From Hispalis to Ishbiliyya: the ancient port of Seville, from the Roman Empire to the end of the Islamic period (45 BC - AD 1248)

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A Thesis submitted in partial fulfilment
for the degree of
Doctor of Philosophy in Archaeology

Michaelmas Term

2016

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The present Thesis was examined by Professor David Blackman (University of Oxford) and Professor Simon Keay (University of Southampton) at a *viva voce* examination held on 31 March 2017. The examiners recommended the award of Doctor of Philosophy in Archaeology, which was officially granted to the author on 3 November 2017.

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Abstract

This Thesis focuses on the history and development of the topography, layout, and facilities of the ancient port of Seville, which is located in the lower Guadalquivir River Basin. From a maritime archaeology perspective, it combines terrestrial and maritime archaeological evidence, literary and epigraphic material, as well as palaeo-geomorphological and palaeo-environmental studies. This Thesis is a *longue durée* or diachronic study ranging between the 1st century BC and the 13th century AD. The Thesis is divided into three main historical periods, and in addition to the port itself, studies the palaeo-geomorphology and palaeo-hydrology of the Guadalquivir River, as well as of the palaeo-climatology of the region during each of these eras.

The first third of the Thesis examines the port of Hispalis during the Roman era. By considering the natural hydrography of the river and the meander of Hispalis, the Thesis proposes a model for the distribution of harbour facilities and their development through the Roman period. Building on this, it becomes possible to assess the extent and scale of these, as well as of the maritime commerce that the Roman port sustained.

The second third of the Thesis focuses on the Late Antique period. Despite the lack of direct archaeological evidence for the port in this era, the Thesis suggests that there was a decline but continuity in the commercial activities in direct connection with the Mediterranean maritime networks. This section also examines the historical events that occurred in Hispalis from the maritime archaeology perspective, arguing that the port was at the core of all these historical episodes because of its geopolitical and strategic importance.

The last third of the Thesis concentrates on the study of the port during the Islamic period. By understanding the extreme changes that occurred in the hydrography and geomorphology of the river in this epoch, the Thesis deciphers the process that led to the progressive siltation of the ancient channel of the river. The study of the archaeological material from the 1981 Plaza Nueva excavation, in combination with other proxies, allows a chronology to be proposed for the demise and subsequent disappearance of the ancient port. The transformation of the meander of the river resulted in the relocation and construction of a new port, which had a prominent role in the maritime history of the world during the centuries that followed.

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Acknowledgments

To study thirteen centuries encompassing three different historical periods from an archaeological, historical, and scientific perspective in the limited span of four years has been a daunting and exhausting undertaking. It has been only possible to complete this Thesis thanks to the support of many people.

First, I would like to thank Marlia Mango and Damian Robinson for their supervision and unconditional support over the course of my doctorate. I also would like to express my gratitude to Brian Ward-Perkins, Chris Wickham, Linda Hulin, Alan Bowman, and Andrew Wilson for reading and commenting on various chapters of the Thesis. Appreciation must be expressed to the examiners of the Thesis, Professor David Blackman and Professor Simon Keay, whose thorough reading and constructive comments improved the manuscript.

The research presented here would not have been completed without the support of many colleges and friends in Seville. I want to thank Fernando Fernández, Concepción San Martín, Ana Navarro, Antonio Pérez, Pablo Quesada, Juan Ignacio Vallejo, Diego Oliva, Manuel Camacho, José Manuel Rodríguez, Salvador Ordóñez, Enrique García, Oliva Rodríguez, Fernando Amores, Miguel Ángel Tabales, Daniel González, Mark Hunt, Francisco Borja, Victor Sánchez, Cinta Maestre, Magdalena Valor, and Pilar Lafuente among others. I want to express my gratitude to Simon Keay who allowed me the privilege of participating on his impressive excavations at Portus. Elena Salinas, Nili Liphschitz, Tom Higham, Marie-Pierre Jézégou, Juan Pablo Olaberria, Ian Cartwright, Ania Kotarba-Morley and Laura Bramley generously provided additional assistance. Thank you also to my "nauticool" friends at OCMA who provided encouragement and support, Veronica, Elspeth, Katia, Ania, Ilaria, Giles, Brian, Bobby, Peter, Greg, Bohim, Kim, and Alki, as well as to the "Oxonian Spanish Mafia", Javier, Isaac, Chema, Fernando, Javi (Gallego), Ana, and others for their encouragement and friendship.

This Thesis would not have been possible without the generous support of several funding bodies from the University of Oxford, Brasenose College, the School of Archaeology, and the Faculty of Classics.

Thorough this academic journey, family losses have been sustained with grief. The unexpected lost of my dear father did not allow us to enjoy his company on family visits to the city of spires. However, life not only takes, it also gives. The arrival of my baby daughter filled our lives with joy. Nevertheless, the lowest point came when I was diagnosed with Dyslexia in July 2016, and I was confronted with the statistical evaluation of my learning difference. It was then when Elspeth Garman, Professor of Molecular Biophysics and Tutor of Graduates at Brasenose College, began to actively support me. She first suggested and guided me through the process of obtaining hardship funds from the University, which were generously matched by Brasenose College that allowed me to be free from the responsibility of minding my baby daughter during four months in order to write the manuscript. Elspeth then followed my progress weekly, and proofread all the chapters of this Thesis. Any mistake, however, is my sole responsibility. I am not exaggerating when I say that without Elspeth's support this Thesis would not have been completed on time, and I must acknowledge her support accordingly.

The greatest of all possible supports, however, has come from my wife, my daughter, and my parents. Without their lifelong unconditional love and support nothing would have ever happened. I thank and love them above all else.

To my wife, daughter, and parents

Chapter 1: Introduction

> *(…) yet I assume that a large portion of the work still remains to be done; and if I shall be able to make even small additions to what it has been said, that must be regarded as a sufficient excuse for my undertaking.(…)* Strabo, *Geographica*, (1.2.1)

The ancient port of Seville was one of the most preeminent commercial hubs during the Roman Empire and the Early Middle Ages. Despite its importance in antiquity, little is known about the port's exact position, layout and/or facilities. Equally, the developments and/or transformations that the port probably underwent through different historical periods are also undetermined. What we know is that the ancient port of Hispalis ceased to exist at some point before the 13th century, yet we are uncertain exactly when, how, and why this happened. It is clear however, that any remains of the ancient port that might be preserved currently lie seven metres beneath the tell of Seville's city centre. This is the result of a significant displacement in the position of the Guadalquivir River, which occurred no later than the 13th century, and ultimately led to the assimilation of the ancient port area by the emergent Islamic medina of Ishbiliyya.

It is the purpose of this DPhil Thesis to study the topography, layout, and facilities of the ancient port of Seville, their history and development from approximately the 1st century BC to about the 13th century AD. This diachronic or *longue durée* study of the ancient port has been conducted adopting a holistic and interdisciplinary approach by examining a diverse range of information such as: direct evidence from the scant knowledge of archaeological remains of the ancient port; direct and indirect information contained in multiple archaeological reports of interventions in Seville that have unearthed remains nearby the location of the ancient port; historical and literary sources that provide information about the port especially, but not exclusively, from the Early Middle Ages onwards; geomorphological data on the palaeo-evolution of the Guadalquivir River in antiquity; and palaeo-climatological data on the Late Holocene. For each particular historical period, the present study has also conducted some comparative analysis, examining analogous information from other ancient ports with related characteristics.

I believe the study of the ancient port of Seville not only could increase our knowledge of the port itself, but could also shed significant light on the development and layout of the city. Additionaly, a diachronic study of the port could help us to understand some of the political, economic, cultural and religious changes that Seville endured through different historical periods.

Research questions that the Thesis intends to address include:

1. What is the current knowledge regarding the topography, layout, number of harbours, and facilities of the ancient port of Seville?
2. What were the size, capacity, and the volume of commercial traffic that the ancient port of Hispalis sustained at the peak of its trade during the Roman era? Did the size and capacity of the port remain similar or change within different historical periods?
3. Where exactly was the ancient port of Seville and its harbour/s located? Was the same location used throughout the life of the port? Or did the location/s change over time?
4. What layout and type of facilities did the port have? Were its layout or facilities transformed with time?

5. Precisely when, how, and why did the ancient channel of the Guadalquivir River cease to be navigable or change its position, an event that irremediably led to the disappearance of the ancient port?

During the course of this research, many archaeological excavations within Seville's historical centre have been thoroughly studied and will be briefly presented. Among them, the Plaza Nueva Square salvage excavation represents a fundamental source of information for deciphering some aspects of the ancient port of Seville. At the present time, the Plaza Nueva excavation is the only archaeological intervention that has been conducted in the area (i.e. anchorage) of the ancient port of Seville. This salvage work not only unearthed abundant ceramic remains and other terrestrial artefacts, but also discovered the only nautical archaeological remains from antiquity (i.e. an iron anchor and the remains of a wooden boat) known to date from Seville. In the present Thesis, for the first time all the artefacts from Plaza Nueva are studied, presented and discussed in detail because of the substantial amount of information that these remains have to offer. This heterogeneous and seemly chaotic assemblage, largely ignored until now by archaeologists, is helping us to better understand the geomorphological transformations that the Guadalquivir River underwent and consequently the transformations of the port. Particularly, they shed light on when the ancient channel of the Guadalquivir, and therefore the ancient port of Seville, ceased to be navigable and how, soon afterwards, it disappeared after being assimilated by the expansion of the Islamic city.

This Thesis represents a *longue durée* or diachronic study with the goal of explaining the founding, development, and disappearance of the ancient port of

Seville. With that goal in mind, and considering both the large time span covered (i.e. about thirteen centuries) and the scarce direct evidence available, the Thesis has been divided into three main historical periods presented in Chapters 3, 4, and 5. Each of them is conceived as a "historical snapshot" of the reality of the port during that period.

The first third of the Thesis is focused on the founding of the port as a commercial hub for the Mediterranean maritime trade network, which occurred in the Roman period of Seville (i.e. Hispalis) during the Late Republic and the Imperial Roman periods (i.e. 1st c. BC to 4th c. AD). Chapter 3 considers the historical role and importance of the ancient port of Seville within the Mediterranean trade networks during the Roman Empire. The Chapter also covers the palaeo-reconstructions of the ancient channel of the Guadalquivir River (carried out by geologists that study its palaeo-geomorphology) and other archaeological data, with the aim of understanding and reconstructing the position, layout and characteristics of the Roman port, and its port facilities (e.g. quays, *horrea*, etc.).

The second part (Chapter 4) focuses on the development of the port. Moving into the 6th c. AD, an extremely important yet scarcely known century of the late antique city of Seville (i.e. *Ispali*), this Chapter aims to explain two aspects: first, some of the profound historical changes that the city, and the entire region endured; second, the palaeo-geomorphological transformations of the river, the port, and its port-facilities that occurred during Late Antiquity.

Finally, the third part of the Thesis (Chapter 5) focuses on the disappearance of the ancient port. Advancing into the Early Middle Ages (i.e. 9th-13th c. AD), it attempts to explain exactly when, how, and why some dramatic changes occurred to the ancient channel of the then Islamic Guadalquivir River (i.e. *al-wādi al-kabīr*). This will tentatively be achieved by examining and combining three sets of information: current palaeo-geomorphological hypotheses; archaeological data from the Plaza Nueva excavation and other archaeological sites from the Islamic medina of Seville (i.e. Ishbiliyya); as well as palaeo-climatological Late Holocene data. The dramatic changes that the ancient channel of the Guadalquivir sustained during an undetermined time during the Islamic period produced the irreversible disappearance of the ancient port of the city.

The change in the course of the river profoundly transformed the Islamic medina of Ishbiliyya, significantly increasing the size of the city and developing, as a result, new vast districts later occupied by its flourishing population. This also represented the foundation of a new port, the current port of Seville. This new port might have been, at first, a mere shadow of its predecessor; yet, in the coming centuries, this newly founded port will became no less than the most prominent and important port of Europe. It will connect, for the first time in history, the Old World of Europe with the New World of the Americas and the Far East in the thriving 16th century of the Age of Discovery. This was the home base used by the Kingdom of Spain to enable Spain to become the world's first and greatest trans-oceanic imperial power. Alas, the fascinating story of this prominent port of the Renaissance is not covered in the present Thesis, although some specific comparative analysis will be offered in the different chapters.

Chapter 2: Methodology and scope of the research

The purpose of this Chapter is to explain and discuss the different methodologies followed by the present Thesis.

2.1 Approaches for studying antiquity: maritime archaeology

The scientific study and understanding of human activities and their history (i.e. some millennia before the present time) is an endeavour that the fields of archaeology and history attempt to carry out. However, the former studies the complete span of time of human existence, whereas the latter focuses only on the last few millennia, or historical period, for which written records existed.

Although the fields of archaeology and history overlap with regard to the historical periods of the last few millennia, traditionally, and in general terms, they have operated separately from each other. The main reason for this is the fact that they employ two different approaches. Archaeology unearths and studies material culture that has survived from past activities to derive insights into the individuals and societies that produced them. History, on the other hand, studies and interprets surviving textual and documentary evidence for past events of ancient people and societies. Both disciplines have in common the study of ancient cultures and peoples, yet with different approaches.

Some mainstream scholars neglect the fact that both academic fields try to understand exactly the same historical periods and the peoples that lived through them. On many occasions, they attempt to address the same research questions.

However, only in recent years have some scholars from both fields started to show a genuine interest in “the other” scholars and their field. Noteworthy publications have come to light since this unorthodox breed of academics has crossed the traditional boundaries (e.g. Horden and Purcell, 2000; McCormick 2001; Ward-Perkins, 2005 and Wickham 2005).

It is the intention of this Thesis to follow that path: by researching, studying and considering not only what the fields of history and/or archaeology have to offer concerning a particular period of time, but also other pieces of information, such as different palaeo-sciences, that could contribute scientifically to a better understanding of the past.

Historians and traditional land-based archaeologists have considered, and some still consider, underwater archaeology, which studies archaeological or historical remains found underwater, as a form of pseudo amateur activity. Although dealing with material culture from the past, it seems that these operations, because they are conducted in a different medium (i.e. underwater), are somehow less academic and rigorous. The fact that the activity is conducted in coastal areas (e.g. the Mediterranean Sea) during the summer months by archaeologists wearing swim suits, contributes to this idealised, romantic, and negatively distorted image of “pseudo-academics” having fun during leisure time in the quest for “treasure”.

After the Second World War, archaeologists such as Honor Frost (1963), Nino Lamboglia (1952), Fernand Benoit (1956; 1958), Frédéric Dumas (1962), and Ole Crumlin-Pedersen pioneered the field of underwater archaeology in the

Mediterranean and Northern Europe. In the USA George Bass, from the University of Pennsylvania, followed the European pioneers, becoming famous after the excavation of a Bronze Age shipwreck at Cape Gelidonya, Turkey, in 1960 (Bass, 1967). He was among the first academics who defended underwater archaeology as a scientific discipline to the rest of the archaeological academic field. In his first book, he explained that underwater archaeology should be just called archaeology, without any qualifying adjective; likewise those archaeologists conducting excavations at sites located at high altitudes are not called mountain archaeologists (Bass, 1966: 15).

A decade later Keith Muckelroy, one of the second generation of pioneers of underwater archaeology in the United Kingdom, defined further and sub-divided the then emerging field. He defined maritime archaeology as *"the scientific study of the material remains of man and his activities on the sea"* (Muckelroy, 1978: 6). Maritime archaeology is focused on the study of individuals, societies, and maritime culture with its technical, social, economic, political, religious and other aspects. It is not the study of objects simply for themselves; when these objects are studied and analysed by archaeologists, they are able to provide insights into the people who made or used them (Muckelroy, 1978: 4).

Muckelroy also explained that maritime archaeology is not necessarily always conducted underwater. A considerable number of finds related to maritime archaeology are found on terrestrial sites, such as ships excavated above water, ships used as graves, or ancient ports currently on land, among other examples. However, it is true that the majority of evidence comes for submerged sites and shipwrecks. Consequently, he explained that maritime archaeology has two sub-disciplines: underwater archaeology and nautical archaeology. Underwater archaeology, or archaeology under water, is the study of material culture from the archaeological record found in submerged sites. Nautical archaeology is a more specialised sub-field focusing on the study of the technology of ships, its hulls, rigging, fittings, armament and instruments (Muckelroy, 1978: 9-10).

Despite Muckelroy's clear explanation of maritime archaeology, some still consider it a different field from terrestrial archaeology. Consequently, the majority of archaeological studies tend not to combine data obtained from terrestrial excavations with information from underwater sites. There are occasions, however, when this has been attempted but largely in an incoherent manner.

A comprehensive approach to integrate these two sets of data was proposed by Christer Westerdahl (1992) who coined the term "maritime cultural landscape". This definition resulted from the need for a *"scientific term for the unity of remnants of maritime culture on land as well as under water"*. The "maritime cultural landscape" then incorporates *"the whole network of sailing routes, old as well as new, with ports and harbours along the coast, and its related constructions and remains of human activity, underwater as well as terrestrial"*. (Westerdahl, 1992: 6). According to Westerdahl (1992), the five main aspects of study of the maritime cultural landscape are:

1. Shipwrecks: Indicators of use and dating instruments
2. Land remains: Ancient monuments preserved on the waterfront

3. Tradition of usage: The advantages of local maritime experience and tradition

4. The study of natural topography: Natural havens. Contours on land, depth curves; the effects of silting and isostatic uplift

5. Place names: General considerations of applicability

This scientific approach resulted, in origin, from the study during the 1980s of the northernmost provinces of Sweden, known as Swedish Norrland. Since then, it has been applied to studies across various geographic areas around the world (Ford, 2011). Unfortunately, scholars who study the Mediterranean have largely ignored this approach, with some exceptions amongst Prehistoric archaeologists (e.g. Knapp, 1997; Vavouranakis, 2011).

This Thesis will use a maritime archaeology approach to study the micro "maritime cultural landscape" of the ancient port of Seville. As explained above, this means the study of man and his interaction with the sea with a focus on the port and its related maritime culture and landscape. This study will, therefore, not utilise any underwater archaeology undertakings. It will have as its primary approach the study of diverse material culture already extracted from the archaeological record, which is kept within museum collections. The heterogeneous archaeological materials extracted from the Plaza Nueva excavation will be at the centre of the study. They are the only archaeological remains extracted from an anchorage area of the ancient port of Seville and, as we will see, the information that they can provide is of significant scientific value. The Plaza Nueva materials will serve as the connector of all the historical periods studied (*vide infra*). The research will also encompass the analysis of additional primary sources, such as surviving documentary evidence and other textual evidence. Finally, this work will also include the study and revision of much modern scientific literature on the subject of the harbour facilities of Seville, including some previously unpublished material.

2.2 Defining and justifying the geographical area: the Baetica Region

The Iberian Peninsula is a vast geographical area, which since antiquity has comprised different cultural realities that are still discernable to this day. The east of the Iberian Peninsula is directly related to the Mediterranean Sea and the peoples and cultures that inhabited its shores. The south is also related to the Mediterranean but also has a strong Northern African influence as well. The west is dominated and mainly influenced by the Atlantic Ocean. The north is influenced by the Cantabrian Sea, and northwest European peoples. However, the north is populated by a few distinctive indigenous Iberian peoples (e.g. the Basque, the Cantabri, and the Astures) who have been little affected by foreign Mediterranean influence due to the nature of the very inaccessible geographical territories that they inhabit. The centre of the Iberian Peninsula is dominated by the Inner Plateau or *Meseta Central*, which is isolated from the coast and, therefore, has a lesser maritime influence (Phillips, 2010).

These different geographical realities, with their different sources of influence, are the home of different cultures and peoples within the Iberian Peninsula. These regions and their peoples, differ from each other significantly, have disparate cultural values, and in many cases they reacted to the same historical events in different ways. The present Thesis will focus on the southern part of the Iberian Peninsula, which was known in the Roman era as the Province of Baetica, which is dominated by the Guadalquivir River Basin (Figure 1).

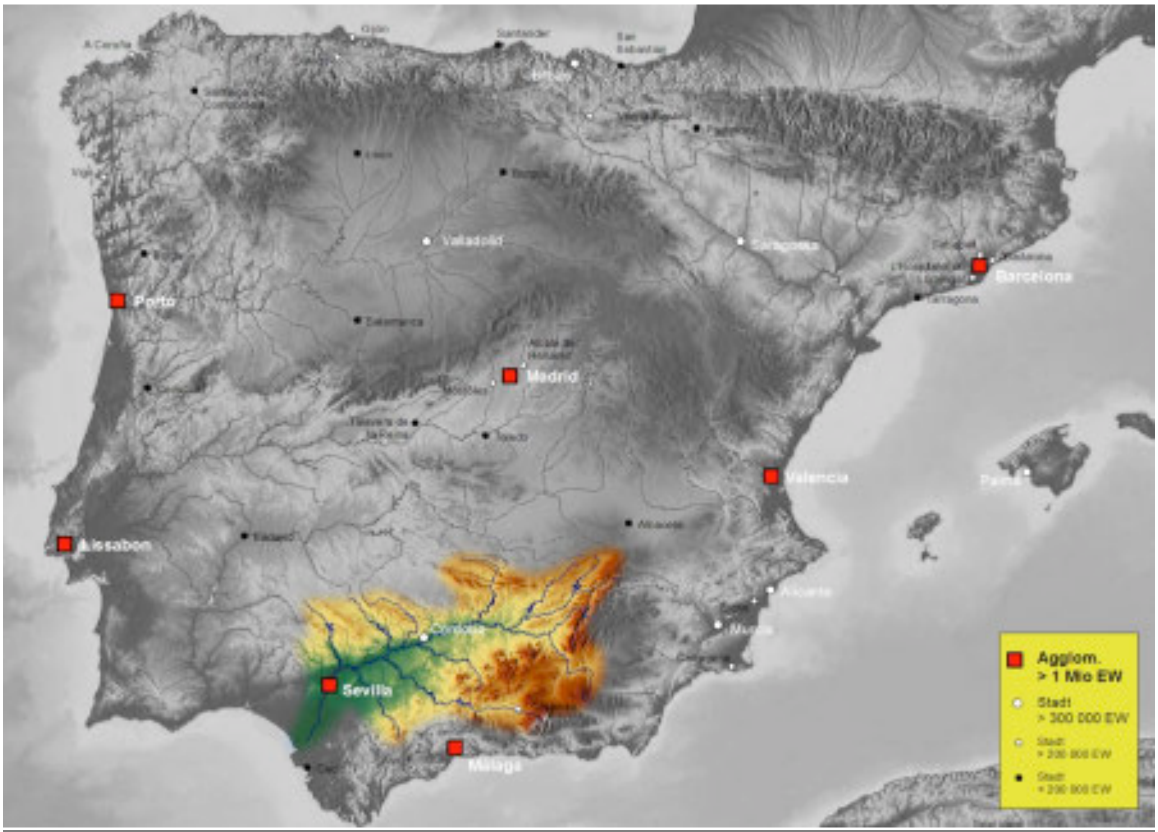

Figure 1: The Iberian Peninsula with the Guadalquivir River basin in colour (Author).

The Iberian Peninsula has played an important role in many aspects of antiquity. Perhaps since the end of the Bronze Age and certainly during the Iron Age, the south of the Iberian Peninsula was visited and colonised by different Mediterranean peoples in search of its abundance of metal ores. Phoenicians first (Aubet, 1993; Alvarez Marti-Aguilar, 2011; Celestino Pérez and López-Ruiz, 2016), Greeks later (Rouillard, 1991; Cabrera Bonet and Sánchez, 2000; Prag and Quinn, 2013), and finally Romans (Keay, 1988; Le Roux, 1995; Richardson, 1996; Caballos

Rufino and Lefebvre, 2011) sought to have a strong influence on, if not total control, of some of its valuable resources.

