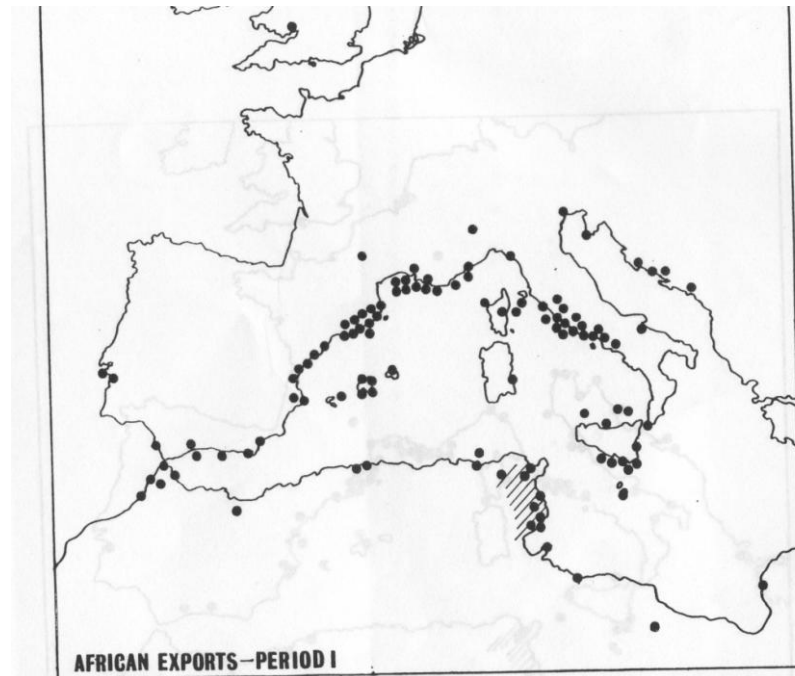
Parker, A.J., 1992. *Ancient Shipwrecks of the Mediterranean and the Roman Provinces*. Oxford: BAR International Series 58

Ancient shipwrecks in four different areas of the Mediterranean Sea grouped by century

Appendix 3

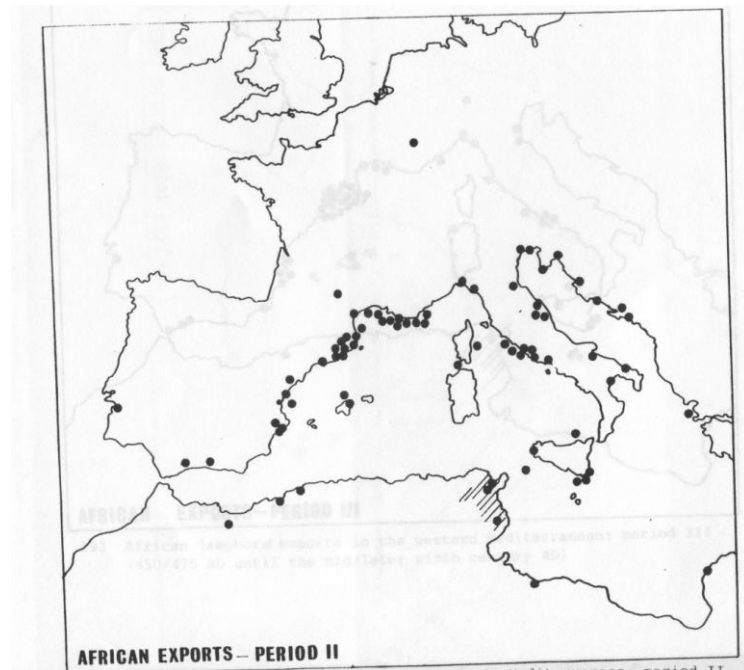
Distribution of Amphorae from North Africa in western Mediterranean area from the 2nd century AD to the 5th century AD (Keay, 1984)

2nd and 3rd centuries AD



Keay, S. J., 1984. *Late Roman amphorae in the western Mediterranean: a typology and economic study: the Catalan evidence.* BAR International Series, 196 (i & ii). Oxford: BAR.

4th and 5th centuries AD



Keay, S. J., 1984. *Late Roman amphorae in the western Mediterranean: a typology and economic study: the Catalan evidence.* BAR International Series, 196 (i & ii). Oxford: BAR.