Located at the far west of the Mediterranean, the Iberian Peninsula is the most remote land in the southwest of continental Europe. It is separated from the African Continent by the straits of Gibraltar and it is physically connected to continental Europe by the Pyrenees at its northeast extreme. However, the inaccessible nature of this range of mountains made the Iberian Peninsula almost like an island, being only accessible by sea.

This characteristic was indeed what made the Iberian Peninsula first visited, later on colonised, and finally conquered by seafaring peoples or by means of military naval power (García de Cortázar, 1995). Thus, from the end of the Bronze Age, the Iberian Peninsula received almost all its foreign influence by sea (Casson, 1991: 65-66). The Guadalquivir River Basin dominates the south of the Iberian Peninsula. This extremely rich and fertile valley is naturally protected by mountain ranges in the north and the Mediterranean Sea and the Atlantic Ocean in the south. Once, the shores of the Baetica Region were part of the Roman *mare nostrum* and the Atlantic cost. It produced vast quantities of manufactured goods that were exported by sea, mainly from the port of Seville (e.g. Rodríguez Almeida, 1984; Ponsich, 1998).

From the Early Middle Ages, the south Iberian Peninsula became al-Andalus (i.e. Muslim Spain), and the port of Seville acted as the node between the two important and different worlds: Christian Europe and Muslim North Africa. Its strategic position, exposed to the influence of both worlds, had important consequences during the Middle Ages; it connected the Mediterranean Sea with north-western Europe, becoming a fulcrum point for the history of seafaring. This double maritime influence did have its consequences. It seems not to be a coincidence that the union of the kingdoms which at the end of the Middle Ages became the Kingdom of Spain, created the foundation of what later was acknowledged as the largest trans-oceanic maritime empire that the world had known. During the 16th and 17th centuries, Seville would become the centre of the world, and that was largely because of its port (Bernal and Collantes de Terán Sánchez, 1988; Pérez-Mallaína Bueno, 1998).

All the aforementioned factors illustrate why maritime culture and maritime trade had a tremendous impact on the history of the Iberian Peninsula and how the port of Seville has always been at its centre. Therefore, the potential archaeological record on the port of Seville that has survived from past maritime activities is of the utmost importance. It is, therefore, the intention of this Thesis to study the maritime archaeology of the ancient port of Seville with the goal of contributing to a better understanding of the events which happened during ancient history and the Early Middle Ages.

2.3 Defining and justifying the chronological scope: 45 BC - AD 1248

The seemingly arbitrary choice of the dates covered by the present Thesis is based on two historical events that changed the reality of Seville: the former was when it obtained the status of a Roman Colony during the 1st century BC; and the latter was the conquest of the city by the Christian troops of King Ferdinand III of Castile in AD 1248.

The Chapter 3 of the Thesis covers the Roman period of Seville, a city known then as Hispalis (Ordóñez Agulla, 1998). For the present Thesis, the Roman period is taken to start in Seville when Julius Cesar bestowed the status of a Roman Colony on Hispalis probably in 45 BC (Ordóñez Agulla, 1998: 52, 54-55) and finish with the various Roman Empire crises of the third and fourth centuries (Keay, 1988; Le Roux, 1995; Richardson, 1996; Caballos Rufino and Lefebvre, 2011).

Whereas the Roman creation of Baetica, as well as the durations of the Islamic and Christian Periods of the Middle Ages, are clearly defined, the intermediate historical period from the Roman era to the Middle Ages is not. This transitional period is described, categorised, or designated by the term Late Antiquity. It mainly concentrates on both mainland Europe and the Mediterranean world. However, the determination of the beginning and end of Late Antiquity varies, depending on which region is being considered (Wickham, 2005), and is often a matter of debate by scholars (Cameron *et al.* 2000: xviii).

This different understanding of precise geographical and chronological boundaries is also a consequence of the geo-political changes that took place during Late Antiquity. What used to be a coherent geographical space (i.e. Roman Empire) was slowly transformed, being broken up into several smaller regions. First, the Roman Empire was split into two: the Western Roman Empire and the Eastern Roman Empire. Later, the Western Roman Empire began to lose its cohesion and soon afterwards, it started to be sub-divided into different smaller regions, which each began to operate individually (Cameron *et al.* 2000: xix; Wickham, 2005). This process of atomization was not linear or homogeneous, and took place at a different pace and at various dates in every region. Consequently, there are several different precise chronological boundaries that define Late Antiquity for each one of these regions (Ward-Perkins, 2005: 40-48).

In the case of Hispania, scholars have proposed various dates to establish the precise chronological boundaries of Late Antiquity in this region of Europe (Kulikowski, 2004; Collins, 2004). In general terms, Late Antique Hispania can be thought of as starting with the various Roman Empire crises of the third and fourth centuries and culminating with the Umayyad conquest in AD 711 (Salvador Ventura, 1990). This is the chronological boundary for the Late Antique period of Seville and Baetica (Padilla Monge, 1989) followed by this Thesis and covered in Chapter 4.

For the Islamic period in Seville (covered in Chapter 5), the Thesis follows a clearly stablished chronological boundary. It begins in AD 712, when forces of the Umayyad's Empire conquered Seville (Levi-Provençal and García Gómez; Bosch Vilá, 1984). Ishbiliya, the name under which Seville was known during the Islamic period, remained controlled by different Islamic monarchies in subsequent centuries until AD 1248, when the city was defeated by the Christian troops of King Ferdinand III of Castile (Collantes de Terán Sánchez, 1992). The Islamic Period of Seville ended then, and this Thesis uses AD 1248 as end of the chronological boundary studied.

2.4 Defining and justifying the study of ports

2.4.1 Definition of port and harbour

First and foremost, from the semantic point of view it is important to define the meaning of the words port and harbour and their differences:

René de Kerchove's International Maritime Dictionary defines a port as *"a place for the loading and unloading of vessels for maritime purposes. The term includes a city for the reception of mariners and merchants and therefore denotes something more than a harbour. A port possesses a harbour but a harbour is not necessarily a port. To make it a port, in the accepted sense of the word, there must be in addition accommodation and facilities for landing passengers and goods and some amount of overseas trade"* (Kerchove, 1961: 598). The Oxford English Dictionary defines port as (definition 1.a): *"A town or place possessing a harbour which boats use for loading or unloading, or which forms the starting point or destination of a voyage (...)"*.

Similarly, the International Maritime Dictionary defines harbour as *"any place which affords good anchorage and a fairly safe station for ships, or in which ships can be sheltered by the land from wind and sea. The term itself applies only to the area of water with the works necessary for its formation, protection and maintenance. It is not necessary that it be landlocked or absolutely safe for ships. It is enough that it affords a reasonably safe place of retreat from wind and storms. Furthermore it is a place where ships are brought for commercial purposes to load and unload goods and passengers. Any natural creek or inlet on the sea shore with* *adequate depth of water and sufficient shelter for ships fulfills the essential conditions of a harbour"* (Kerchove, 1961: 354). The Oxford English Dictionary defines harbour as (definition 3a): *"A place of shelter for ships;* spec*. where they may lie close to and sheltered by the shore or by works extended from it; a haven (...)"*.

As we can see from the above, the words port and harbour are not synonyms: the former, implies a larger and more complex arrangement of facilities that could be as big as a city; whereas the latter describes an area of anchorage that primarily provides protection for ships against the sea and the adverse weather. Consequently, a port can have a harbour (or several) but not vice versa. This Thesis will use these two definitions, so the term port will be used when referring to the city in which there are one or many harbours and other associated facilities are located. Similarly, the term harbour will be used when referring to a specific area of anchorage within the port, or the physical harbour structures themselves (e.g. quay, dock).

The definition, understanding, and study of ports in antiquity, from the historical, archaeological, social, economical or connectivity point of view, however, is a more complex issue and several research questions could be posed (Rickman, 1985; 2008).

Positioning and layout of ports in the ancient Mediterranean were partly dictated by certain physical factors, primarily currents, winds, and the configuration of the coastline (Karmon, 1985: 1; Rickman, 1985: 106). These physical conditions are still the main concern of architects or engineers who plan the layout of a port. However, also the geographical location and its socio-economical factors are important in deciding on the site of a port (Karmon, 1985: 1). Ancient architects and engineers sometimes had to decide between choosing a favourable coastal site with physical advantages versus a profitable geographical location. At least as early as the Iron Age, in a region of strong commercial traffic ports were constructed even if favourable conditions were missing, by erecting artificial harbours. On the other hand, excellent natural sites for ports were not used unless the economy of the region demanded it (Karmon, 1985: 1).

According to its definition, a port usually comprises various infrastructures, facilities, and installations. The main necessary feature of a port is, however, the existence of a harbour for the vessels to anchor or berth. From Classical times most major ports had several harbours which had different purposes. Associated with their harbours, ports were usually equipped with different infrastructures such as jetties, wharfs, docks, quays, bollards, etc. Commercially oriented harbours could also have machineries such as cranes as well as other facilities and offices, warehouses, granaries, etc. Military harbours, on the other hand, could have installations such as slipways and shipsheds (Blackman, 1982b).

Some ports in antiquity served as the major origin and/or destination of goods; these ports were described as emporia. The encyclopaedia of Pauly and Wissowa, *Realencyclopädie der classischen Altertumswissenschaft*, defines *ἐμπόριον* (i.e. emporium) as *"(...) port/trading centre, (...) a place where different communities come together to exchange goods (...). The residents of an* emporion *are actively* *engaged in trade, (...). An emporion offers infrastructure and institutions that preserve the rights and living standards of its inhabitants, as well as fair trade (temples, authorities for controlling the market etc.).(...) Unlike the polis, the emporion offers a space in which foreigners can mingle unhindered"*. Within the Classical Mediterranean world, emporia were in origin independent trading posts for foreign merchants, and were reserved for their business. The emporium denotes a distinct sector or district around the harbour of a port dealing with commercial activities; they were trading places in which goods of all sorts were exchanged (Blackman, 1982b: 194-196). Emporia seem to have been cosmopolitan places with an international and multi-ethnic population of traders, ship-owners, other professionals and their families (Demetriu, 2011: 267). However, not all ports were emporia, and not all emporia were located in ports. Although some ports became important commercial hubs due to the export or import of commodities, ports were not exclusively intended to function as economic centres. Ports were, and still are, gateways for connectivity, traffic, and communication of people, ideas, religion, artistic practices and culture in general (Blackman, 1982b: 188). Consequently, it is important to understand the individual nature of each port and harbour, their specific functions, and their specific role within their surroundings.

The geographical areas surrounding a port, alongside its political and socio-economic factors, at the local, regional and wider levels such as maritime trade networks, are also important in the understanding of ancient ports (Rickman, 1985). These geographical areas with their associated socio-economic concepts can be summarised and divided into two parts: the “Hinterland” and the “Foreland”.

The hinterland was the surrounding region, which provided the port with exports, such as raw materials, agricultural products, and industrial goods, as well as the area where traffic demand originated and through which imports were received into the port. Three levels of hinterland can be distinguished: continental or semi-continental, regional, and local. The port was connected to its hinterland by means of inland communications (Karmon, 1985: 1-3), which were of the outmost importance for establishing and developing them (Rickman, 1985: 109). Geoffrey Rickman (2008: 7) suggested that ports *“must be thought of as great clusters of facilities, set in wide webs of communication by road and by water.”*

Foreland, on the other hand, denoted the width of the ocean accessed from the port, but in practical terms refers to the ports to which a certain port has frequent shipping connections and the network of routes leading to these ports (Karmon, 1985: 1-3). Pascal Arnaud (2005; 2007: 325-329) has established that linear segments (resulting from choosing a cardinal direction and a prevailing wind) that merged at specific geographical landmarks, such as capes, composed maritime routes in the ancient Mediterranean. In that sense, ports could be simply defined as commercial hubs of maritime trade networks. Colin Adams (2012: 228) has taken this concept further by proposing *“Ports acted as nodal points, connecting maritime, riverine, and land routes”*.

Considering the concept of foreland, ports did not function individually, but did so in connection with their frequent shipping connections and the network of routes leading to these ports. Jean Rougé was one of the first scholars that raised the main questions in relation to maritime trade in the ancient Mediterranean. He had in mind that direct connections over the shortest distance was the basic pattern (Rougé, 1966) and this notion was followed by Duncan-Jones (1974: 366-369). Since the late 1980s, the question has been revisited, and some scholars (e.g. Reynolds 1995: 126-136; Horden and Purcell 2000: 133-143) consider coasting or tramping as the main pattern of pre-modern sailing, both ancient and mediaeval.

Javier Nieto (1988), relying upon the composition and disposition of shipwreck cargoes, proposed a simple model of commercial interaction and redistribution between two types of ports: primary and secondary. However, the reality in the ancient Mediterranean was a more complex maritime pattern. There were ports of different sizes and their roles differed from one to another suggesting a multi-level hierarchy and sophisticated network of trading ports working on various scales, that in some cases formed maritime façades (Purcell, 1996; Schörle, 2011). Wilson *et al.* (2012) have further explained this idea of port hierarchies suggesting, *"The very large emporia of the Roman world (...) were linked directly to each other by regular shipping routes, and often by established trading arrangements between groups of merchants. But they play no less important a role in articulating between the long-distance shipment of goods and local collection from and redistribution to lesser ports in their foreland regions"*.

Taking all these complex issues regarding ports in antiquity, Nicolas Carayon and Simon Keay (forthcoming) have provided the most comprehensive definition that I have read: *"A port is an interface between land and water which acts as a node of connection between centres of population in its hinterland and other ports overseas. They are sites that are usually thought of as dots on the map or nodes in network analyses of inter-site connectivity. In reality, however, they are much more complex. Within the same micro-region, what is usually termed as simply a "port" in fact acts as an interface of connectivity that is perhaps better conceived of as a cluster of port facilities and sites of harbour-related potential. These "port-systems" take the form of façades maritimes of differing degrees of development. They were devoted to the export and import of traded goods, facilitated the development and maintenance of social relationships by enabling people to travel by sea, and could also help insure the security of maritime areas by hosting fleets."*

In this Thesis the hinterland of the ancient port of Seville, particularly the Valley of the Guadalquivir River, will be discussed to a certain extent (*vide infra*). On the other hand, only particular aspects of the foreland of the port, mainly its commercial connection with Rome during the Imperial period, will be deliberated. These facets will both be examined in the Roman chapter of the Thesis as a means of necessary introduction to the context of the ancient port, but will not be covered in the other two historical periods studied. The reason for this is because the Thesis focuses on the physical reality (i.e. topography and layout) of the port facilities and its harbour installations as well of their development during the three historical periods that this Thesis examines. The broader regional socio-economic context aspects of the ancient port of Seville regarding its hinterland and foreland, albeit briefly discussed when needed, are not the main focus of this work and, consequently, will not be addressed extensively.

2.4.2 Harbour typology

Rougé (1966) was the first to propose an archaeological typology distinguishing natural and artificial harbours on the basis of harbour technology. Since this first proposal, ancient ports and harbours have also been classified according to different points of view, such as their economic and administrational organisation and their social structure, as well as their natural landscape based on a number of variables such as geomorphology and sediment supply, and their artificial structures (e.g. Flemming 1971; Galili *et al.* 1991; Blue 1995; Goiran and Morhange 2003; Carayon 2008; Marriner and Morhange 2007; Marriner et al. 2010).

Marriner and Morhange (2007: 146–162) proposed a very comprehensive classification of harbours from the standpoint of the geo-archaeology. According to them, four main aspects are important in dictating harbour location and design.

1. Situation. A port forms an interface between the hinterland and the sea, and its location depends on traffic in these two areas. The margins of large deltas were often attractive locations (e.g. Marseilles for the Rhone valley, Alexandria for the Nile, and Seville for the Guadalquivir).
2. Site conditions. Two types of geological contexts, rocky and clastic coasts, were exploited. During the Iron Age, harbour complexes where largely established in protected rocky bays and coves. Ports on clastic coasts were generally developed in later periods, following the technological development of harbour technology and engineering. The discovery of

hydraulic concrete in the second century BC (Oleson, 1988; Brandon *et al.* 2014) meant that the Romans were significantly less hindered by environmental constraints, as was typically the case during the Bronze and Iron Ages.

3. Overall layout. The layout of a port depends on the environmental conditions (winds and waves) and on the types of ship that use it. The size of the ships defines the acceptable wave-induced disturbance and the need to provide protection against swells and storms with a breakwater. The volume of traffic and number of ships operating in the port dictates the length of quays and the area of the basins required.
4. Harbour structures. The draught of a vessel defines the necessary depth at the quayside and thus the height and structure of the quay. Locally available materials (wood, stone and mortar) and construction methods define the specific structures for a particular region and historical period.

Considering these determining factors, there is a great variety of harbour types. The harbour typology proposed by Marriner and Morhange (2007: 146–162) also considered how ancient harbours have come to be preserved in the geological record. Four variables were taken into account: (1) distance from the present coastline; (2) position relative to the present sea level; (3) geomorphology, and its role in influencing the choice of harbours; and (4) taphonomy, or how these ancient ports have come to be fossilised in the sedimentary record (Figure 2).

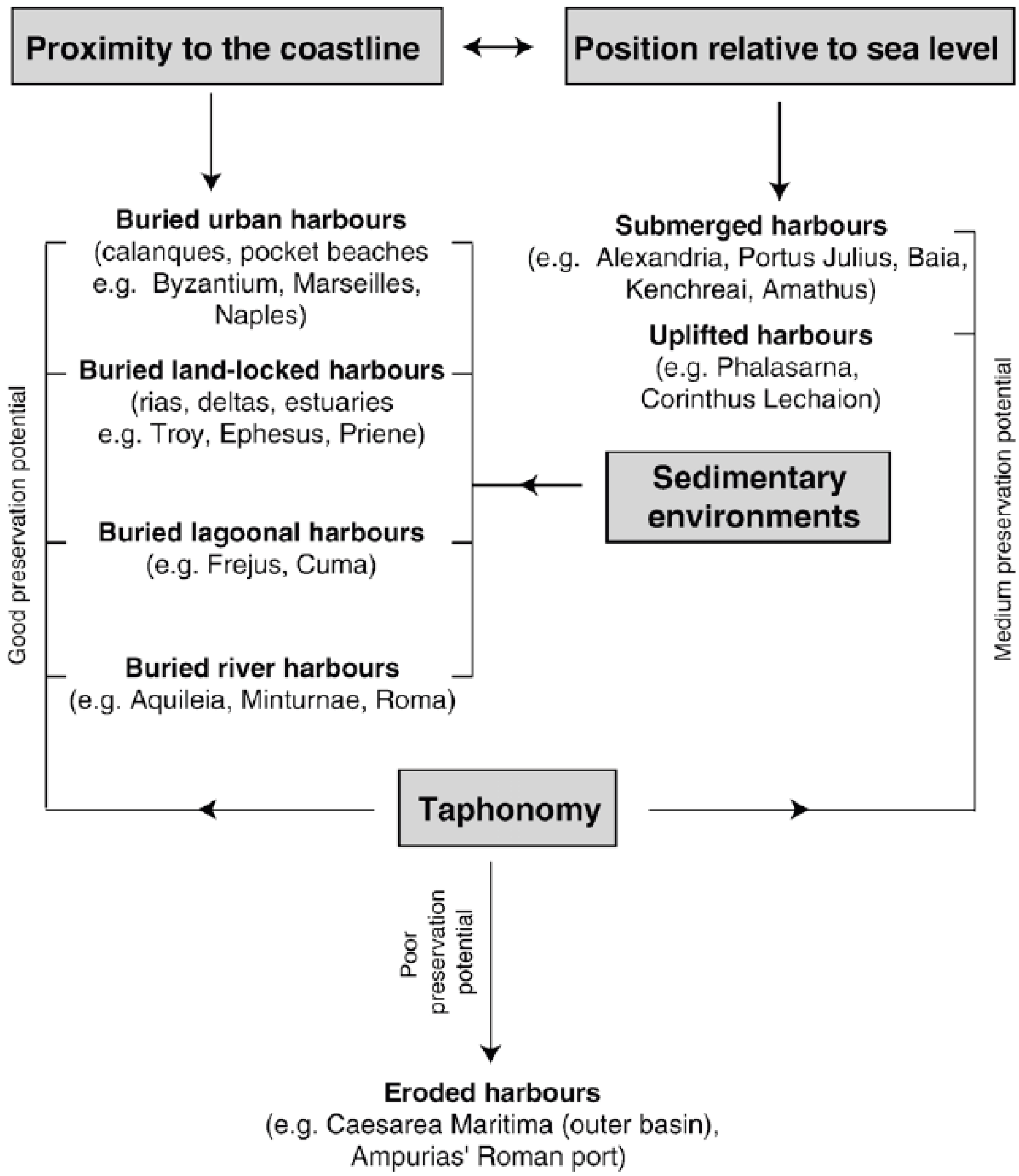

Figure 2: Ancient harbour classification based on four variables (1) proximity to the coastline; (2) position relative to sea level; (3) sedimentary environments; and (4) taphonomy (after Marriner and Morhange, 2007: fig. 7).

A total of seven different harbour types can broadly be discerned and these are divided into two main groups (Figure 3): the first group refers to unstable coasts where 1, submerged harbours and 2, uplifted harbours can be found. The second group, refers to stable coasts: 3, buried urban harbours; 4, buried landlocked harbours; 5, buried fluvial harbours; 6; buried, lagoonal harbours; and, finally 7, eroded harbours compose this group. Following the classification of Marriner and Morhange (2007: 146–162), the ancient port of Seville falls into the category of a buried fluvial harbour.

Unstable coasts		Stable coasts				
Submerged harbours	Uplifted harbours	Buried urban harbours	Buried landlocked harbours	Buried fluvial harbours	Buried lagoonal harbours	Eroded harbours
- Alexandria	- Aigeira	- Acre	- Enkomi	- Antioch	- Coppa Nevigata	- Ampurias
- Baia	- Kenchreai	- Beirut	- Ephesus	- Aquileia	- Cuma	- Caesarea (outer harbour)
- Eastern Canopus	- Lechaion	- Byzantium/Istanbul	- Kalopsidha	- Gaza	- Frejus	
- Egnazia	- Phalasarna	- Cartagena	- Leptis Magna	- Minturnae	- Lattara	
- Helike	- Seleucia Pieria	- Kition Bamboula	- Miletos	- Narbonne		
- Herakleion		- Marseilles	- Malta	- Naucratis		
- Megisti		- Naples	- Priene	- Ostia (Sardinia)		
- Miseno		- Olbia	- Troy	- Pelusium		
- Pozzuoli		- Piraeus	- Salamine	- Rome		
		- Sidon		- Sevilla		
		- Toulon		- Schedia		
		- Tyre		- Thebes		
				- Valencia		
				- Zaragoza		

Figure 3: Non-exhaustive list of harbours classed into seven groups (after Marriner and Morhange, 2007: fig. 8).

2.4.3 Ancient ports and harbours studies

Nevertheless, nowadays the principal challenge for studying ports in antiquity comes from the fact that very few have been properly excavated, studied, and the information published. In 1923, Lehmann-Hartleben published a detailed survey of ancient harbours that has not been revised, and modern scholar literature lacks a comprehensive study of ancient ports. From the late 1960s and during the 1970s, archaeologists pioneered the study of ancient ports. Scholars such as Honor Frost (1963, 1972), Nic Flemming (1969, 1971, 1978, 1979) and Paula de Coetlogon Williams (1976) identified and described more than 1,000 coastal sites in the Mediterranean.

David Blackman is the senior expert and pioneer of the archaeology of ancient harbours, particularly with regard to shipsheds, and he has written widely (e.g.

Blackman 1972; 1973b; 1982a; 1982b; 1988; 1995; 1996; 1999; 2008; Blackman and Lentini 2003; Blackman *et al.*, 2013). In 1982, he published two very influential articles focusing on the technical aspects of ancient harbours in the Mediterranean (Blackman 1982a; 1982b). His latest synthesis concerning Mediterranean ancient harbours is largely an update of his previous articles (Blackman, 2008). Also during the 1980s, Geoffrey Rickman (1971, 1980, 1985; 1988; 1996; 1998; 2002; 2003; 2005; 2008), George W. Houston (1980, 1988), and Avner Raban (e.g. 1980, 1985, 1986, 1992; Raban and Hohfelder 1981) began to focus their research on the wider context of the historical, social, economic and operational aspects of ports.

The development of harbour infrastructure and construction techniques has been the focus of several studies. Particularly, the development during the Roman era of hydraulic concrete, which for the first time in history enabled the construction of entirely artificial harbours such as Caesarea Maritima, has been thoroughly studied (Brandon *et al.*, 2005; 2008; 2010; 2014; Hohlfelder *et al.*, 2008; Oleson *et al.*, 2004; 2006).

The decade of the 1990s and during the early 2000s witnessed a further expansion of studies focussing on ancient ports. The landscape-based approach, an idea proposed by Westerdahl (1992), was the new focus of studies conducted by archaeologist such as Lucy Blue (1995) or Ford (2011). This methodology was soon led by a 'French School' of scholars such as Christophe Morhange, Nick Marriner, and Nicolas Carayon (2008) among others (*vide infra* section 2.7). Other work has concentrated on the economy, society and connectivity of ports in the wider Mediterranean context (Schörle, 2011, Wilson *et al.*, 2012; Rice, 2013).

During the 2000s, scholars from Italy, France, Spain, Algeria, Morocco and Portugal participated in a joint European funded project entitled *Anciennes Routes Maritimes Méditerranéennes* (ANSER). The focus of this project included the study of harbours, trade routes and commercial exchange in the Western Mediterranean. A series of conferences, training courses, and education campaigns were organised, which also resulted in several publications (De Maria and Turchetti, 2004a; 2004b; Gallina Zevi and Turchetti, 2004a; 2004b; Espinosa *et al.*, 2006; Gravina *et al.*, 2007). One of the main objectives of the ANSER project was setting up a scientific database containing information on objects and materials exchanged in the ancient Mediterranean, as well as all the information and documents relating to the project itself, that could be used by researchers on-line (www.projet-anser.net). Unfortunately, the website of the ANSER project, and all its contents, is no longer operational.

From the mid to late 2000s the study of ancient ports and harbours experienced an exponential growth. The website Scopus, the largest abstract and citation database of peer-reviewed literature from the academic publisher Elsevier, provide a search engine capable of providing analytics. By searching the terms "harbour archaeology" 265 documents in total are found to have been published since 1970 in all disciplines (156 documents in Arts and Humanities and Social Sciences alone). The search and its chronological distribution show how from the late 2000s the number of academic publications per year focused on harbour archaeology has risen exponentially (Figure 4).

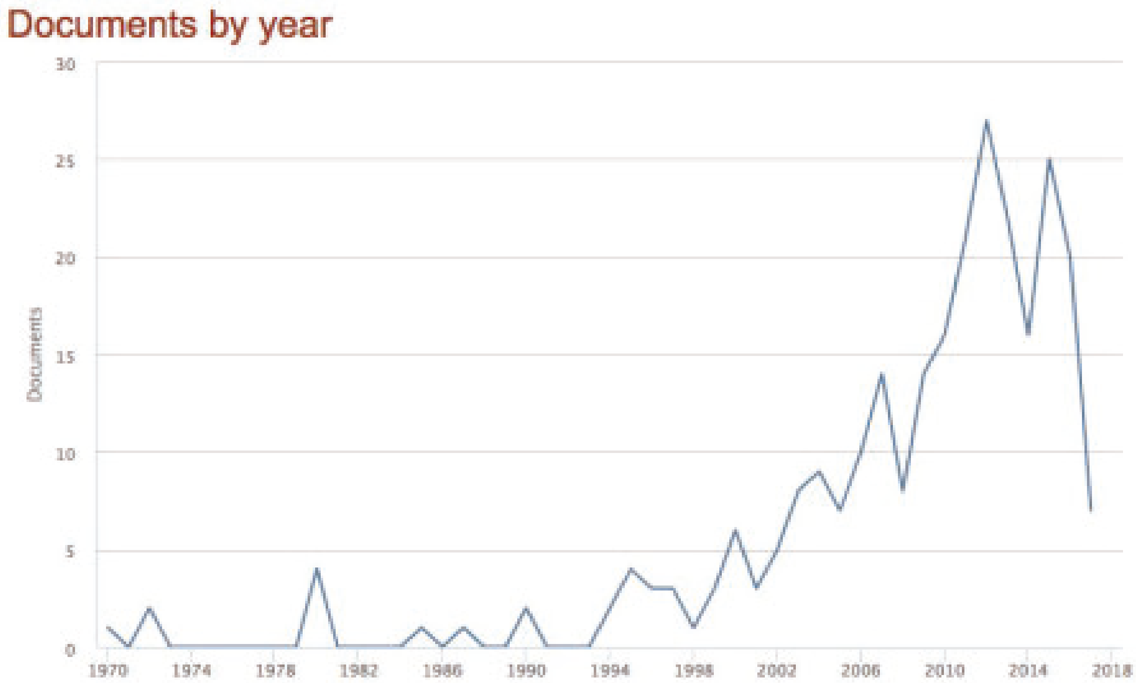

Figure 4: Chronological distribution of academic work focused on "harbour archaeology" according to the website Scopus (Author).

Many of these academic works are the result of the many seminars, workshops and conferences on the study of ports and harbours organised since the mid to late 2000s. To mention them all would require an entire Chapter and it is not the intention of this introduction to make a historiographical account of harbour archaeology research.

Nevertheless, I would like to comment on some major examples. In relation to Portus, Ostia and other Ports of the Roman Mediterranean (including several from Spain) Simon Keay and Giulia Boetto organised a session within an international congress of the AIAC Conference *"Meetings between cultures in the ancient Mediterranean"*, (Keay and Boetto, 2010a).

Since 1998, Professor Simon Keay has been the Director of the Arts and Humanities Research Council funded "Portus Project", which is studying Portus, the ancient port of Rome, using a holistic approach. With the connectivity of ports in the wider Mediterranean context being the focus, an European Research Council funded project entitled "Portus Limen – Rome's Mediterranean Ports", directed by Prof Simon Keay and Prof Pascal Arnaud, is studying a large network of ports around the whole Mediterranean. Stretching from Turkey in the east to Spain in the west, the 'Rome's Mediterranean Ports' project is examining 31 ports in nine different countries, including the port of Hispalis (http://portuslimen.eu/). Prof Simon Keay is widely acknowledged as the leading expert on Portus as well as in the wider context of Roman ports, and during the last few years he has published extensively on the subject (e.g. Keay, 2010; 2012a; 2012b; 2012c; 2016; Keay and Boetto, 2010b; Keay and Paroli, 2011; Keay *et al.*, 2005; 2011; 2012).

Also in Italy, excavations at the Roman port of Naples provided important information regarding harbour-dredging operations in antiquity and unearthed several shipwrecks (Boetto, 2011; Boetto, Carsana, and Giampaola, 2009). A similar case transpired in Pisa, where a fluvial harbour and several shipwrecks were found (Bruni, 2000; Camilli, 2002; Camilli *et al.* 2005; 2006a).

Following the pioneering excavations at the ancient port or Marseille (Hesnard, 1994; 1995; 2004a; 2004b) that also unearthed several shipwrecks (Pomey, 1995; Pomey and Hesnard, 2005), the Mediterranean coast of France is now an area of concentrated multidisciplinary studies regarding ancient ports and harbours. For instance, among many others, there are recent publications from a conference about archaeological studies on Mediterranean coasts (Delestre and Marchesi, 2010), a conference about fluvio-maritime and riverine ships and boats (Boetto *et al.* 2011), and an important project focused on the ancient port system of Narbonne (Sanchez and Jézégou 2011; 2016).

In the Eastern Mediterranean, it is important to mention Istanbul and the Byzantine era Theodosian Harbour of Constantinople, and the many shipwrecks found within its basin (Kocabaş, 2008; Kızıltan and Baran Çelik, 2013). Similarly significant is the multi-year study conducted in relation to the port of classical Athens and the ancient harbours of the Piraeus (Lovén, 2011; Lovén and Schaldemose, 2011; Lovén and Sapountzis, 2016). Another important recent conference has been Byzas 19 that was focussed on *"Harbors and harbor cities in the eastern Mediterranean from antiquity to the Byzantine period"* (Ladstätter *et al.* 2014). Finally, it must be mentioned that Arthur de Graauw (2016) has been recording a Catalogue of Ancient Ports and Harbours published in several volumes on his website http://www.ancientportsantiques.com/. His work collects, identifies, locates, and organizes around 3000 ancient harbours and ports, based on a study of existing historical, archaeological and geo-archaeological documentation.

2.4.4 Archaeological studies on ports and harbours in Spain

In Spain, although many ports from antiquity were known through classical sources (Blázquez Martínez, 2007), ancient ports and harbours did not begin to be studied archeologically until the 1990s (Blackman, 1990). What follows is a brief historiographical account of academic work on the archaeology of ancient ports and harbours conducted in Spain but it is by no means an exhaustive bibliography that could be found elsewhere (ARQVA, 2016).

The pioneering beginnings of maritime and underwater archaeology in Spain dates from the 1960s and 1970s. However, it was in the 1980s, when Julio Mas created the Spanish National Museum of Maritime Archaeology and Underwater Archaeology National Research Centre, that a significant institutional strengthening of this discipline occurred. In 1982 this institution organised the 6th International Congress of Underwater Archaeology (Museo Nacional de Arqueología Maritima y Centro Nacional de Investigaciones Arqueológicas Submarinas, 1985) and published the first journal devoted to Maritime Archaeology in Spain (i.e. *"Cuadernos de Arqueología Marítima"*).

However, with regards to ancient ports and harbours in Spain, since the mid 1990s a series of academic conferences and studies have been produced. The University of Valencia organised a series of conferences about ports and navigation in antiquity (Pérez Ballester and Pascual Berlanga, 1998, 2003; 2008). The study of engineering aspects of Spanish harbours during the Roman period was also the focus of some academic works (De la Peña Olivas and Prada Espada, 1996; De la

Peña Olivas, 2001; 2007) and a successful museum exhibition (Museo Arqueológico Nacional, 2002). As already mentioned (*vide supra*), some Spanish institutions were core members of the ANSER project (De Maria and Turchetti, 2004a; 2004b; Gallina Zevi and Turchetti, 2004a; 2004b; Espinosa *et al.*, 2006; Gravina *et al*., 2007).

The first direct archaeological survey conducted in the Guadalquivir was made by Bonsor (1931) at the end of the 19th century, and was later followed by many others (Ponsich, 1974; 1979; 1987; 1991; Mattingly, 1988a). However, Hohlfelder (1976) conducted the first archaeological survey specifically focused on ancient ports in Baetica. Soon afterwards, Spaar (1981) produced the first academic monograph (i.e. Doctoral Thesis) with the same focus.

The German Archaeological Institute in Spain conducted one of the first geo-archaeological studies on shores and ports of Baetica (Arteaga Matute and Hoffmann, 1987), and more recent geo-archaeological analyses have shed light on the maritime landscape of the coast of Cádiz and the Straits of Gibraltar (Alonso Villalobos and Garcia Vargas, 2003; Garcia Vargas *et al.* 2004; Alonso Villalobos *et al.* 2007; Arteaga Matute *et al.* 2008; Bernal Casasola, 2008).

Despite its importance in antiquity and excellent natural harbours and facilities in antiquity such as a lighthouse (Bernal Casasola, 2009), very little is know about the port and harbours of Gades (Cádiz) from the archaeological record (López de la Orden and García Alfonso, 2010). Despite this, in recent years our general understanding of the layout of the ancient port of Gades, as well of Baelo Claudia, has increased (Roos and Arteaga Matute, 2002; Bernal Casasola, 2008; 2010; 2012). Also, the study and re-examination of archaeological interventions conducted in the 20th century have provided information about harbour infrastructures in smaller ports such as Sexi (Almuñecar) where a mooring stone from the Roman period was found (Sánchez López, 2013) and Carteia (Bernal Casasola, 2010).

The ancient historian Salvador Ordóñez Agulla (2003) completed the first study of the ancient port of Hispalis combining historical and archaeological evidence, and his hypotheses remain valid to this day. Later on, the archaeologist Daniel González Acuña (2011) built upon the work of Ordóñez Agulla (2003) and produced fundamental work for understanding the morphology and urban development of Hispalis, including its port (González Acuña, 2010). However, the present Thesis represents the first in depth study of the ancient port of Seville.

The ancient port of Huelva, Roman Onuba, has been important since the Late Bronze Age (Gómez Toscano, 2009). Exceptional Late Bronze Age and Iron Age archaeological finds were recovered from its port basin, including 98 bronze swords from the 10th century BC (Almagro Basch 1940; 1958), although it remains unresolved if these came from shipwrecks or were ritual deposits (Fernández Rodríguez, 2014). Some nautical archaeological finds have recently been discovered (Bouzas Abad *et al.* 2008) and, in combination with studies of geo-archaeology (Zazo *et al.* 2005), have shed some light on this area in antiquity.

Carthago Nova (Cartagena) was another important ancient port of the Spanish Mediterranean coast (Pérez Ballester, 1998; Ramallo Asensio, 2006; 2011; Ramallo Asensio and Ruiz Valderas, 2010; Noguera Celdrán, 2012). The archaeological evidence from the ancient harbour is scarce and different proposals about it have been put forward (Manera, 1946; Mas García, 1979; Martinez Andreu, 2004; Ramallo Asensio and Martínez Andreu, 2010). Some hypotheses have attempted to offer a detailed image of the port layout and harbour infrastructures in antiquity (Berrocal Caparrós, 1998). The coastal landscape of Cartagena has been sparsely studied (Berrocal Caparrós, 2008), but, recently, its port and its cultural landscape have been considered in detail in a Doctoral Thesis (Cerezo Andreo, 2016).

A number of the major ancient ports of the coast of Valencia have been investigated, as well as other lesser ports and anchorages of the maritime coast (Espinosa Ruiz and Castillo Belinchón, 1996, Espinosa Ruiz *et al.*, 2006; Pérez Ballester *et al.* 2010). Geomorphological information has contributed to the study of the maritime landscape of some of these ancient ports (Carmona González and Pérez Ballester, 2011). The archaeological excavations at the ports of Valencia, Roman Valentia, (Burriel *et al.* 2003; Ferrer Garcia, 2005; Ribera i Lacomba, 2007; 2008) as well as Cullera, Roman Sucrone, (Rosselló Mesquida 2008) have produced significant results. In the Albufereta de Alicante important remains have been discovered, emphasizing the existence of a quay with successive additions (Ortega Pérez *et al.* 2004; de Juan Fuertes: 2009). In Denia archaeological work has been conducted on its port, yet its urban and functional characteristics remain unclear (Espinosa *et al.* 2006: 31-35).

In recent years it has been possible to archaeologically document the port of Sagunto, Roman Saguntum, with the identification of storage structures, a possible watch and defensive tower, and a quay (Aranegui Gascó, 1991a; 1991b; de Juan Fuertes, 2002; 2003; Aranegui Gascó *et al.* 2004; Fernández, 2008). The understanding of the port of Sagunto has benefited from the application of geo-archaeological methods for its better interpretation (Aranegui Gascó *et al.* 2005).

There were several ports in the maritime façade of the Hispania Tarraconensis (Izquierdo i Tugas, 2008; 2009) and some of them have been subject to archaeological research. Regarding the Port of Tarragona, Roman Tarraco (Ruiz de Arbulo, 2001), although there is no surviving evidence of Roman harbour structures, through literary and cartographic sources we know of the existence of a quay built with *opus pilarum* of probable Republican chronology (Remolà Vallverdú and Pociña López, 2001; Terrado Ortufio, 2015). On the other hand, the port district is characterised by an important area of warehouses (i.e. *horrea*) dated between the 1st and 2nd centuries AD (Macias i Solé, 2011). Several recent studies have helped to better understand its layout and configuration (Macias i Solé and Remola Vallverdú, 2010; Orengo *et al.* 2011). Additionally, an on-going Doctoral Thesis by Patricia Terrado Ortufio probably will add to the current state of knowledge of the port and its daily activities (Terrado Ortufio, 2016).

Conversely, little is know about the ancient port of Barcelona, Roman Barcino, since scant archaeological remains have been unearthed and geo-archaeology is the best source of information to date (Julià Brugués and Riera Mora, 2012; Járrega Domínguez, 2013).

The ancient port of Ampurias, the Greco-Roman city of Emporion, has been studied from different points of view. Initial land-based topographic interpretations (Almagro Basch, 1962; Sanmartí i Grego, 1988) were followed by underwater surveys carried out in the mid 1990s (Nieto and Raurich i Santaló, 1998). It has been proposed that a complex port system existed, with at least two artificial harbours built in the late-republic period for which the large surviving structure known as "malecón", seemed to have been part of a walled breakwater that enclosed the port (Nieto *et al.* 2003; 2005).

Although some archaeological infrastructures have been unearthed, as well as warehouses, little is known about the ancient fluvial port of Zaragoza, Roman Caesar Augusta (Aguarod Otal and Erice Lacabe, 2003; 2008; Erice, 2011).

Finally, there has been little research regarding the Cantabric coast and Atlantic coasts (Fernández Ochoa and Morillo Celdrán, 1994; Urteaga Artigas and Noain Maura, 2005), however, some work has been published regarding the port of Gijón (Fernández Ochoa and Camino Mayor, 2003), Santander and Santoña (Cisneros Cunchillos, 1998). In the Basque Country, the ancient port of Irun, Roman Oiasso, several well-preserved wooden structures from the Roman period have been documented, corresponding to a timber quay and harbour structures (Urteaga Artigas, 2003; 2005).

The river estuaries along the Galician coast and the natural harbours found within, such as the ports of Vigo and La Coruña, Roman Brigantium, offer an exceptional refuge for those vessels sailing the Atlantic sea routes. However, apart from remains of warehouses and the famous lighthouse, Torre de Hercules (Arias Vilas *et al.* 2009; Zamora Merchán, 2011-2012), we know little about the ports and harbours during the Roman period in Galicia: the field of port archaeology has yet to be further developed in this region.

To conclude this section, in order to understand ports and harbours, it is necessary to know their morphology, characteristics, and existing infrastructures. However, the study of ports and harbours presents some challenges. Although ports occupy large geographical areas, sometimes identifying and describing them can be difficult.

Ports and emporia are frequently cited in different and diverse surviving written documents from antiquity, due to the key role they played in the economy. Unfortunately, there is very scarce textual evidence that describes ports and their facilities in detail, so little information could be obtained from these written sources (Blackman, 1982a). The situation is very similar within iconography: some ports are depicted on coins, mosaics, and other artistic representations, yet those depictions provide only basic information lacking specific detail. In consequence, the best source of information for studying ports comes from the archaeological record, yet this approach also presents some other complications.

The principal challenge in the study of ancient ports is that, in many cases, ports are still in use and their original facilities were replaced or were buried by modern facilities, thus making archaeological studies difficult. In other cases ports were abandoned in antiquity due to different problems such as siltation. Many of these abandoned ports are currently covered by modern urban developments, such as in the case of the port of Seville, and it is very difficult to reach the archaeological record. However, ancient ports that have not been covered by modern urban developments represent a great potential opportunity as possible sources of information.

2.5 Mediterranean maritime trade routes and ships' cargoes

In general terms, in order to understand different maritime aspects of the Mediterranean World, some introductory and essential works are: from Prehistory to the Classical World, the recent publication by Cyprian Broodbank (2013); for Classical and Late Antiquity, Horden and Purcell (2000); for the Early Middle Ages, the essential works of Archibald R. Lewis (1951) and John L. Pryor (1988); for the Renaissance, the new english translation of the fundamental and classic work of Fernand Braudel (1995) first published in French in 1949; and finally, a recent work by David Abulafia (2011) has attempted to compile *"the first complete history of the Mediterranean"*.

As explained above, the present work is focused on the study of the maritime archaeology of the port of Seville. Ports are nodes of maritime route networks and, consequently, knowledge of maritime trade routes used in antiquity is essential for the study of ports as well as of maritime history, maritime trade, commerce and economics. It is also important to understand Mediterranean maritime trade routes of the time in connection with the port of Seville.

In geometry, the shortest distance between two points is a straight line. On land this theoretical line is affected by the geography of the terrain. At sea, the shortest distance between two points is in some cases also affected by geographical parameters (e.g. shoreline configuration, peninsulas, islands, etc.); but more importantly it is affected by meteorological parameters. Weather conditions, more specifically tides, currents, winds, and visibility are important factors that define maritime routes (Aubet, 1993; McGrail, 1987; 2001; Arnaud, 2005). In antiquity, during the winter, when weather conditions were adverse, there was a downturn in maritime traffic and certain routes were not used. Romans termed this "closed season" as *mare clausum* (i.e. closed sea) (Tammuz, 2005; Beresford, 2013).

Geographical and meteorological parameters have defined maritime routes since antiquity. Sea routes did not significantly change until the invention of steam-powered ships in the first half of the 19th century as part of the industrial revolution. The work of Pascal Arnaud (2005), *Les Routes* de la *Navigation Antique,* is to date the best study of ancient Mediterranean maritime routes. The study combines maritime expertise with both ancient textual material and archaeological evidence. The dearth of nautical instruments in antiquity demanded empirical and practical response to navigate the seas. Pascal Arnaud (2005; 2007: 327) has established that by choosing a cardinal direction and a certain tack under a prevailing seasonal wind, and considering the geographical constraints, produced the navigation of a vessel in a linear segment; by assembly and combining linear segments, which merged at specific geographical landmarks easily to identify at sea such as capes, maritime routes in the ancient Mediterranean were composed and established by ancient navigators and pilots. Based on Arnaud's work for the maritime routes, the Stanford Geospatial Network Model of the Roman World (ORBIS) is an excellent GIS based on-line tool which is very useful for the calculation of travel routes, times, and distances in the Roman world, and it will be used in the present Thesis (Meeks *et al.*, 2016).

Figure 5: General map of ancient shipping lanes in the Mediterranean (after Arnaud 2005).

The study of Mediterranean maritime trade routes could benefit from considering other sources of information such as the study of ships' cargoes. The main activity of seafarers in antiquity was commercial by means of the transportation and distribution of cargoes composed of infinitely different trade goods (Casson, 1995). These commercial cargoes always had a port of origin, where goods were loaded, and a port of destination, where some or all goods were unloaded for trade or re-distribution (Nieto, 1988; 1997). Some trade goods have left no trace in the archaeological record, mainly those of organic nature such as grain. However, other trade goods or the containers in which they were carried, mainly those of inorganic nature such as pottery and amphorae, have been preserved. They can therefore be used for the study and reconstruction of ancient maritime routes. In particular, the study of the production and distribution of amphorae has been one of the most used and successful sources of information for studying maritime trade, commerce and ancient economy (e.g. Rodríguez Almeida, 1984; Ponsich, 1998; Reynolds, 2010). The study of the provenience and destination of cargoes that have survived in the archaeological record will, henceforth, be one of the approaches followed by this Thesis.

2.6 The study of shipwrecks in the Mediterranean

Although the number of shipwrecks that lie on the bottom of the western Mediterranean (as well as in the Atlantic Ocean and other seas around Europe) is certainly enormous, only a few thousand have been discovered to date (Parker, 1992; Wilson, 2011b; Strauss, 2013). Only a handful of those have been excavated and thoroughly studied by archaeologists.

Since prehistoric times until the industrial revolution, boats, and later on ships, were the most complex machines made by men. In one single unit, or ship, the amount of diverse materials, complex engineering, and craftsmanship techniques required for its construction had no parallel. Once the ship was loaded with cargo, it comprised one of the most complete, varied, and dense examples of material culture from a particular period of time. Ships that underwent wrecking, or shipwrecks, keep these unique examples of material culture (i.e. artefacts) from which considerable amounts of potential information can be extracted.

This large amount of potential evidence is derived from the fact that a shipwreck compromises three different sources of information (Muckelroy, 1978). The personal belongings that have survived from the shipboard community (composed by seafarers, travellers, pilgrims, soldiers, etc.) can tell us about many different aspects of their lives such as culture, fashion, wealth, religion, and diet, among many others. The vessel, or the ship's remains, can provide valuable information about other areas such as shipbuilding technology, naval warfare, and different types of craftsmanship, for instance carpentry, metalworking, ropemaking, and basketry, etc. Finally, the ship's cargo, as explained before, can be of paramount importance for understanding maritime trade routes, and demand. It can also offer models of trade goods, and ancient economy. Shipwrecks' cargoes are of utmost significance because the cargo has remained intact as a single unit in the same manner in which it was loaded. They represent snapshots of maritime commerce in a particular area during a precise period of time.

This uniqueness that shipwrecks possess, of keeping material culture and trade goods within the original time and space, is what makes them such potentially important sources of information. That is why Westerdahl (1992) noted how shipwrecks are, and could be used as, excellent indicators of a precise chronology.

This Thesis will study the remains of the only shipwreck that has been found, and its remains survived, from the Guadalquivir River or the port of Seville. The study will include the documentation, study, and analysis of the Plaza Nueva boat remains found in Seville in 1981, but never studied until now.

2.7 The use of palaeo-sciences for the study of ancient ports

A review of a recent monograph devoted to the study of rivers during the Roman Empire entitled *"Rivers and the Power of Ancient Rome"* (Campbell, 2012) pointed out that its author seems to have dismissed the importance of data provided by scientific disciplines other than the archaeological, literary, or palaeographical evidence (Franconi, 2013). According to the reviewer, studies of palaeo-climatology and/or hydrology were overlooked in understanding the palaeo-hydrology of rivers during the Roman Empire (Franconi, 2013: 705). Consequently, and in agreement with the reviewer, this Thesis will pay special attention to information from different palaeo-sciences.

During the 1980s and 1990s, a predominantly French group of scholars pioneered the use of geoscience techniques to solve archaeological problems in the study of ancient ports and harbours in the Mediterranean (e.g. Marriner and Morhange 2006a, 2007; Morhange *et al.* 2011, 2014a). These pioneer large excavation projects at famous ancient ports included: Troy (Turkey), Caesarea Maritima (Israel), Marseille (France), and Carthage (Tunisia). These projects in the early 1990s employed, for the first time, a holistic approach, in which the cultural-historical model was combined with a natural-environmental stance (Marriner *et* *al.* 2010a; Morhange *et al.* 2013a, 2014a, 2014b; Walsh 2013). It was demonstrated that a multidisciplinary approach studying above-ground geological formations as well as sub-surface sediments, in and around ancient harbour basins, can reveal much about the anthropogenic and natural processes that have shaped harbours, ports, and the coasts on which they are located.

After the initial pioneering work, a French team of geomorphologists (currently under the leadership of Christophe Morhange) formulated a wider conceptual framework often referred to as a "culture-nature duality": they shifted the focus of traditional, land-based urban Mediterranean port studies towards an enhanced landscape approach with emphasis on sea level and coastal changes (already signalled in works such as: Weill 1946; Flemming 1969; Blackman 1973a; Kraft et al. 1977, 1980; Brückner 1986). Ultimately, they have developed an environment-oriented geo-archaeological methodology (e.g. Provansal 2000; Carayon 2008; Rickman 2008; Marriner et al. 2010a; Morhange *et al.* 2013a).

Ancient harbour basins are located at the intersection of natural and human landscapes, and there is a close relationship between their development (e.g. foundation, siltation and management, abandonment), and natural events (e.g. relative sea level change, tectonics, tsunamis). The study of ancient harbour basins, therefore, helps scientists to reconstruct the natural landscape responses to fluctuations in climate, as well as provides a better understanding of the anthropogenic impact on the changes in Holocene coastlines. Geomorphologists achieved this by using a series of complementary proxies that include different analytical techniques and a wide range of geological and biological parameters, as well as archaeological finds and structures, and their relationship to historical sources (Morhange *et al.* 2013a: 406).

It has now become routinely accepted that the scientific study of ancient ports should involve palaeo-environmental reconstruction methods such as: geoarchaeological coring, that is used as a key technique for retrieving sedimentological samples (that can be studied using a range of proxies including lithofacies and bioindicators) as well as geophysics, which could be used to reconstruct the topography of ancient ports. These geosciences datasets are supplemented with the information extracted from the archaeological record, which could provide evidence for human "adaptation to" and "involvement in" the changes in the coastal environmental of the port sites under study (e.g. Marriner and Morhange 2006a; Marriner et al. 2010a).

From a geo-archaeology point of view, the study of the Lower Guadalquivir Valley and its river was pioneered by Jean-René Vanney (Vanney, 1970; Drain *et al.* 1971) and Loïc Ménanteau (Ménanteau and Clemente, 1977; Ménanteau and Vanney, 1985; Ménanteau, 1982; 2007; 2008; Alonso Villalobos *et al.* 2007). These pioneering works were followed by many studies from Francisco Borja Barrera, a geologist from the University of Huelva, who has been studying the palaeo-geomorphology of the Guadalquivir River, and the geo-archaeology of the city of Seville, for the last three decades. The conclusions of his lengthy analysis have recently been summarized (Borja Barrera, 2014). Borja Barrera also directed Barral Muñoz's doctoral Thesis (2009), which constitutes a valuable source of information for understanding of the palaeo-geomorphology of Seville.

More recently, geologists that reconstruct the fluctuations in climate through the history of the Earth (i.e. palaeo-climatologists) have teamed up with historians and archaeologists with the objective of deciphering the influence of climate variations on historical events during the Late Holocene. Palaeo-climatologists combine a variety of proxy records from several palaeoclimate archives (including tree rings, lake sediments, river sediments, marine cores and speleothems) to reconstruct the fluctuations in climate. Recent studies on climate reconstruction have demonstrated substantial climatic variation during the last two millennia and their results suggest a correlation between these climatic events and historical developments in the Mediterranean and Europe (e.g. Büntgen *et al.* 2011; Luterbacher *et al.*, 2012; McCormick *et al.*, 2012).

The palaeo-geomorphology and the palaeo-hydrology of the Guadalquivir River as well as palaeo-environmental and palaeo-climatic studies of the South Iberian Peninsula will thus be taken into account during the study of the ancient port of Seville. Through the three historical periods that this Thesis encompasses, we will see how essential these palaeo-studies are in order to understand the development of the Guadalquivir River and its close relationship with the port of Seville.

2.8 Defining and justifying the organization of chapters

The present Thesis has been divided into three main sections. Although the present work is a doctoral Thesis in the field of archaeology, the three main chapters represent fundamental historical periods of the Iberian Peninsula: the Roman era, Late Antiquity, and the Islamic period. The idea is to study and research surviving archaeological and historical evidence pertaining to the maritime archaeology of the port of Seville, and present it in the context of each historical period. Chapter 3 concentrates in the Roman era, but, it also includes information about the geography of the Guadalquivir River and its Basin, which is essential to understand the maritime landscape of port of Seville and the content of the subsequent Chapters.

The present Thesis concentrates on a very specific area, the port of Seville, during different historical periods that occurred in the Iberian Peninsula. These successive historical episodes are: the Roman Empire; the fall of the Western Roman Empire and the invasion of the Germanic peoples; the Visigothic Kingdom and the Byzantine occupation of the south-east Iberian Peninsula; and, finally, the Umayyad conquest of Visigothic Spain and the creation of al-Andalus. In the words of Prof Chris Wickham this Thesis is a study of the "micro global history" of the port of Seville (Wickham personal comment). This Thesis is a *longue durée* or diachronic study with the objective, among others (see Chapter 1) of attempting to decipher what did happened during those historical periods as regards the ancient port of Seville: was there continuity? Or did things change with every historical event?

To address these research questions, the Thesis will focus on three historical periods studied and four main aspects for each of them. These are: the hydrography and hydrology of the Guadalquivir River, archaeological and palaeographical evidence of the ancient port of Seville, historical accounts in relation to the port of Seville, and the palaeo-climatology of Seville.

In general terms, each historical section of the Thesis will present all the available archaeological, literary, or palaeographical evidence of each period. Additionally, the palaeo-geomorphology and the palaeo-hydrology of the Guadalquivir River, as well as palaeo-environmental and palaeo-climatic studies of the South Iberian Peninsula, will be presented in order to understand the development of the Guadalquivir River and the port of Seville.

Chapter 3: The Roman period: the port of Hispalis

3.1 Geomorphology of the Guadalquivir Basin and River

The Guadalquivir valley occupies an area of 58000 km^2. In geological terms, it is a geosyncline between the older Precambrian massif of the Sierra Morena to the north and the younger Cordillera Sub-Bética to the south (Figure 6). From the Tertiary period onwards, it was infilled with different secondary sediments and subsequently cut into by the Guadalquivir River (Keay et al. 2000: 1).

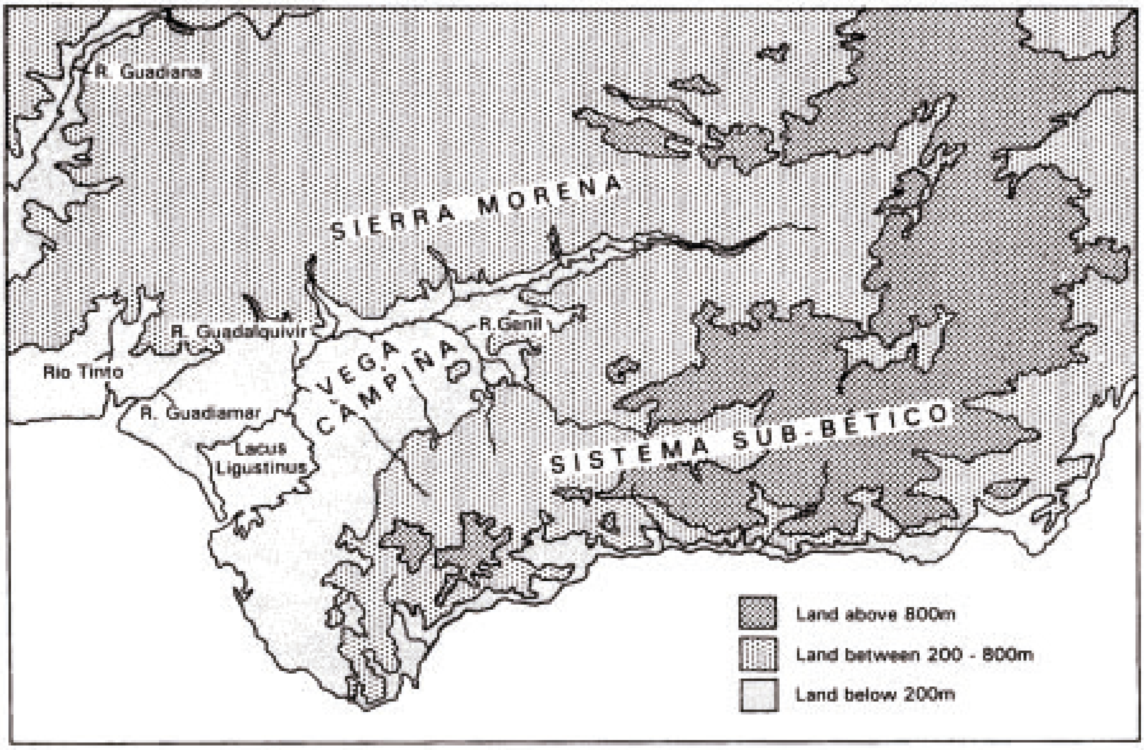

Figure 6: The topography of the lower Guadalquivir Valley (after Keay *et al.* 2000: fig. 1.2)

The Guadalquivir River is the major watercourse of southern Spain and the fifth longest river in the Iberian Peninsula after the Ebro, the Tagus, the Douro, and the Guadiana. The Guadalquivir is 657 km long and rises in the Sierra de Cazorla mountain range (Province of Jaén). It drains the valley along with a number of tributaries, including the Guadaira, Huesna, Bembezar, Corbones and the Genil, the latter of which bore water from the Cordillera Sub-Bética to the south-east. The Guadalquivir River runs in a generally westward direction passing through Córdoba and Seville, and flows into the Atlantic Ocean in the Gulf of Cádiz, at the village of Bonanza, at Sanlúcar de Barrameda (Figure 7). It is the only great navigable river in Spain, and currently it is navigable from its mouth at the Atlantic Ocean up to Seville (Drain, *et al.*, 1971; Palancar Penella, 1977; García-Baquero López 1990).

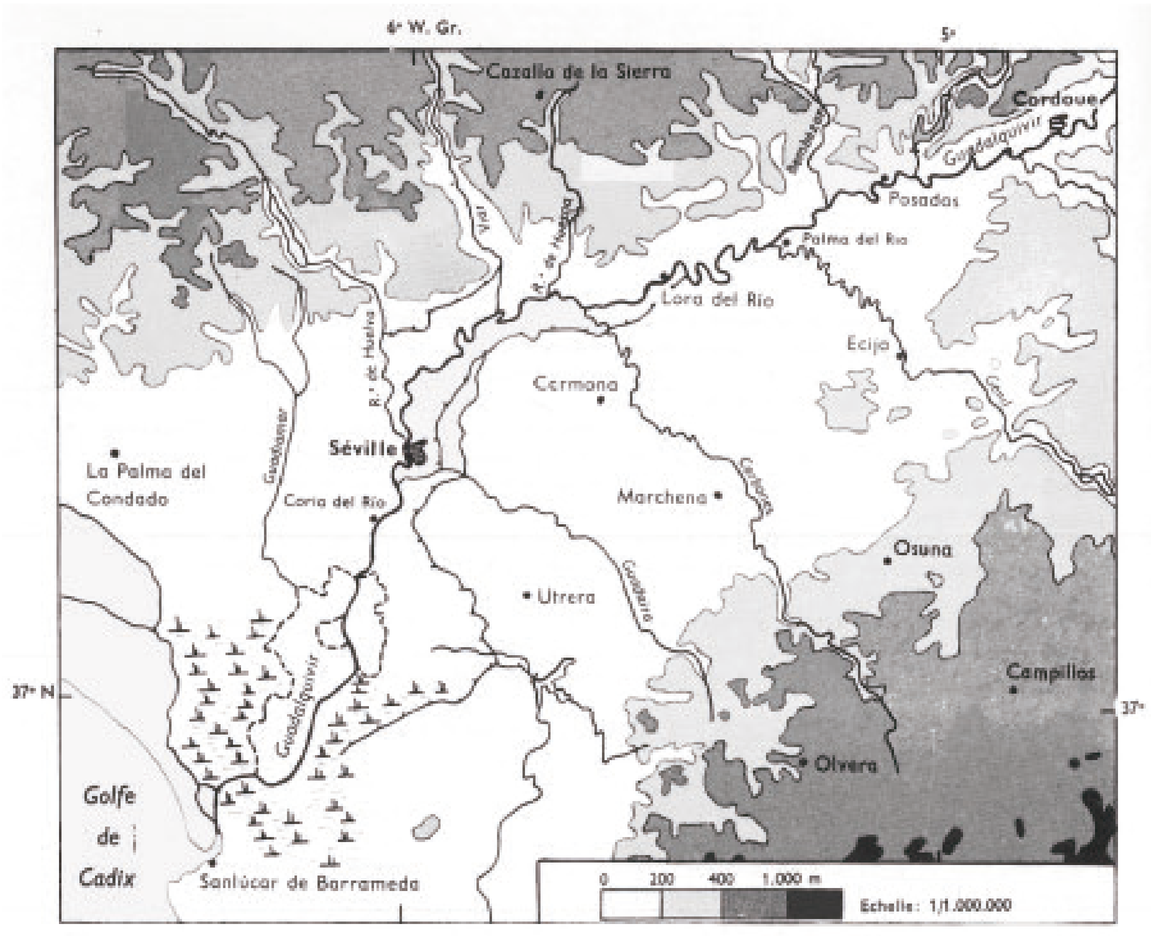

Figure 7: Map of the Lower Guadalquivir River, its tributaries, and major cities around them (after Drain, *et al.*, 1971: fig. 1).

Today Seville is located 90 km inland northwards from the Atlantic coast (Puerto de Sevilla, 2016) and is separated from the ocean by an extended area of marshy lowlands near the banks of the Guadalquivir River. The Guadalquivir Marismas (i.e. marshes) have an approximate area of 2000 km^2 and are one of the richest and most varied areas of plant and animal life in Europe (Ménanteau, 1982). The irrigative capacity of the Guadalquivir, particularly in its wide and fertile plain, supports the rich agriculture of Andalusia, being one of the largest agricultural production areas of rice in Spain. It is also the home of one of Spain's largest natural reserves: Doñana National Park, declared a UNESCO World Heritage Site in 1994.

During the Roman period, the Guadalquivir River was known as *Baetis*. In the late first century BC, Augustus created the Roman province of Baetica from the southerly part of Hispania Ulterior (Keay, 1988: 49), receiving its name from the river *Baetis* (Pliny, NH, 4.4). The area that today occupies the Guadalquivir Marismas was very different from the present day; it was a large body of water that can be described as an interior sea, a large estuary, or an enormous coastal lagoon (Figure 8). The lake slowly filled with sediment, which gradually transformed into the current marshes (Ruiz*, et al.*, 2002).

Figure 8: South-western Iberian Peninsula present-day (left), and around the 9th c. BC (right) showing the position and approximate extent of the Lacus Ligustinus (Author).

We know that during the Roman period this interior sea was navigable and deep enough to allow seagoing merchant vessels of considerable size to sail through it (Strabo 3.2.3). We do not know, however, under what name this interior body of water was known, since neither Strabo, Pomponius Mela, Pliny the Elder nor Ptolemy assigned a specific name to this area. Current historiography of the region describes this body of water as Lacus Ligustinus (Figure 9); the origin of this name and the reasons why scholars used it will be explained later.

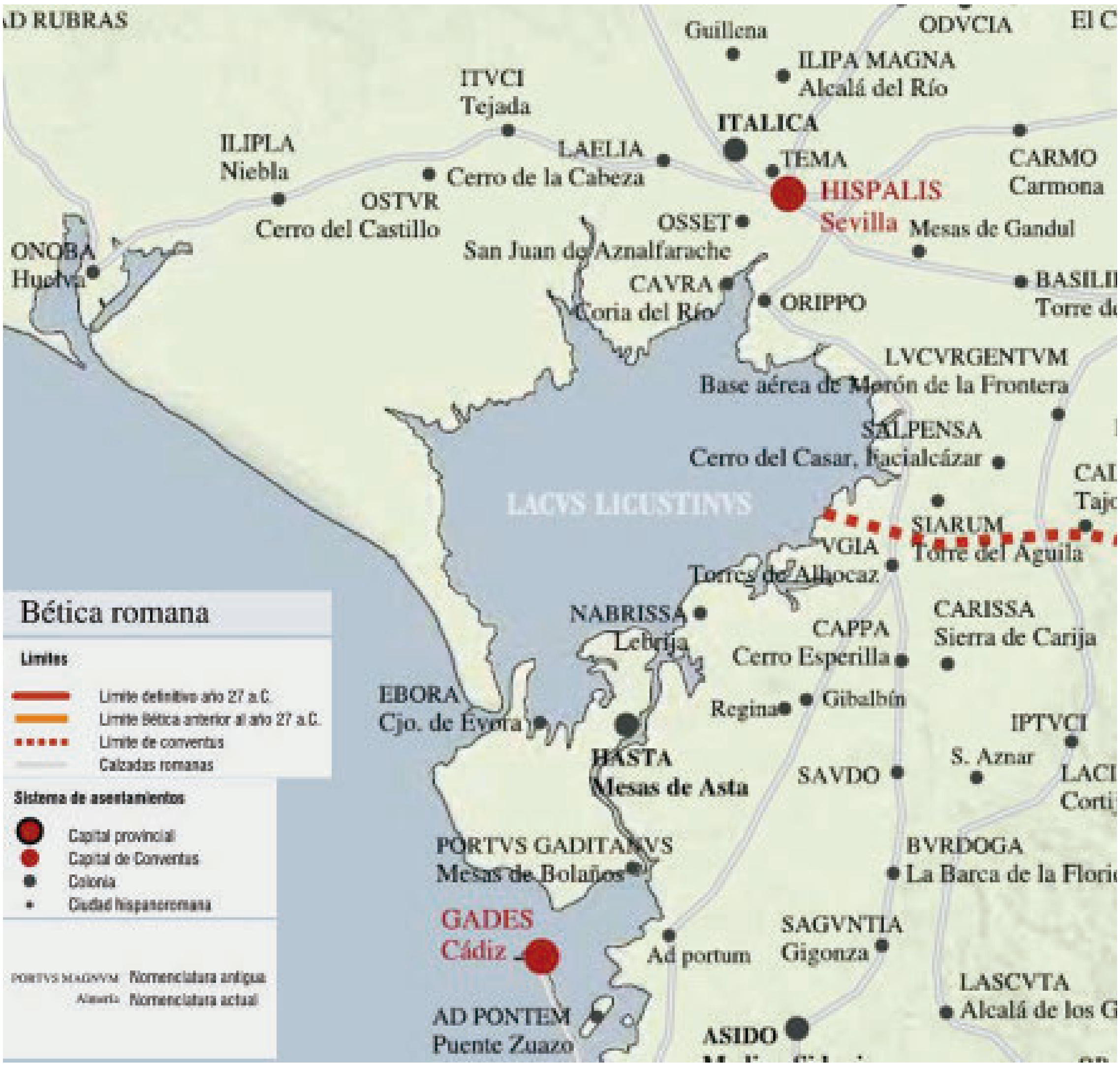

Figure 9: Map of south-western Baetica with the lacus Ligustinus, Roman urban centres (capital letters) and their current names (lowercase letters) (Author).

Strabo is the only ancient geographer who, despite not using a specific name for it, described the area in great detail; in his *Geography*, he gives a description of the Baetis River and the cities and towns around it. He refers to this area as the estuary (i.e. *ἀνάχυσις*) of Asta and Nabrissa (Strabo 3.1.9). He defines *ἀνάχυσις* as follows: "the name of estuaries is given to hollows covered by the sea at the high tide, and in the same way that rivers afford waterways to the interior and to the cities on their shore" (Figure 10).

(...) 'εφεξῆς δ' ἐστὶν ὁ Μενεσθέως καλούμενος λιμὴν καὶ ἡ κατὰ Ἄσταν ἀνάχυσις καὶ Νάβρισσαν. λέγονται δὲ ἀναχύσεις αἱ πληρούμεναι τῇ θαλάττῃ κοιλάδες ἐν ταῖς πλημμυρίσι καὶ ποταμῶν δίκην ἀνάπλους εἰς τὴν μεσόγαιαν ἔχουσαι καὶ τὰς ἐπ' αὐταῖς πόλεις.(...)[1]

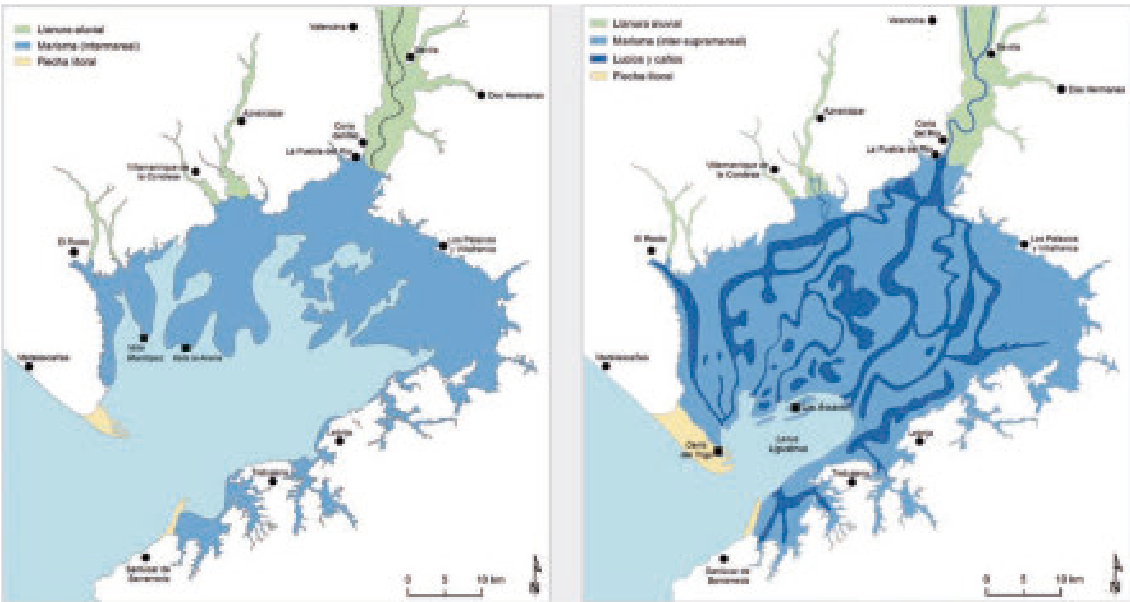

Figure 10: Lacus Ligustinus *circa* 1300-800 BC (left), and 390 BC – AD 400 (right) (after Borja Barrera, 2014: 281).

Strabo continues describing the area above the Atlantic coast situated between the "Sacred Promontory" (i.e. Cape St. Vicent) and the "Pillars" (i.e. the Strait of Gibraltar) where, he says, there is a considerable plain that extends inland. This plain is composed of many inlets and hollows running from the sea towards the interior (Figure 10); these were large size riverbeds of the Baetis estuary that extended for many stadia (Strabo 3.2.4).

[1] (...) Next in order comes what is called the Port of Menestheus, and then the estuary at Asta and Nabrissa. (The name of estuaries is given to hollows that are covered by the sea at the high tides, and, like rivers, afford waterways into the interior and to the cities on their shores.)(...) (Strabo transl. by Jones, 1923: 17).

(…) ἅπασα γάρ ἐστι πεδιὰς ἡ ὑπὲρ τῆς παραλίας ἐπὶ πολὺ τῆς μεταξὺ τοῦ τε ἱεροῦ ἀκρωτηρίου καὶ στηλῶν. ἐνταῦθα δὲ πολλαχοῦ κοιλάδες εἰς τὴν μεσόγαιαν ἐκ τῆς θαλάττης ἀνέχουσι φάραγξι μετρίαις ἢ καὶ ῥείθροις ἐοικυῖαι ποταμίοις, ἐκτεταμέναι ἐπὶ πολλοὺς σταδίους: (…)[2]

Despite the extended and detailed geographical description of the entire area that Strabo produced, he described it as estuary or country but never gives a specific toponym for this body of water. The first time that a specific name is used for the estuary of the Guadalquivir River occurred in the 4th century AD, when Avienus described the area as Lacus Ligustinus in his *Ora maritima* (vv. 283-290).

> *(…) sed insulam*
> *Tartessus amnis ex Ligustino lacu*
> *per aperta fusus undique adlapsu ligat.*
> *Neque iste tractu simplici provolvitur*
> *unusve sulcat subiacentem caespitem,*
> *tria ora quippe parte eoi luminis*
> *infert in agros, ore bis gemino quoque*
> *meridiana civitatis adluit. (…)*[3]

Ora maritima is a poem containing borrowings from the early 6th century BC *Massiliote Periplus*. The editor of one of the French translations of *Ora maritima*, A. Berthelot, remarked that Avienus composed his poem by searching archaic travel accounts and *periploi* and then mingling the information gathered with his personal impressions and perceptions of the world in the 4th century AD (Berthelot, 1934: 7, 15). The result is a rather confusing account of the coastal regions of the known world in the form of a poeticised *periplus*. The account is

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[2] (…) For the whole country beyond the seaboard that lies between the Sacred Cape and the Pillars is a plain for a considerable distance inland. And here, at a large number of places, are inlets which run up from the sea into the interior, resembling moderate-sized ravines or simply river-beds, and extending for many stadia (…) (Strabo transl. by Jones, 1923: 27).

[3] (…) But the Tartessus river, spread through open spaces from the Ligustine lake, binds an island on all sides with its lapping. Nor does the river flow through with a simple course or singly cleave the underlying earth. Rather, on the eastern side, it brings three mouths into the fields, and it washes the south part of the city with four mouths (…) (Avienus transl. by Murphy, 1977: 21).

confusing because the geographic description of the areas is real, yet the toponyms used to name certain places are often borrowed from different and distant locations. Consequently, neither the indigenous peoples living in the Baetica region nor the Romans who colonised it called the estuaries of the Baetis with the name Lacus Ligustinus (Ferrer Albelda, 2012: 65). Avienus borrowed this term from the *ligur* coast, a place located on the Mediterranean shores of southeast Gaul close to the Greek colonies of the area.

Nevertheless, despite never being used by the Romans, the hydronym Lacus Ligustinus is widely accepted by modern day scholars and in the historiography of the region, probably because we do not have a different name for the Baetis estuary (Ferrer Albelda, 2013: 218), and it will be used in this Thesis.

3.1.1 Hydrography and hydrology of the Guadalquivir River

A river could be described as a one way flow of water generated by gravity and controlled by the gradient of its bed (Petts and Foster, 1985: 11). The longitudinal gradient of a river, among other factors, is the principal influence that determines the speed of the water flow (Petts *et al.*, 1989: 3); the greater the gradient, the greater is the speed of the water flow and *vice versa*. The longitudinal gradient of the Guadalquivir River is very small. It is so subtle that the poet Martial (9.61) described it as "*placidus* Baetis". This shallow gradient is a consequence of the extremely low altitude of the valley and the cities through which the river flows. The city of Seville is, on average, only 10 m above mean sea level. Up stream, at the confluence of the Guadalquivir River and the Genil River, the altitude reaches 25 m, and the city of Córdoba is about 100 m above mean sea level (Vanney, 1970; Chic García, 1990: 20, footnote 10).

The longitudinal gradient of the Guadalquivir River from Seville to the Atlantic Ocean is only 0.25 x 1000 m, and from Seville upstream is 0.19 x 1000 m (Ménanteau and Vanney, 1985: 116; Chic García, 1990: 21). These two different areas of navigation coincide with the descriptions that Strabo gave in the 1st century AD on the navigation of the Baetis River (*vide infra*).

Climate variability, in the form of rainfall and droughts, are important factors to consider when determing hydrological phenomena. The fluvial regime of the Lower Guadalquivir is defined as Oceanic-Mediterranean, and it is characterised by extreme irregularity and by a low mean discharge. The reduced volume of the Guadalquivir River's flow is in part explained by the limited size of its basin (i.e. 58,000 km^2) but it increases thanks to the input of several tributaries. The absolute mean discharge of the Guadalquivir River is of about 230 m^3/sec, but at Seville is of about 185 m^3/sec, being one of the smallest of the Iberian Peninsula as well as of those in the Roman Empire (Figure 11).

BASIC DATA ON SELECT RIVERS OF THE ROMAN EMPIRE[1]

River	Length (km)	Mean discharge (m^3/s)	Basin size (km^2)
Nile	6650	2830	3400,000
Danube	2860	6500	817,000
Euphrates	2780	***	444,000
Rhine	1230	2650	185,000
Loire	1015	850	117,000
Rhône	810	1700	95,500
Seine	775	500	78,650
Po	650	1540	74,000
Guadalquivir	660	229	57,530
Garonne	645	630	55,000
Meuse	925	400	34,550
Buyuk Menderes (Maeander)	550	35	25,000
Orontes	571	75	24,750
Medjerda	484	30	21,000
Tiber	405	265	17,375
Thames	345	65	12,935

*** Modern Euphrates discharge is too heavily modified by dams to gauge discharge accurately.

Figure 11: Current basic characteristics of the main rivers in the Roman Empire (after Franconi 2013: 705).

Between Autumn and Spring, mean discharge of the river is at its peak, since it receives a large amount of run-off from the Sierra Morena, periodically flooding some of the lowerlying adjacent areas. In the summer, from early June until late September, the river is relatively quiet and its discharge decreases significantly (Ménanteau and Vanney, 1985, García-Baquero López 1990, 45-57). During Roman times temperatures were similar to those at the end of the 20th century, or perhaps slightly higher (Lamb, 1972: 143-146). Consequently it is possible to use current data of precipitation totals to study the Roman period.

3.1.2 The transport zones of the Baetis River

The French ethnologist François Beaudouin, in a study about propulsion systems before mechanised transport, proposed that European rivers, understood as riverine milieux for transportation of goods, could be broadly divided into two main groups: the Northwest European network (Figure 12), which expands from the Atlantic Ocean to the Baltic Sea, and the Southern European network, which comprises the Mediterranean and the Black Sea (Beaudouin, 1994).

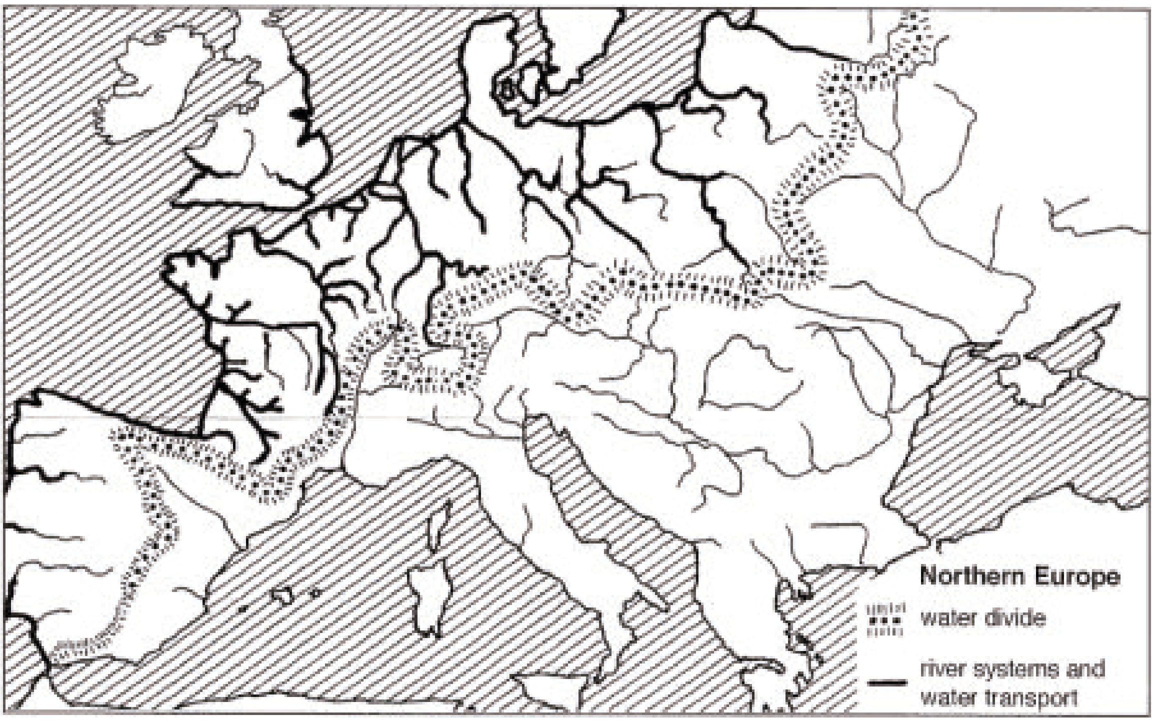

Figure 12: Network of Northwest European rivers (after Beaudouin 1994).

There are great differences in their physical geography and the conditions for navigation differ between these two groups. The network of rivers in Northwest Europe is dense and continuous, with an abundance of long rivers largely opening to the sea by wide estuaries. Conversely, in the Mediterranean the network (Figure 13) of rivers is not very dense, and is therefore discontinuous. Long rivers are scarce but those that exist have vast deltas at their mouths. As a result, in the Northwest Europe network there is a continuous system of inland and coastal navigation areas where the different zones are directly connected. In the case of the Mediterranean area, there is often a discontinuity between rivers and sea or between the different river areas (Pomey, 2009: 267).

Figure 13: Network of Southern European rivers (after Beaudouin 1994).

A river basin can be described as a geographical transport zone, and its river as a fluvial milieu for riverine navigation (Beaudouin, 1994; Pomey and Rieth 2005: 38-41). Within each fluvial milieu or river, three different hydrographical sections or transport zones can be identified (Figure 14). The first transport zone of a river is defined as the floatable section. This zone corresponds to the upper basin of a river: it is narrow, steep-sloped, with a strong current and shallow. The hydrography of this section restricts navigation downstream to floating logs and rafts alone, thus boats cannot sail on it. Historically, the floatable section was utilised mainly for transporting logs down the river (Rieth 1998, 32-35.).

The second transport zone is defined as the navigable section. This section corresponds to the middle and lower basin of a river and varies in length on each river. Here the river widens, the slope decreases allowing the current to flow more gently while the channel depth increases. In the navigable section, fluvial vessels could navigate both upstream and downstream. The navigable transport zone is, in turn, divided into two sub-sections: a fluvial section, where only fluvial vessels could navigate; and a fluvio-maritime section, where both riverine and maritime vessels could sail. In Northwest European rivers, the fluvio-maritime section could extend for hundreds of kilometres. However, in the Mediterranean, it occupies a particularly small area of the river (Rieth 1998, 36-37.)

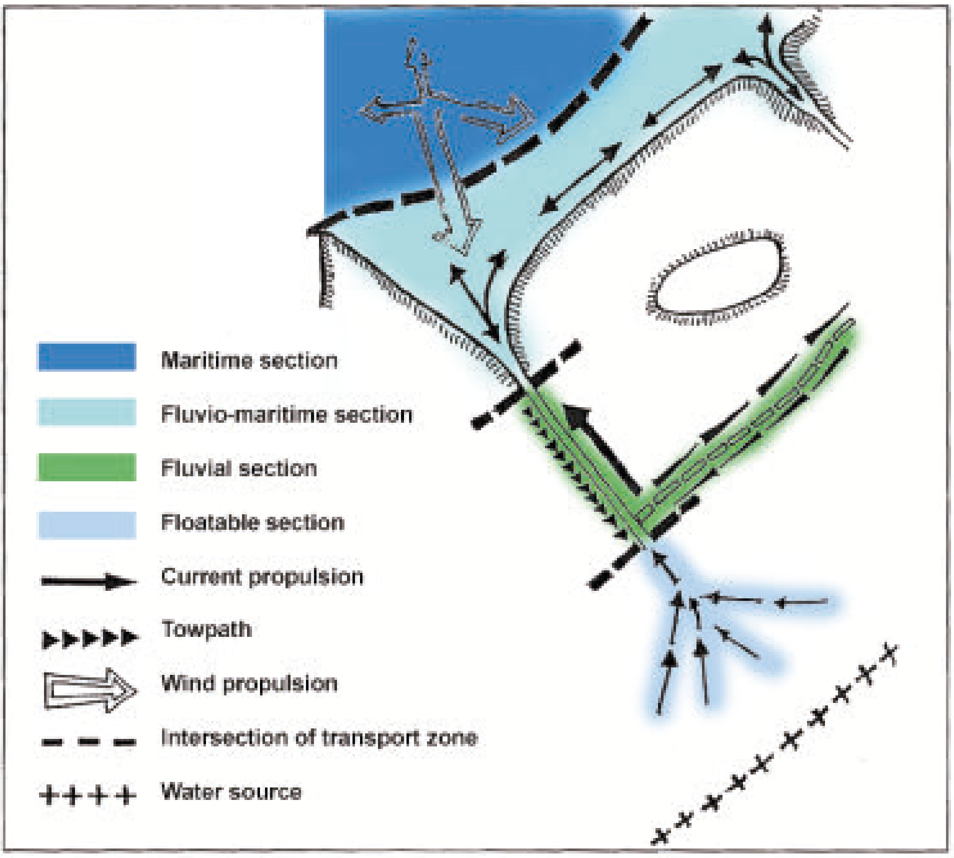

Figure 14: Geographical transport zones of a river milieu (after Beaudouin 1994).

Each of the transport zones can also be described and understood as a nautical milieu, where specific crafts, suited to the navigation of that particular zone, were used. The particular place where two transport zones intersected is described as a transit point. When sailing up a river, the transition from one transport zone to another involves the transferral of cargo to a riverine craft better suited for that section of the river. Transferral of cargo occurred at transit points (Boetto, 2016: 272).

Strabo described how the area of the Lacus Ligustinus was navigable from the sea to the many cities located inland for both small and large vessels (Strabo 3.2.4).

> *(…) ποιοῦσι δὲ τοῦτο οἵ τε ποταμοὶ καὶ αἱ ἀναχύσεις, ὡς εἶπον, ἐμφερεῖς τοῖς ποταμοῖς οὖσαι καὶ ἀναπλεόμεναι παραπλησίως ἐκ θαλάττης οὐ μικροῖς μόνον ἀλλὰ καὶ μεγάλοις σκάφεσιν εἰς τὰς ἐν τῇ μεσογαίᾳ πόλεις. (…)*[4]

Strabo further explains in more detail that the Baetis was navigable for seagoing vessels for 500 stadia as far as Hispalis. It was also navigable for smaller vessels up to Ilipa (modern-day Alcalá del Río). Finally, Corduba (located a distance equivalent to 1200 stadia from the sea) was only accessible by river-boats (Strabo 3.2.3).

> *(…) καὶ ἀναπλεῖται σχεδόν τι ἐπὶ χιλίους καὶ διακοσίους σταδίους ἐκ θαλάττης μέχρι Κορδύβης καὶ τῶν μικρὸν ἐπάνω τόπων. (…) μέχρι μὲν οὖν Ἱσπάλιος ὁλκάσιν ἀξιολόγοις ὁ ἀνάπλους ἐστὶν ἐπὶ σταδίους οὐ πολὺ λείποντας τῶν πεντακοσίων, ἐπὶ δὲ τὰς ἄνω πόλεις μέχρι Ἰλίπας ταῖς ἐλάττοσι, μέχρι δὲ Κορδύβης τοῖς ποταμίοις σκάφεσι (…)*[5]

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[4] (…) This is made possible by the rivers, and by the estuaries as well, which, as I have said, resemble rivers, and, like rivers, are navigable inland from the sea, not only for small boats but also for large ones, to the cities of the interior (…) (Strabo transl. by Jones, 1923: 27).

[5] (…) now, up to Hispalis, the river is navigable for merchant-vessels of considerable size, that is, for a distance not much short of five hundred stadia; to the cities higher up the stream as far as Ilipa, for the smaller merchant vessels; and, as far as Corduba (…) (Strabo transl. by Jones, 1923: 25).

According to the proposal of Beaudouin 1994, the Guadalquivir River, because of its hydrography, is categorised as one of the North Western European rivers. Strabo, unknowingly, was describing with startling precision the transport zones of the Baetis River. The fluvio-maritime section, or transport zone, of the river expanded from the Lacus Ligustinus up to Ilipa. The fluvial section, where only fluvial vessels could navigate, extended upstream to Cordoba. The floatable section, where only logs or simple rafts ran downstream, extended from Cordoba up to its sources at the Sierra de Cazorla. The transit points of the Baetis River transport zones were, not by chance, Hispalis and Corduba.

3.1.3 Historical development of the hydrography of the Guadalquivir River

The meandering course of the Guadalquivir River in the lower valley has varied quite considerably since antiquity, although its precise development is not entirely clear (Drain, *et al.*, 1971; Palancar Penella, 1977). Scholars have noted that the Guadalquivir River is currently navigable up to Seville, which is exactly as Strabo stated: that the Baetis was navigable for seagoing vessels for 500 stadia as far as Hispalis (Abad, 1975; Chic García, 1990: 21). This is not the only similarity between the classical descriptions by Strabo and the current situation of the Guadalquivir River, yet it seems that modern scholars missed the aspect I am about to comment on or, at least, did not mention it.

As we have seen, Strabo explained that Hispalis was located at distance of 500 stadia from the sea. A Roman *stadium* approximately corresponds to 185 m (Smith and Anthon, 1851: 1026, Table III). Thus, the 500 stadia necessary to reach Hispalis corresponded to approximately 92,5 kilometres. Seville is currently at a navigable distance of 90 km from the Atlantic Ocean, so a very similar distance to that of Hispalis in Roman Times. This results from similarities between the physical characteristics of the ancient Roman Baetis and the late 20th century morphology of the Guadalquivir River. Some geologists, upon careful examination of satellite imagery, have stated that the ancient channel or riverbed of the Baetis River was rather straight and that its meanders were less curvaceous (Ménanteau and Vanney, 1985: 121). In the last decade of the 20th century, the last of several major civil engineering works in the Guadalquivir was completed, reducing navigation distance by straightening the course of the river through "cuts" or *"cortas"* (*vide infra*). What this means is that navigation in the Guadalquivir River is currently fairly similar to that of the Roman period, and this detail is important because it was not the case for the most part of the last millennia.

The current navigable distance of 90 km from Seville to the Atlantic coast is the result of many civil engineering undertakings (*vide infra*) and, therefore, has only been available since the mid or late 20th century, so it is relatively new. However, in the 13th century, the Islamic historian Abd al-Wāḥid al-Marrākushī recorded that Seville was 70 miles away from the great sea, which is approximately 126 km (al-Marrākushī, ed. Huici Miranda, 1955: 306). Later, in 1795, the navigable distance from Seville to the sea was of 127.5 km (Ménanteau and Vanney, 1985: 124; Del Moral Ituarte, 1991: 44). Consequently, since the Early Middle Ages, the voyage from Seville to the Atlantic was not only longer but completely different than in Roman Times (Figure 15). The geomorphology of the Guadalquivir River changed substantially at some point during the Early Middle Ages, and its navigability has worsened dramatically since the 16th century. By 1650, it was impossible to sail upstream to Seville for oceangoing Galleons, so from then on they harboured at Cadiz (Serrano Mangas, 1985: 49-53).

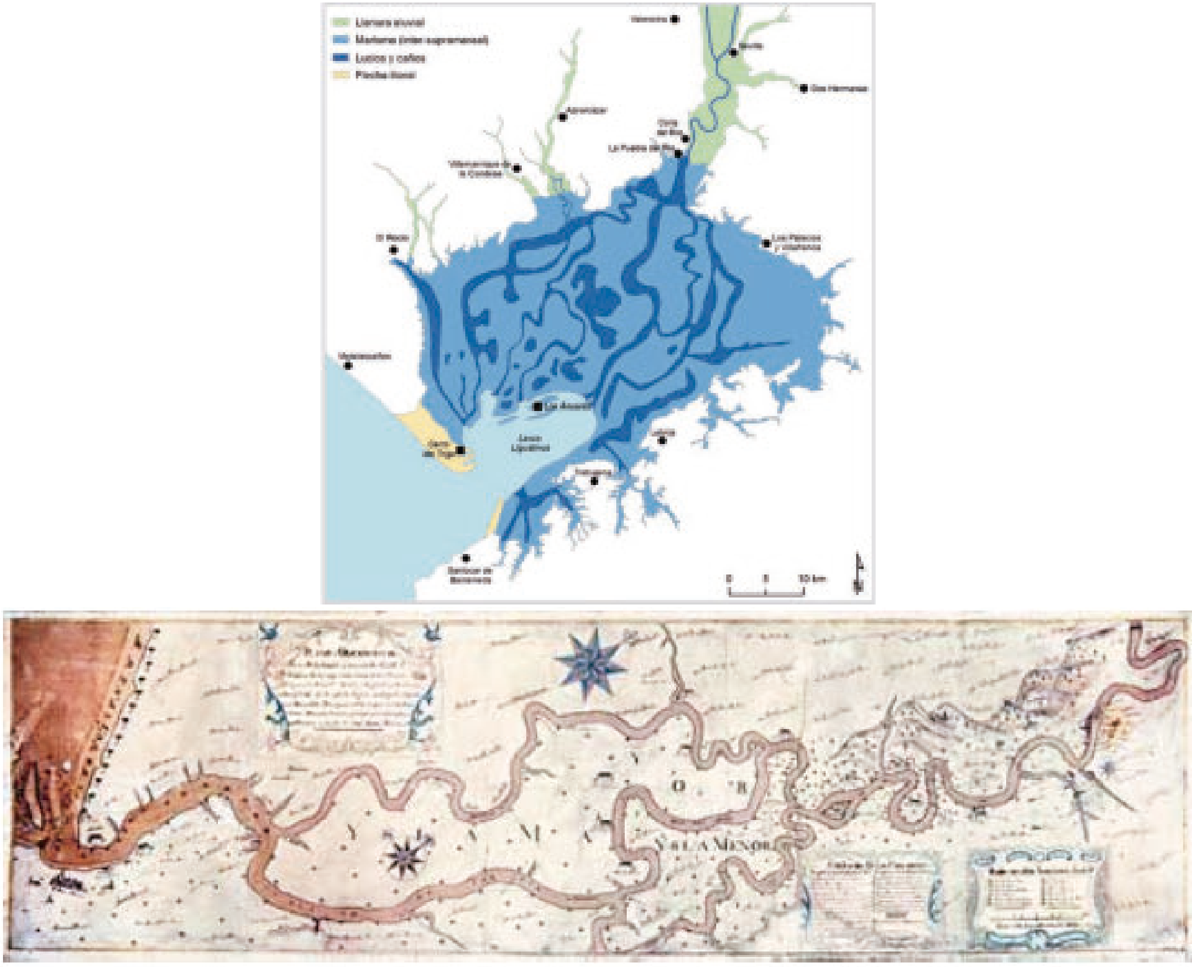

Figure 15: Reconstruction of the Lacus Ligustinus and the Baetis river *circa* 390 BC – AD 400 (top) *cf* map of the Guadalquivir River of 1720 (bottom). By the 18th c. the Lacus Ligustinus was completely filled in and the meanders of the river were more numerous and longer (after Borja Barrera, 2014: 281 and Ménanteau, 2008: 57).

In general terms, during the last two millennia the evolution and development of the Guadalquivir River can be roughly divided into three general periods: first, from the Roman era to the early Middle Ages; second, from the early Middle Ages until the late 18th century; and third, from the late 18th century until the late 20th century. The first of these periods will be addressed in the chapters of the present

Thesis. The two remaining periods will not be discussed in this Thesis, since they fall out of the chronological scope thereof; although, a brief description of each of them will be given here as it seems this is sufficient for a better understanding of the overall picture of the evolution and development of the Guadalquivir River.

The second period started in the early Middle Ages, approximately around the 11th century, when the Guadalquivir River reached a period of stability. It is in this second and intermediate period that the estuary of the river endures what has been described as a "general process of continentalization" in which the maritime marshes of the Guadalquivir River were transformed into an "interior delta" (Vanney 1970; Del Moral Ituarte, 1991, 47). During this period, slowly but increasingly through six centuries, the sedimentation of the river progressively intensified, seriously hampering the navigability of the river by the mid 17th century. In 1650 practically all commercial shipping activity was relocated to Cadiz and the riverine transit towards Seville was decreasing rapidly (Serrano Mangas, 1985: 52). This was the result of the increasingly difficult and seriously hazardous navigation that the river presented, from the mouth of the Guadalquivir River towards Seville.

The third and last period of transformation started in the late 18th century, more precisely in 1795. In that year an artificial channel was made with the goal of facilitating the navigation of the Guadalquivir River and shortening the distance between Seville and the sea by 10 km. This shortening channel or "*corta"* (i.e. cut) of 1795, known as Corta de la Merlina, was the first of several large scale civil engineering works that from late 18th century until the late 20th century (Del Moral

Ituarte, 1991) were made with three main goals: first, to facilitate the navigation of the Guadalquivir River; second, to alleviate the severe floods that Seville endured from the Middle Ages onwards; and third, to shorten the distance between Seville and the sea. The navigable distance from the Atlantic Ocean to Seville has been reduced by around 40 km, from 127.5 km in the year 1795, to the current 90 km. The last of these civil engineering works was undertaken in the 1990s, with the construction of the Corta de la Cartuja.

3.2 Ancient navigation in the Lacus Ligustinus and the Baetis River

Another similarity between the navigational characteristics of the Roman Baetis and the current state of the Guadalquivir River is the importance of tides. On the ocean shores of the world the sea level rises and falls on a daily basis; these phenomena are called tides. They are caused by the combined effects of the gravitational forces exerted by the Moon and the Sun in conjunction with the rotation of the Earth. Tide times and amplitudes are influenced by the alignment of the Sun and Moon. Daily tides have the following four stages: first, the sea level rises over several hours, covering the intertidal zone (i.e. flood tide); second, the water rises to its highest level, reaching high tide; third, the sea level falls over several hours, revealing the intertidal zone (i.e. ebb tide); and finally, the water stops falling, reaching low tide (Mellor, 1996: 169).

The tides of the Atlantic Ocean (Figure 16) greatly affect the Guadalquivir River, and its navigation, reaching at high tide the town of Alcalá del Río (Roman Ilipa) located 15 km upstream from Seville. High tide in Seville reaches 1.20 m at the neap tides (i.e. when the moon is at first quarter or third quarter) and up to 3 m at the spring tide (i.e. around new moon and full moon when the Sun, Moon, and Earth are aligned)(Ménanteau and Vanney, 1985: 119; Chic García, 1990: 22).

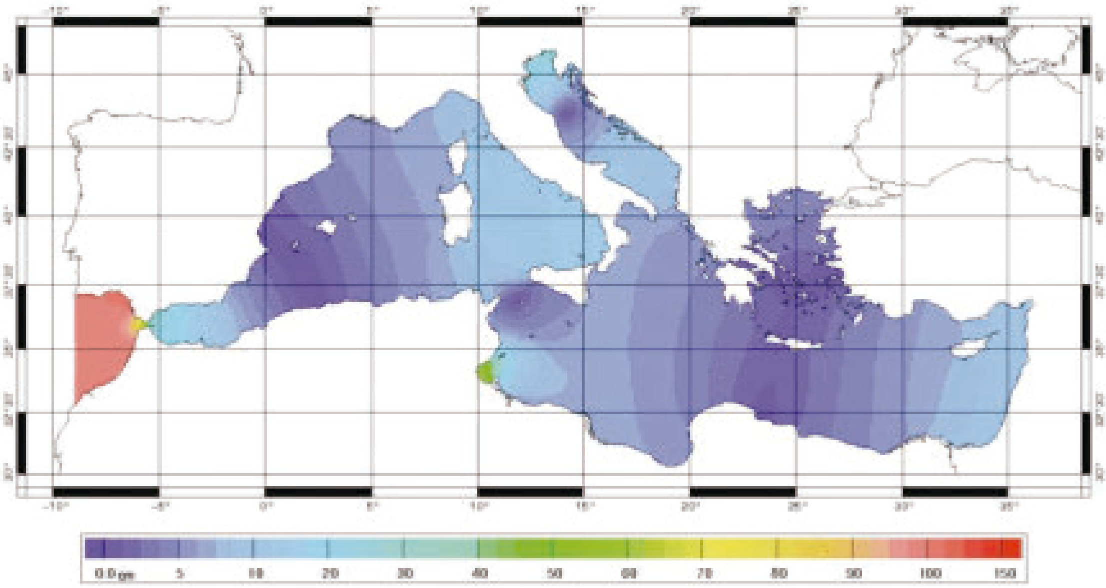

Figure 16: Average amplitude of principal tides in the Mediterranean Sea and in the Gulf of Cádiz (after LEGOS 2016).

Strabo described how during the Roman period the high tide reached Ilipa (Strabo 3.5.9). He also provided a rather detailed description of the local characteristics of the navigation in the Guadalquivir River influenced by the daily tides (Strabo 3.2.4). He described how ships could use the daily tides to reach inland towns using the rise of the tide to sail up stream within the rivers. This provided a certain advantage for ships and their crews, rendering the whole region navigable and convenient both for exporting and importing merchandise. However, due to the strength of the rising tide, navigation on the river channels was dangerous both in the ascent and descent of the rivers. In the estuaries, the ebb tide was also dangerous because its swiftness often left ships stranded on dry land. Strabo further described that the excessive rise of the tides is greater than compared with other regions. He explains that the strength of the tides was a result of the sea, coming from the great ocean, compressing into the narrow strait which Maurusia forms with Iberia, meeting resistance, and therefore rushing to those parts of the land that yield to it (Strabo 3.2.4).

In the 1st century AD, Silius Italicus seems to confirm the previous detailed description of Strabo in regards to Hispalis and its famous tides (Pun. 3.392)

> *(…) et celebre Oceano atque alternis aestibus Hispal (…)*[6]

In the 3rd century AD, Philostratus of Athens gives a similar description to that of Strabo about navigation in the Baetis River (V.A. 5.6).

> *(…) Φασὶ δὲ καὶ τὸν ποταμὸν ἀναπλῶσαι τὸν Βαῖτιν, ὃς δηλοῖ μάλιστα τὴν τοῦ Ὠκεανοῦ φύσιν· ἐπειδὰν γὰρ πλημμύρῃ τὸ πέλαγος, ἐπὶ τὰς πηγὰς ὁ ποταμὸς παλίρρους ἵεται πνεύματος δήπου ἀπωθουμένου αὐτὸν τῆς θαλάττης. τὴν δὲ ἤπειρον τὴν Βαιτικήν, ἧς ὁ ποταμὸς οὗτος ὁμώνυμος, ἀρίστην ἠπείρων φασί, πόλεών τε γὰρ εὖ ἔχειν καὶ νομῶν καὶ διῆχθαι τὸν ποταμὸν ἐς τὰ ἄστη πάντα, (…)*[7]

As we are about to see, it is remarkable that the characteristic navigation of the Roman Baetis River using the daily tides is very similar to the navigation of the Guadalquivir River in the second half of the 20th century. This is inferred from the testimonies of owners of the last traditional wooden boats for crossing the river at Coria del Río, as well as one of the last fishermen of Seville (Román, 1985: 177, 182), who made virtually the same descriptions about the unique characteristics of

[6] (…) and of Hispalis, famous for commerce and for the ebb and flow of its tides (…) (Silius Italicus transl. by Duff, 1934: 143).

[7] (…) They say also that they sailed up the river Baetis, which exactly illustrates the nature of the Ocean, since when the tide is high, the river flows back towards its source, presumably because an exhalation drives it away from the sea. The mainland region of Baetica, which gets its name from the river, they describe as the best of all such regions, being well provided with cities and pastureland, and because the river is distributed among all the towns. (…) (Philostratus ed. and trans. by Jones, 2005: 9).

the navigation in the Guadalquivir River as that made by the classical authors. Arguably the best validation of the accuracy of these authors' descriptions comes from the Merchant Captain Mr Ginés Sáenz Hernández, chief pilot from La Barra de Sanlúcar (port at the mouth of the Guadalquivir River flowing into the Atlantic Ocean). After more than two decades (from the 1960s until the mid 1980s) as the chief pilot for manoeuvring ships through the extremely dangerous waters of the Guadalquivir River mouth, he confirmed that the descriptions that Strabo made 2000 years ago, in regards navigation in the Baetis/Guadalquivir, are accurate and truthful. This is despite the fact that the ancient author never travelled on the river (Román, 1985: 194). Therefore, it is significant to note that the characteristics of the Guadalquivir River and its navigation in the 20th century returned to being very similar to those in the Roman era after roughly a millennial hiatus. However, modern scholars appear to have missed this important aspect or, at least, did not mention it in their published work.

3.2.1 The nautical milieu of the Baetis River and its riverboats

In the 18th century, the naval architect Fredrik af Chapman formally established the relationship between ship types and nautical milieux, or geographical transport zones (Chapman, 1971). Chapman underlined the influence of the natural environment on the architectural features of ships. On the one hand, seafaring ships used for transoceanic navigation have similar naval design regardless of the area or county of origin. However, coastal vessels used for coastal navigation, tramping, and/or fishing are designed to adapt to the constraints of their particular nautical milieu and the local natural environment in which they operate. In addition to the natural environment, local culture as well as social and economic context influenced the ship design: it is possible to understand boats as expressions of regional maritime culture (Pomey and Rieth 2005: 38-41; Rieth, 2016: 48-52).

The relationship between river transport zones and riverine crafts increases the further we travel upstream (Rieth, 1998: 32-33). The physical characteristics of each transport zone (i.e. depth of channel, speed of the current, etc.) influence the overall design and construction of a ship, including its propulsion and steering systems. These will, in turn, affect its sailing and navigational performance which ultimately will have an impact on the economic patterns of transport, such as the transfer of cargo at transit points (Pomey and Rieth 2005: 38-41).

Because ships are designed according to their primary function as well as the particular nautical milieu on which they operate, they can be organised into different categories. Expanding on a classification proposed by Pomey (2009: 271-274), commercial crafts of the Roman period could be divided into the following categories:

1. Maritime seagoing cargo vessels (*naves onerariae*), had different sizes (Pomey and Tchernia, 1978; Wilson, 2011a: 213-217) and types such as:
    a. Exceptionally large grain freighters able to carry up to 1,000 to 1,200 tons of cargo such as the famous ship *Isis*[8].
    b. Large merchant ships (full load displacement of *circa* 350-500 tons) of the class *muriophorios*, or 10,000 amphorae carriers (e.g. the

[8] Casson, 1995: 186-188 on the basis of Lucian's (*Navigium* 5-6) description of the *Isis*.

Albenga shipwreck[9]) or of the class *ponto* (e.g. *Madrague de Giens* shipwreck[10]).

c. Medium size cargo vessels (full load displacement of *circa* 150-200 tons) able to carry 3,000 amphorae or 20,000 *modii* of grain (e.g. *Bourse* de *Marseille* shipwreck[11]).

d. Common maritime merchant ship (full load displacement of *circa* 70-80 tons) known as *corbita*, able to carry around 1,000 amphorae or 10,000 *modii* of grain (e.g. *Saint Gervais III* shipwreck[12]).

2. Harbour and fishing boats that according to Pomey (2009: 272-273) could be sub-divided into groups: lighters used for transhipping and unloading cargo, that is the *navis codicaria* (e.g. *Fiumicino* 1, 2 and 3 shipwrecks[13]), harbour working boats (e.g. Jules-Verne 3, 4, and 5[14]), and fishing boats (e.g. *Fiumicino* 5[15]).
3. Fluvio-maritime boats designed to be able to navigate both environments at sea and on rivers (e.g. Blackfriars I shipwreck[16]).
4. Riverboats, which could be sub-divided into two groups: boats built following a Romano-Celtic tradition, and those built with a Greco-Roman tradition of mortise-and-tenon construction.

Given the theme of the present Chapter, the Baetis River and the fluvial port of Roman Hispalis, I will only address the riverboats as far as shipbuilding is

[9] Lamboglia, 1952; 1961; 1971, Pallares, 1977; 1983.
[10] Pomey and Tchernia, 1978; Tchernia, 1978; Pomey, 1982.
[11] Gassend and Cuomo, 1982; Pomey *et al.*, 2012.
[12] Liou *et al.*, 1990.
[13] Boetto, 2000; 2001; 2002; 2006a; 2008, 2010; 2011.
[14] Pomey, 1995; 1999.
[15] Boetto, 2002; 2006a; 2006b.
[16] Marsden, 1967; 1994.

concerned. Riverine fleets of river crafts and barges operated in rivers, canals, and lakes, and had regional differences in their design according to the nautical milieu in which they operated (Boetto, *et al.*, 2011). Taking into account their technical characteristics and their cultural origin, Roman riverboats can be divided into two main groups: Romano-Celtic and Mediterranean shipbuilding tradition or with influences from the latter. The former tradition is the best known because of numerous archaeological examples found in the last forty years. The term Romano-Celtic refers to both the time and the place of these boats. The term "Roman" in the binomial refers to the temporal distribution of these crafts, from the 1st century to the 4th century AD, and also considers the possible influence of Roman technology. The term "Celtic" refers to the geographic and spatial distribution of these finds (Figure 17), as they have been documented mainly in Celtic populated regions prior to the Roman conquest (McGrail, 1995: 139).

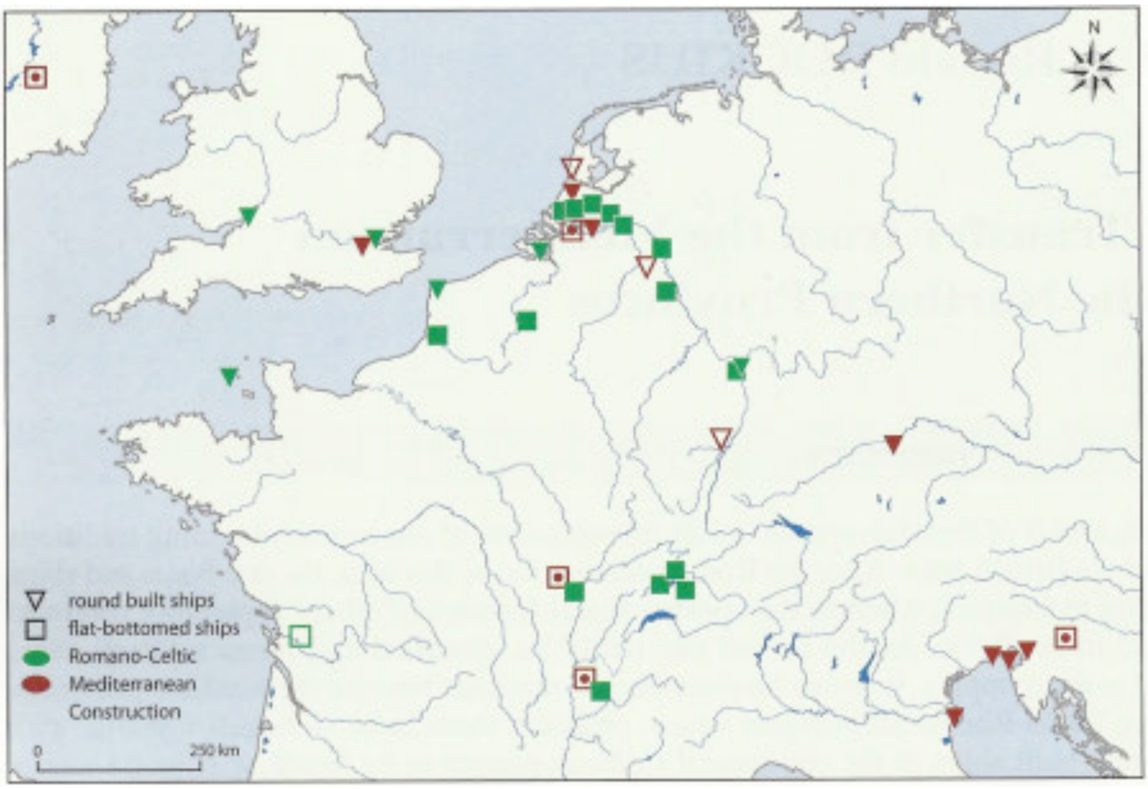

Figure 17: Roman riverboats found in Central and Northwest Europe (after Bockius, 2011: fig. 1).

Based on the known archaeological examples, riverboats and barges that were built in the Romano-Celtic shipbuilding tradition presented the following characteristics in their construction (McGrail, 1995: 143).

1. A flat-bottomed hull with flared vertical sides in transverse section.
2. A bottom-based construction that is completed with either frame or plank oriented assembly.
3. A hull structure that is keel-less and without end posts.
4. Propelled by paddle, pole, oar or tow, and possibly by a sail when there are winds blowing from the stern sector.

The design features of the Romano-Celtic shipbuilding tradition resulted from both the function for which they were built (i.e. transportation), and also the adaptation to the physical constraints of the natural environment of their nautical milieu (e.g. river courses, canals, lagoons, etc.). Thus, Romano-Celtic boats and barges, with a flat-bottomed and broad hull, could beach in shallow waters near half tide to avoid being stranded, and could navigate through shallow courses passing over shoals and sandbars. In addition to their navigational performance, their "lidless-box shape" hull maximised their load capacity, maintaining the cargo stable and safe on board while keeping a reduced draught (Marsden 1994, 178). These vessels reached 40 m in length, were able to carry up to *circa* 60 tons of cargo, and, when fully loaded, their draught did not exceed 1 m (Bockius, 2004).

Scholars also describe the Roman-Celtic shipbuilding tradition as Gallo-Roman, given the seemingly indigenous origin of the construction technique (Boetto, *et al.*, 2011). Regardless of the definition, according to the distribution of the river basins where these vessels operated, they can be organised into the following regional groups: the Rhine group, the Alpine group (i.e. from the Lake Neuchâtel), the Rhône- Saône group, and the Atlantic group (Rieth, 2006: 76). The shipbuilding characteristics of the Lipe barge, found in the Ljubljanica River (Slovenia), which are similar to those of the Romano-Celtic construction but with differences, have led to the proposal of a different riverine shipbuilding tradition for south-eastern Europe, described as Romano-Iliria (Boetto and Rousse, 2011: 190). A selection of the main archaeological examples of flat-bottomed river crafts and barges, belonging to the Roman period (1st to 4th centuries AD), can be found in Table 1.

Shipwreck	River basin (Country)	Chronology (AD)	Hull dimensions (m) Length/Width/Height	Estimated cargo capacity (t)	Shipbuilding tradition (Fastening system/s)	Propulsion system/s	Selected Bibliography
Zwammerdam 2	Rhine River (Netherlands)	150 - 225	22.75 / 2.8 / 0.95	11.2 t	Romano-Celtic (Iron nails)	Tow	De Weerd, 1978; 1990; 2001
Zwammerdam 4	Rhine River (Netherlands)	150 - 225	34 / 4.4 / 1.2		Romano-Celtic (Iron nails)	Sail	*Ibid*
Zwammerdam 6	Rhine River (Netherlands)	150 - 225	20.25 / 3.4 / 0.9		Romano-Celtic with Mediterranean influence (Iron nails + Pegged mortise-and-tenon)	Sail	*Ibid*
Woerden 1	Rhine River (Netherlands)	175 - 200	25 / 3.6 / 1.6	54.7 t	Romano-Celtic (Iron nails)	Sail	Bockius, 1996; 2002
Woerden 2/6	Rhine River (Netherlands)		14 / 3.1 / 1.2		Romano-Celtic (Iron nails)		*Ibid*
Woerden 7	Rhine River (Netherlands)	163 - ?	*c.* 29.6 / 4.7 (Reconstructed)		Romano-Celtic (Iron nails)	Sail + oars	Vos, Morel, and Hazenberg, 2011
De Meer 1	Rhine River (Netherlands)	150-200	25 / 2.7 / -		Romano-Celtic (Iron nails)	Sail	Van Holk, 2011
De Meer 4	Rhine River (Netherlands)	100 - ?	*c.* 27 / *c.* 3.7 / - (Reconstructed)		Romano-Celtic with Mediterranean influence (Iron nails + Pegged mortise-and-tenon)		*Ibid*
De Meer 6	Rhine River (Netherlands)	3rd c.	*c.* 9.5 / *c.* 1.5 / *c.* 0.4 (Reconstructed)		Romano-Celtic (Iron nails)		*Ibid*
Kapel-Avezaath	Rhine River (Netherlands)	2nd c.	30.5 / 3.2 / -		Romano-Celtic (Iron nails)		Lehmann, 1990
Druten	Rhine River (Netherlands)	End of 2nd c. beginning of 3rd c.	*c.* 27 / *c.* 4 / *c.* 0.8		Romano-Celtic (Iron nails)		Lehmann, 1978; 1990
Pommeroeul 1	Haine River (Belgium)	*c.* 50 - 110	18-20 / 3 / 0.67	10 t	Romano-Celtic (Iron nails)	Pole Sail? Tow?	De Boe and Hubert, 1977 De Boe, 1978.
Mainz 6	Rhine River (Germany)	81 - ?	*c.* 40 / *c.* 5 / *c.* 0.9 (Reconstructed)	65 t	Romano-Celtic (Iron nails)	Sail	Bockius, 2002
Bevaix	Neuchâtel Lake (Switzerland)	182 - ?	19.4 / 2.9 / 0.9	18 t (max.)	Romano-Celtic / Gallo-Roman (Iron nails)	Sail	Arnold, 1992
Yverdon 1	Neuchâtel Lake (Switzerland)	115 - ?	24 / 3.3 / 0.9	20 t (max.)	Romano-Celtic / Gallo-Roman (Iron nails)		*Ibid*
Yverdon 2	Neuchâtel Lake (Switzerland)	End of 3rd c. beginning of 4th c.	10 / 1.5 / 0.7	2.5 t	Romano-Celtic / Gallo-Roman (Iron nails)	Sail + oars	*Ibid*

Shipwreck	River basin (Country)	Chronology (AD)	Hull dimensions (m) Length/Width/Height	Estimated cargo capacity (t)	Shipbuilding tradition (Fastening system/s)	Propulsion system/s	Selected Bibliography
Chalon-Sur-Saône 1	Saône River (France)	50 – 70	8.7 / 2.1 / 0.1 Reconstructed = 18-23 / 2.3 / 0.1		Romano-Celtic / Gallo-Roman with Mediterranean influence (Iron nails + Mortise-and-tenon)		Lonchambon *et al.*, 2009 Lonchambon, 2011
Chalon-Sur-Saône 2	Saône River (France)	50 – 70	15.46 / 1.62 / 0.72	5.09 t	Romano-Celtic / Gallo-Roman (Iron nails)	Tow	*Ibid*
Parc Saint-Georges 8	Saône River (Lyon, France)	55 - ?	17.41 / 2.8 / 0.5		Romano-Celtic / Gallo-Roman with Mediterranean influence (Iron nails + Mortise-and-tenon)		Rieth, 2010 Guyon and Rieth, 2011
Parc Saint-Georges 5	Saône River (Lyon, France)	150 - ?	7.3 / 0.83 / 0.55		Romano-Celtic / Gallo-Roman (Iron nails)		*Ibid*
Parc Saint-Georges 4	Saône River (Lyon, France)	158-185	18.53 / 4.67 / 1.15 Reconstructed = c. 28 / c. 4.85 / c. 1.35	55 t	Romano-Celtic / Gallo-Roman (Iron nails)		*Ibid*
Parc Saint-Georges 3	Saône River (Lyon, France)	160-185	14.64 /3.05 / 0.25		Romano-Celtic / Gallo-Roman (Iron nails)		*Ibid*
Parc Saint-Georges 2	Saône River (Lyon, France)	210-215	15.11 / 2.83 / 1.1		Romano-Celtic / Gallo-Roman (Iron nails)		*Ibid*
Parc Saint-Georges 7	Saône River (Lyon, France)	245-260	19.82 / 5.05 / 1.13		Romano-Celtic / Gallo-Roman (Iron nails)		*Ibid*
Place Tolozan	Rhône River (Lyon, France)	30 - ?	7 / 2.4 / 0,9		Romano-Celtic / Gallo-Roman with Mediterranean influence (Iron nails + Mortise-and-tenon)	Paddle?	Rieth, 2011
Arles-Rhône 3	Rhône River (Arles, France)	40-60	31,12 / 2,9 / 0,99 (Reconstructed)	21.48 t	Romano-Celtic / Gallo-Roman (Iron nails)	Tow Pole	Marlier, 2014
Lipe	Ljubljanica River (Slovenia)	Beginning of 1st c.	30 / 4.8 / 0.6	40 t – 70 t (max.)	Romano-Iliria (Sewn + Iron nails)	Pole Tow?	Boetto and Rousse, 2011

Table 1: Main archaeological examples of flat-bottomed river crafts and barges, belonging to the Roman period (1st to 4th centuries AD), organised according to the regional groups of the Rhine, Alpine, and Rhône-Saone, Slovenian case of Lipe (Author).

Regarding the Guadalquivir basin, we lack archaeological examples of the Roman riverboats which sailed the Baetis in antiquity. This contrasts with the very large volume of goods transported on the Baetis during the Imperial period (*vide infra*). The best testimony is the millions of oil *amphorae* that departed from the numerous ports at *figlinae* located on the Baetis basin and that were distributed out to the fringes of the Roman Empire (*vide infra*). This indirectly shows that the number of riverboats carrying the products of the countryside to Hispalis must have been really remarkable (Chic García, 1990: 78-79). Epigraphic evidence attests to the existence of two associations (Meiggs, 1960; Tran, 2006) of boatmen in the Baetis River, and to the types of the boat that they used, *scaphae* and *lintres* (CIL II 1168, 1169, 1180, 1182, 1183). Unfortunately, we do not have any artistic representation of these, and consequently their characteristics are unknown to us.

Strabo (3.2.3) asserts that the Baetis riverboats were built of assembled planks, and that before (the Roman era) were simple dugout canoes. The hypothesis that Roman river barges are the product of an evolution from pre-Roman dugout canoes has been proposed for Gallo-Roman vessels (Arnold, 1992; Rieth, 2010). It will be very interesting to see if the characteristics of the "*Cajón marismeño*" (Figure 18), a traditional small box-like contemporary traditional boat used in the Marismas del Guadalquivir (i.e. Guadalquivir Marshes), have a connection with crafts of the Roman period or even with the dugout pirogues that Strabo (3.2.3) described.

Figure 18: Early 20th century "*Cajón marismeño*", a traditional small box-like boat used in the Marismas del Guadalquivir (Juan Manuel Jiménez).

Eric Rieth has proposed the idea that traditional river barges, of a particular nautical milieu, retain design and structural characteristics from their predecessors in antiquity throughout their historical development (Rieth, 2006; 2010). He supported this hypothesis by comparing the characteristics of Gallo-Roman fluvial vessels found at the Saône and Rhône Rivers with known traditional and historical river vessels from the region. In the Guadalquivir River, traditional flat-bottomed barges, at least 13 m long and very similar in characteristics to those of the Roman period excavated in Central and Northwest Europe (*vide supra*), were still in use at the end of the 19th century as shown in photographs of the period (Figure 19). Consequently, the existence of flat-bottomed barges in the Baetis River during the Roman period must be considered as a distinct possibility.

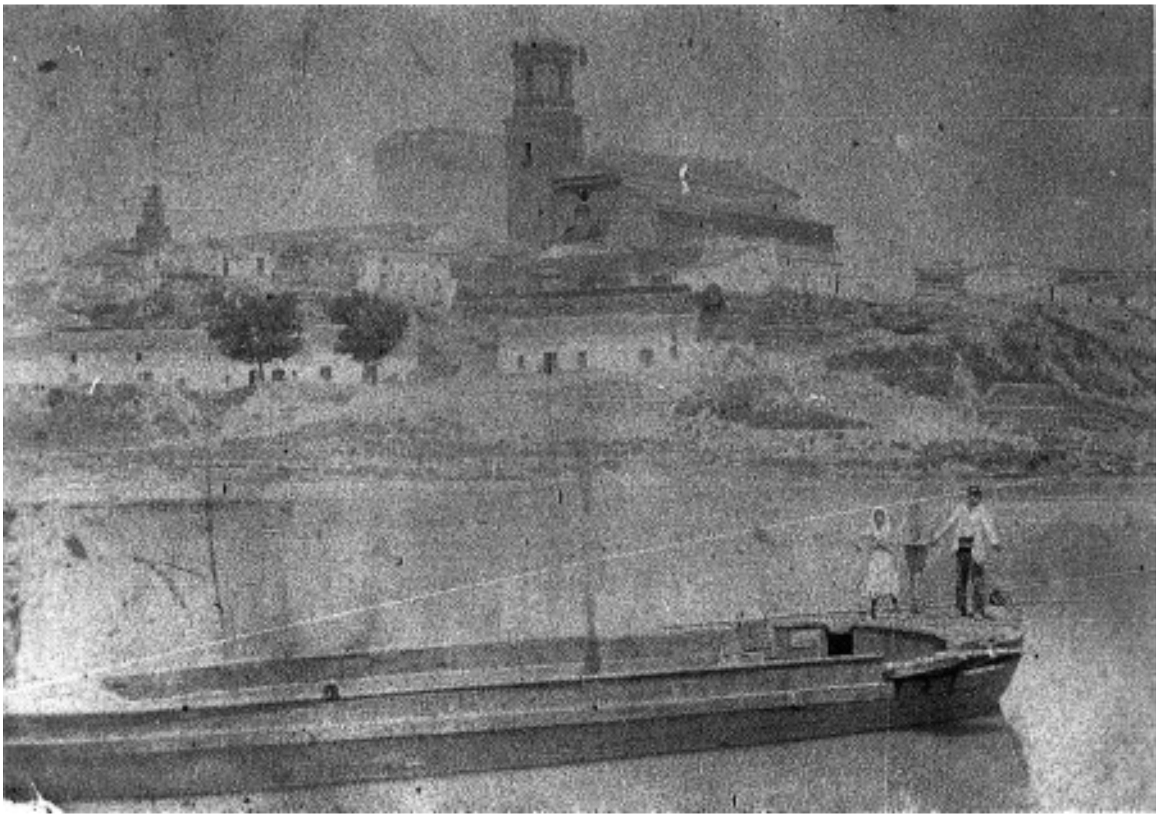

Figure 19: 1885 photograph of Cantillana showing a traditional flat-bottomed barge of the Guadalquivir River. The archaeological remains of the Roman harbour at Cantillana can be seen in the background (after Arias Solís and Pérez Camacho, 1990: 119).

It is possible, therefore, to propose that Roman riverboats and barges from the Baetis River were probably similar in characteristics and use to their Central and Northwest European counterparts, which are archaeologically documented from the river basins of the Rhine and the Rhône-Saône. However, it is probable that certain details of its naval construction were characteristic of their nautical milieu, the Baetis River basin. These may have been inherited from indigenous traditions in existence prior to the Roman conquest. Therefore, they might have had regional features different from the aforementioned Roman-Celtic shipbuilding tradition. Unfortunately, until archaeological examples of Roman riverine crafts from

Antiquity are found in the Guadalquivir, and properly studied, this proposal will remain hypothetical.

Taking into account the remarkable volume of products exported from the Baetis basin (*vide infra*), as well as other available archaeological, literary and epigraphic evidence, the categorical need and existence of abundant flotillas of flat-bottom riverboats and/or barges must be recognised. As we have seen, these flat-bottomed barges were the most efficient vessels for inland waterway transport, since their "lidless-box" shaped hull maximised the cargo capacity while keeping a very small draught which rarely exceeded 1 m (Bockius, 2004). This allowed these river crafts to beach and berth on riverbanks or beaches without the need for port facilities.

3.2.2 The "ports" of the rural villas along the Baetis River

Numerous archaeological surveys carried out in the lower Guadalquivir Valley (Ponsich, 1974; 1979; 1987; 1991; Mattingly, 1988a) have identified a myriad of villas, rural settlements, and *figlinae* where the Baetica oil was produced and bottled (*vide infra*). Many of these *figlinae* are referred to as *portus* or "ports" on the seals found on Dressel 20 amphorae (Berni Millet, 2008: 164-168). The term could be understood literally and refer to fluvial harbour facilities, or it could also be related to commercial mechanisms of production control along the river (Remesal 1977-78: 116; Berni Millet, 2008: 166). However, very little evidence of port facilities has been found so far in the Guadalquivir River in the form of conventional harbour structures such as quays built with concrete foundations and masonry. The use of flat-bottomed vessels on the Baetis could explain the paradox of the necessary existence of ports facilities along this River during the Roman period and the lack of archaeological evidence.

Chic García (1990), followed by Parodi Álvarez (2001), proposed that the word *portus* present on the Dressel 20 amphorae seals could be associated with a system of dams and locks used to control the water flow of the Baetis and its navigability during the Roman era (Chic García, 1990: 32). According to this hypothesis, some monumental stone structures found along the banks of the Guadalquivir River would have been archaeological remains of this system of dams and locks. Conversely, this proposal has encountered some strong disagreement (Sillières, 1990: 722-723; Remesal Rodríguez 1991). Remesal Rodríguez, on the other hand, proposed that dams and locks did not control the navigation of the Baetis River during the Roman era, but instead a system of canals (i.e. *fossae*) could have existed and could have been used (Remesal Rodríguez, 1991: 294). According to him, archaeological remains of one of these canals seemed to have been found between Lora del Río (Axati) and Alcolea del Río (Arva) (Remesal Rodríguez, 1991: 290; 1978)

Despite the extensive surveys that have been carried out (Ponsich, 1974; 1979; 1987; 1991; Mattingly, 1988a), only a handful of possible harbour infrastructures have been found on the banks of the Guadalquivir River at Celti (modern day Peñaflor), Naeva (modern day Cantillana), and Ilipa (modern day Alcalá del Río).

Keay (1988: 101) proposed the possibility that the stone structure known as "El Higuerón" at Celti is the remains of a Roman quay. However, different interpretations have been put forward (Chic García, 1990: 27, footnote 48), its location on the bank of the Roman Baetis has been questioned (Remesal Rodríguez, 1991: 294), and, therefore, the chronology and function of the remains of "El Higuerón" at Celti are still unknown.

That Roman Naeva (Cantillana) had a fluvial port is attested both epigraphically and archaeologically (Ordóñez Agulla, 1993). An inscription unearthed in Seville (CIL II 1182 = CILA II, 17)[17] indicates the existence of an association of boatmen (*lyntrarii*) based at Naeva. However, the best evidence is the archaeological remains of what seems to be monumental foundations of a Roman quay constructed with *opus caementitium* (Figure 20 *cf* Figure 19). The remnants of the Roman harbour at Naeva were first identified in the late 19th century by Bonsor (1931: 46) and they were still visible until the end of the 20th century when they were buried. These Roman quay remains at Naeva have been never studied archaeologically.

[17] CIL II 1182 = CILA II, 17: *C(aio) Aelio C(ai) f(ilio) C(ai) n(epoti) / Quir(ina) Avito / lyntrariorum / omnium patro/no lyntrari(i) Ca/nanienses Oduci/enses Naevenses.*

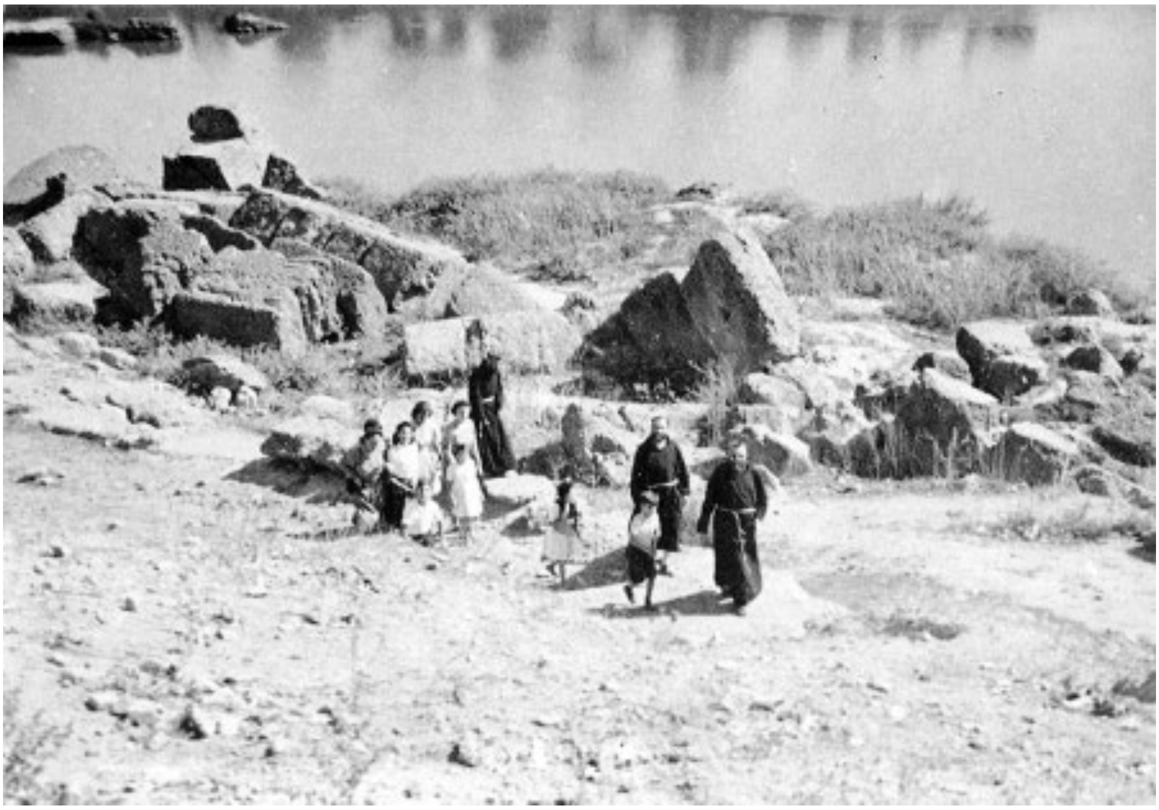

Figure 20: 1944 photograph of the monumental foundations of a Roman quay at Naeva (after Arias Solís and Pérez Camacho, 1990: 124).

In Alcalá del Río (Roman Ilipa Magna) (Millán León, 1989), however, some archaeological remains have been interpreted in relation to harbour structures: remains of warehouses, as well as an *opus caementitium* foundation have been interpreted as possible remnants of a quay and of a riverine watch tower (Rodríguez Gutierrez *et al.* 2012: 713).

Apart from the remains at Cantillana and those unearthed at Alcalá del Río, other archaeological evidence of harbour infrastructures present on the banks of the Guadalquivir River (such as quays) in relation to the "ports" mentioned on the seals found on Dressel 20 amphorae (Berni Millet, 2008: 164-168) has not yet been found, despite the extensive surveys that have been carried out (Ponsich, 1974; 1979; 1987; 1991; Mattingly, 1988a).

Most likely, due to the gradual hydrography and easy navigability of the Baetis River on its fluvial section, the numerous ports attested by the Dressel 20 amphorae seals (Berni Millet, 2008: 164-168), were simple loading and unloading areas without complex harbour infrastructures. For transhipment of amphorae to occur, only two elements were necessary: on the one hand, a slightly inclined bank where a flat-bottomed barge could be berthed; on the other, a wooden pole or a simple tree nearby to which to tie and secure the craft. If needed, a small, simple wooden pier would be more than adequate to complete the most demanding transshipment of cargo. The archaeological remains of a wooden pier would have completely disappeared within decades after its abandonment and traces of it (wooden piles) would be very hard to find within the archeological record. The loading and stowage of the barge would have been carried out by stevedores, as evidenced by the iconography in the ports of Ostia and Narbone (Tchernia, 1997: 117, 119 and 127).

Consequently, the use of flat-bottomed riverboats and barges in the Baetis could explain the lack of harbour infrastructures in those production centres. The *portus* or ports, some of which are referred to in the Dressel 20 amphorae seals (Berni Millet, 2008: 164-168), used to stack the Dressel 20 amphorae into riverboats and barges, were possibly simple loading and unloading areas without large, masonry made, harbour infrastructures. After being loaded, the barges began the first stage of their journey descending downstream towards Hispalis. Once the barges arrived to Hispalis they were transhipped to seagoing cargo vessels (*vide infra*) for the second stage of their journey (Keay, 1988: 101-102), sailing away towards numerous and distant regions of the Roman Empire and beyond (Bernal Casasola, 2001).

3.3 The geographical and topographical context of ancient Seville

Seville is located in the Lower Guadalquivir Valley close to the mouth out to the Atlantic. According to Strabo, Hispalis was located within tidal reach of the Atlantic Ocean. The strategic position of this area, located at the transit point between its fluvio-maritime transport zone and its fluvial one (*vide supra*), seems to have been recognised in antiquity when the original settlement was established.

Irrefutable and definitive archaeological evidence that proves, without a doubt, that Seville was a Phonicean colony has not as yet been unearthed because these first occupational strata currently lie seven metres beneath the tell of Seville's city and are very rarely reached by any excavation conducted in Seville. However, many scholars, especially those from the University of Seville, on the basis of ample indirect or circumstantial evidence, as well as a few archaeological remains found on those first occupational levels, currently accept the hypothesis that the Phoenicians founded a colony there around the 9th century BC (Escacena Carrasco and García Fernández, 2012; Escacena Carrasco, 2014).

The existence of the Phoenician sanctuary of El Carambolo (Celestino Pérez and Jiménez Avila, 2005), one of the most important Phoenician sanctuaries currently known in the Mediterranean (Bandera Romero and Ferrer Albelda, 2010), which is located three kilometres eastwards from Seville, is used to support the hypothesis of a Phoenician colony for the initial settlement. Lipinski (1984) proposed that it was known by the Semitic name of Spal or Ispal, and that it seems to have started to interact with already established Tartessian settlements nearby (Escacena Carrasco y García Fernández, 2012).

The geographical and topographical context of Seville is key to understand its success in antiquity, especially in the Roman Era. One of the main reasons why Roman Hispalis thrived and flourished is derived from its strategic geographical position in relationship to other Roman urban centres of Baetica. Hispalis, as the capital of the *Conventus Hispalensis* (Figure 21), was located between Corduba (Córdoba), the provincial Capital of Hispania Ulterior, and was accessible by boat through the Baetis River, and the other two major maritime ports of Baetica: Gadir (Cádiz) and Onuba (Huelva) (Sillières, 1990).

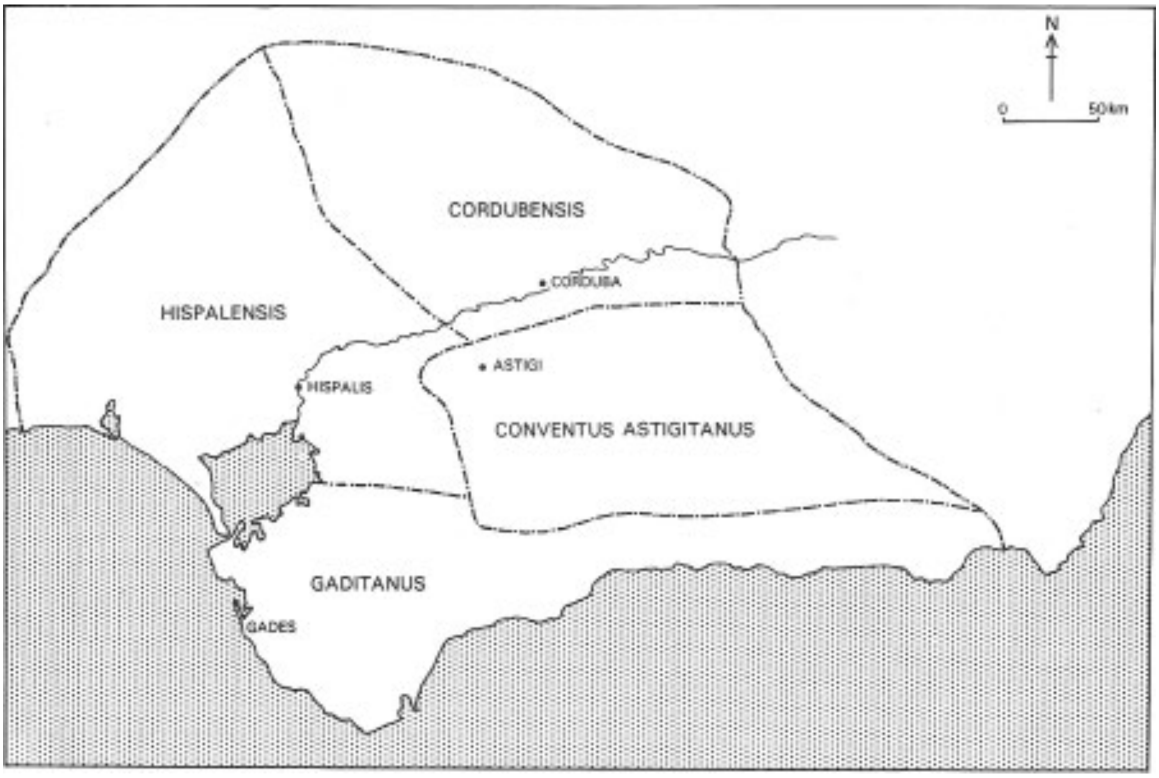

Figure 21: The *conventus* divisions of Early Imperial Betica (after Keay, 1998b: fig. 2).

Hispalis stood very close to the Lacus Ligustinus, and it was actually both a maritime as well as a fluvial port, since it acted as the transit point between the fluvio-maritime transport zone and the fluvial transport zone of the Baetis River (*vide supra*). Hispalis lay north of two smaller ports Cavra (Coria del Río) and Orippo (Dos Hermanas) situated at the junction of the Baetis River and the Lacus Ligustinus. This large internal sea provided access to the Atlantic Ocean and had on its shores urban centres such as Ebora (Évora), Hasta (Mesas de Asta), and Nabrissa (Lebrija) among others (Sillières, 1990).

Hispalis was also close to important urban centres along the banks of the Baetis River such as Italica (Santiponce) and Ilipa Magna (Alcalá del Río) as well as many other smaller ones such as Naeva (Cantillana) and Celti (Peñaflor) (Sillières, 1990).

The River Baetis was the single most important factor in understanding the transport geography of Baetica, and, as Ponsich (1998:173) described it, *"it was the one outstanding geographic feature in Baetica's dynamic economic history"*. Roman Hispalis needs to be perceived and understood in terms of its strategic position as a transit point between the Lacus Ligustinus and the Baetis River, which made it one of the most important ports in Baetica.

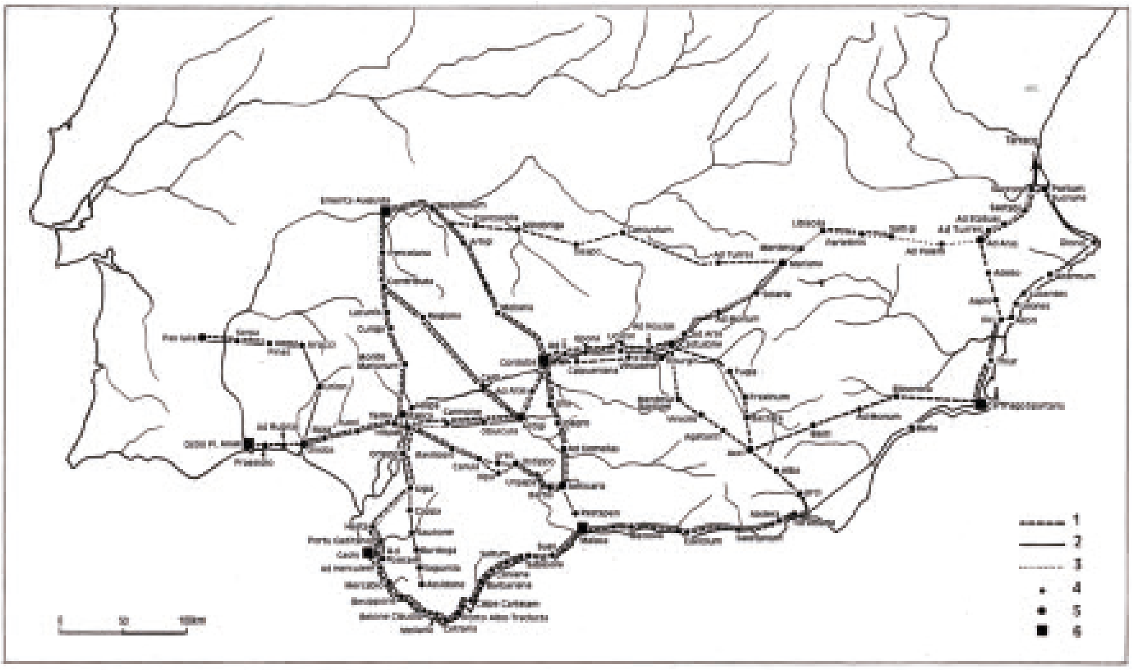

Figure 22: Itineraries and communication routes of Roman Baetica (after Sillières 1990: fig. 2).

From the point of view of communication by road, Hispalis was also located at a key crossing of the Baetis River. After becoming a Roman colony in the mid 1st century BC, the Via Augusta was routed through Hispalis on its way from Corduba (Córdoba) down to the Portus Gaditanus (Puerto de Santa María) (Figure 22). This helped transform the colony into a major regional communications hub for south-western Baetica (Keay, 2016: 308).

The strategic position of Hispalis connecting two different but complementary networks (i.e. the maritime-riverine network of the Lacus Ligustinus and the Baetis River, and the terrestrial road network of Baetica) played an important role in the Roman Era. This was demonstrated by an AHRC-funded project of the University of Southampton entitled "Urban Connectivity in Iron Age and Roman Southern Spain". The project *“focused on the various social, economic, and geographical relationships apparent between towns and nucleated settlements (...), between c. 500 BC and AD 500”* (Earl and Keay, 2007: 89). The project analysed different networks and looked, among other parameters, at the closeness and betweeness of urban centres across of the region. The results of the study suggest that if the riverine network or the road network are analysed independently, Hispalis does not particularly predominate compared with other urban centres in the region. However, if the two networks (i.e. riverine and roads) are combined and integrated, both Hispalis and Astigi stand out as points of key junctions in the combined riverine and road communication networks of Baetica (Keay and Earl, 2007: 324).

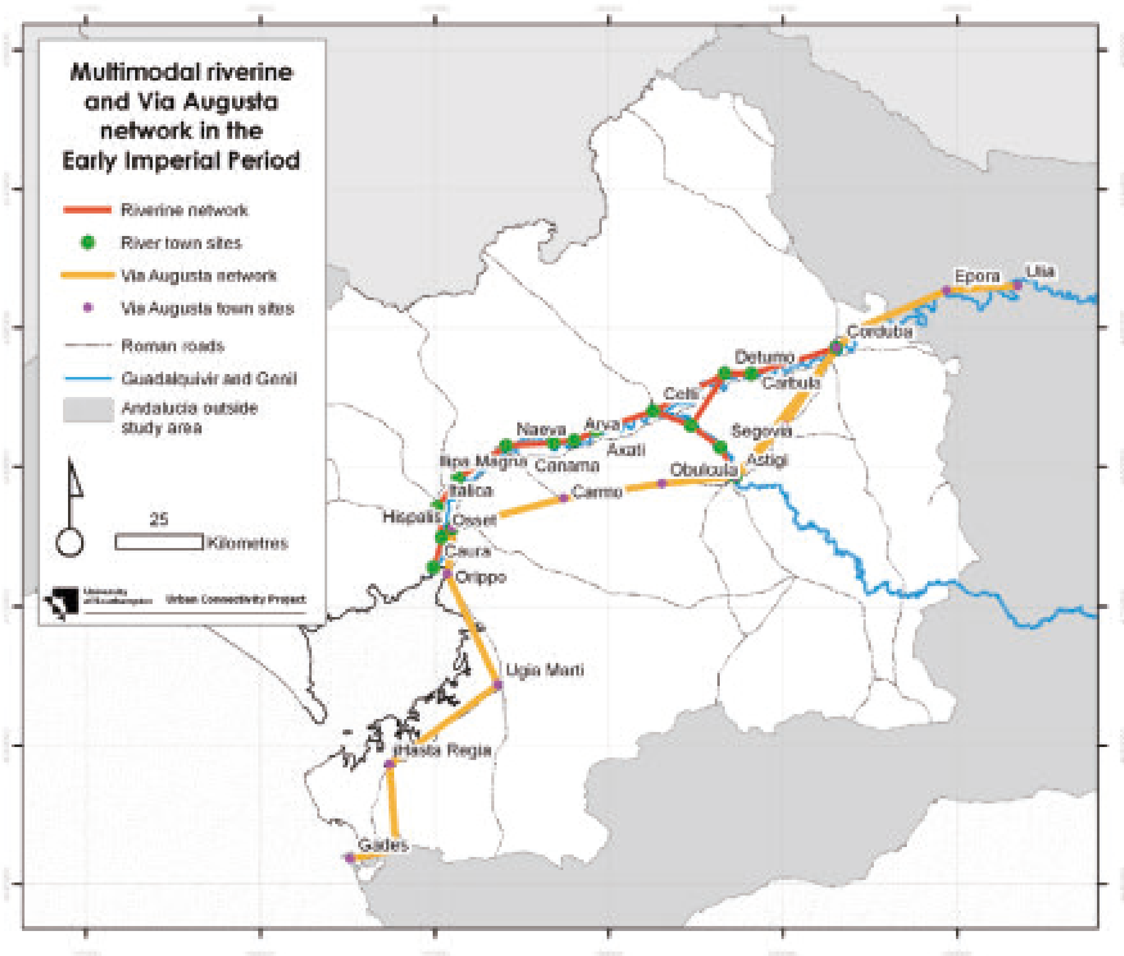

Figure 23: Multimodal networks derived from ancient itineraries, demonstrating hypothesised riverine and Via Augusta connectivity (after Earl and Keay, 2007: fig. 3).

The geographical position of Hispalis worked in tandem with the riverine network and road network of the rest of the *conventus*, the province, and ultimately Roman Hispania. The Via Augusta (i.e. road network) sustained communication with the rural settlements, whereas the Baetis River and the Lacus Ligustinus (i.e. fluvio-maritime network) connected Hispalis to other regions abroad. The natural entry and exit point was therefore the Lacus Ligustinus, which functioned to connect Hispalis to the Atlantic Ocean first, the Mediterranean later, and, ultimately, to the rest of the Roman Empire.

3.3.1 Geomorphology of the city of Seville in ancient times

In antiquity, the area where the city of Seville lay was different from today's geographical morphology. Scholars place the origin of Spal on the tip of a peninsula surrounded by and connected to the salt-water lagoons and the Baetis (Ordóñez Agulla, 2003: 59). This location, close to the sea and also close to an indigenous settlement, matches the model that the Phoenicians used for establishing their colonies around the Mediterranean (Aubet, 1993: 33, 140).

In antiquity, the area where Spal was found was significantly different from the topography of the present day. The peninsula where the ancient settlement was located is a fluvial terrace of the Guadalquivir River with an average height of more than 10 metres above sea level, and as such was protected from daily tides and river floods. The peninsula is flanked towards the west by the large alluvial plain of the Guadalquivir River. The ancient channel flowed through a riverbed (which no longer exists) located in a different area from the current channel; towards the east by the Tagarete stream, and its area of influence flanked the other side of the peninsula (Figure 24).

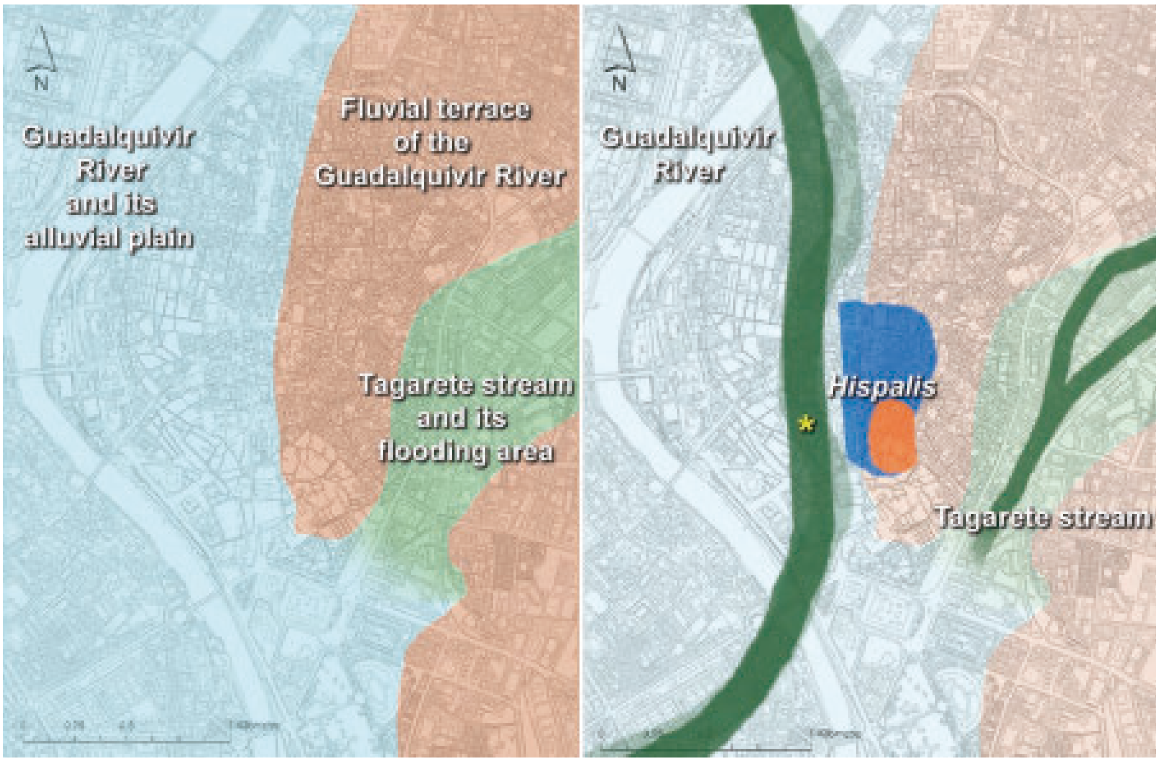

Figure 24: Geomorphology of Seville, alluvial plain (pale blue) and fluvial terrace of the Guadalquivir River (pale brown) Tagarete stream and its flooding area (pale green) (left) (after Borja Barrera, 2014: fig. 1). The above colour scheme will be used in all subsequent maps of ancient Seville through the Thesis; geomorphology and the position of the ancient riverbed *circa* 1st c. AD (right); Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27); the asterisk marks the location of the Plaza Nueva (scale bar 1 km, Author).

The number of channels that the Baetis River had during the Roman era is uncertain, and is still debated by geologists who have thoroughly studied the formation process of the city of Seville (Ordóñez Agulla, 2003: 60-62; Ménanteau, 2007: 173-178).

However, scholars agree that at least one channel existed and that the position of the Guadalquivir River has changed through time. The current position of the channel has been fairly stable from the 12th century onwards, but in the Roman-era it was different. The Roman palaeo-channel of the Guadalquivir River flowed north to south passing through an area that today is occupied by central downtown Seville. The ancient port Hispalis was located on the east bank of the river. The Roman palaeo-channel passed through an area where several centuries later the Plaza Nueva was built; the place on which the archaeological remains described in this Thesis were found.

3.4 Palaeo-hydromorphology of the Guadalquivir in the area of Seville

In order to properly establish the exact location and approximate extent of the ancient port of Seville, it is essential to determine the palaeo geomorphology of the Baetis River in antiquity in the Seville area. In this sense, one of the key issues is to determine how many ancient channels (one or two) existed in the area of Seville in antiquity. Once the number of channels is determined, it is then necessary to understand their evolution through time.

With the aforementioned objectives, for the last two decades geologists have studied the geomorphological changes that the Guadalquivir River underwent during the Late Holocene, particularly during the Sub Atlantic climatic phase (i.e. 2500 year BP). Although precise details remain unclear, the general evolution and displacement processes of the Guadalquivir ancient riverbed are now understood.

One of the studies that compiled and now provides large amounts of geological information for understanding the palaeo-geomorphology of Seville is a doctoral Thesis later published as a book (Barral Muñoz, 2009). This work focused on the palaeo-geomorphological reconstruction of the Guadalquivir's alluvial plain and the river in the area next to the city of Seville. The study encompassed the evolution of Seville and the Guadalquivir River during the Sub-Atlantic climatic phase of the Late Holocene period, (i.e. 500 BC to present). Dr Francisco Borja Barrera directed Barral Muñoz's doctoral Thesis as part of his larger study.

In order to achieve the palaeo-geomorphological reconstruction of the Guadalquivir's alluvial plain in the area next to the city of Seville during the last 2500 years, it is necessary to understand the displacement or change processes of the river by comparing two opposed phenomena that have been defined as: *development phases* and *stable phases* (Barral Muñoz, 2009: 533, Borja Barrera, 2014: 282).

In the *development phases*, which can also be referred to as *alluvial phases*, precipitation rates (i.e. rainfall) are higher than average and the amount of sediment carried by the river is large. These phases usually lead to aggradation processes that shape the alluvial plain of rivers. Aggradation is a term used in geology to refer to the increase in land elevation due to the deposition of sediment by a river, stream, or current. Aggradation occurs in areas in which the supply of sediment is greater than the amount of material that the system is able to transport. These *development phases*, or *alluvial phases*, also lead to the lateral displacement of the river channels creating meanders.

In the *stable phases*, the position of the river channels remains unchanged since, among other factors, the system is able to transport downstream all the sediment without generating aggradation processes. The *stable phases* of the Guadalquivir River in the alluvial plain next to the city of Seville allowed the urban expansion and development of the city during the different historical periods in which they occurred (Barral Muñoz, 2009: 534).

The geo-archaeological studies on the Guadalquivir's alluvial plain in the area next to the city of Seville have been conducted by analysing three different, but complementary, sets of data: geomorphological (provided by bore core samples), archaeological, and historical information. These studies of the palaeo-hydromorphology of the Guadalquivir's alluvial plain in the area of the city of Seville have established different phases in the period from 1500 BC to AD 1500 (Borja Barrera 2014, 284). These different phases aim to explain the different transformations that the ancient channel of the Guadalquivir underwent through time.

Chapters 3, 4 and 5 of this Thesis include different maps that graphically represent the position of the Guadalquivir River during several historical periods. They are firmly based on the existing scientific evidence rather than being artistic representations. I have prepared them taking into consideration different but complementary sources: first, the palaeo-geomorphology data of the Guadalquivir River from Barral Muñoz (2009) and Borja Barrera (2014); second, geoarchaeological information obtained in the last decades from the analysis of the numerous archaeological excavations nearby to the river bank contained in different reports, many of them compiled in González Acuña (2011); and finally, the dynamic evolution of the meander of Seville was reconstructed taking into consideration the geography of Seville (located on top of the fluvial terrace of the Guadalquivir River) as well as meander dynamics (Figure 25) which were studied in detail by Weerts (1996) who analysed 180,000 boreholes in the Rhine-Meuse delta. Nevertheless, the precise limits of the Guadalquivir River during different historical periods are approximate, since the information that we have at present does not allow us to achieve absolute precision. The maps should then mainly be understood as a tool to follow the evolution of the meander of the Guadalquivir River at Seville across time, as well as being the best possible representation to date (i.e. scientifically based approximation) of the position and limits of the river.

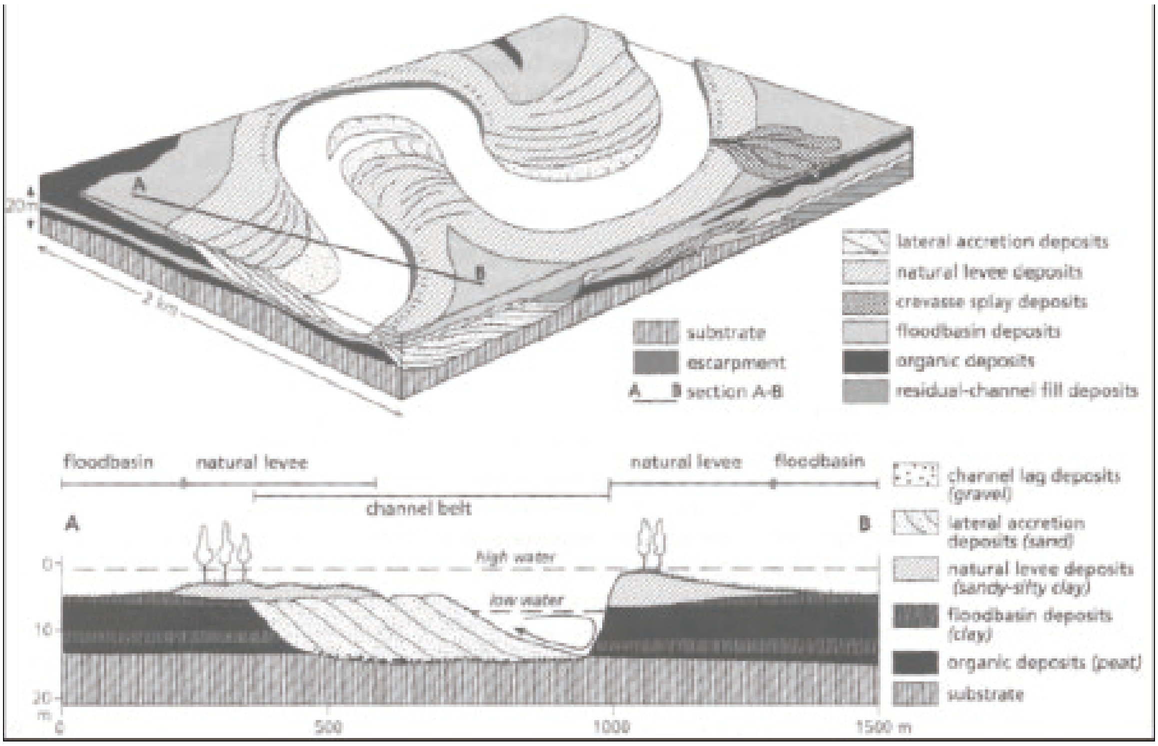

Figure 25: Explanatory illustration of fluvial meanders, their different constituents, and their dynamic process of formation (after Weerts, 1996).

3.4.1 Iron Age to Roman Republican transitional phase

In the first millennium BC, there were two *development phases* in the alluvial plain of the Guadalquivir River: the first occurred from the Chalcolithic period to the Bronze Age. This was followed by a *stable phase* with few changes in the hydro-geomorphology of the alluvial plain during the Late Bronze Age. The second of the *development phases* occurred from the Iron Age to the Roman Republican period (Borja Barrera 2014, 283).

During the Iron Age, a large alluvial plain composed the palaeo-environment of the Phoenician Spal where multiple interlaced riverbeds flowed on the west side of the settlement; this system of multiple riverbeds is known in geology as a braided system. This environment was highly influenced by both alluvial seasonal episodes and the daily Atlantic tides, creating many marshy areas affected by floods.

From the foundation of Spal as a Phoenician colony until the Roman republican Hispalis, the alluvial plain of the Guadalquivir river, in the area next to the city of Seville, was composed of a meandering channel, or channels, which changed their position over time (Borja Barrera, 2014: 284). The number of palaeo-channels and their exact position remains unclear and has been a point of debate for scholars who have thoroughly studied the formation process of the city of Seville (Ménanteau, 2007: 173-178; Barral Muñoz, 2009: *passim*; Borja Barrera 2014, 284).

During the *development phase* of the second half of the first millennium BC (ca. 500 BC to ca. 50 BC), a process of change in the fluvial river dynamics occurred. The Guadalquivir River abandoned the braided system of multiple interlaced riverbeds, or river channels, evolving instead into a meandering system in which one single or main riverbed existed (Barral Muñoz, 2009: 537-540) (Figure 26).

Figure 26: Approximate reconstruction of the hydromorphology of the Baetis River *circa* 3rd - 2nd centuries BC; Intramural area of Republican Hispalis (orange)(after González Acuña, 2011: fig. 25). The asterisk marks the location of the Plaza Nueva (scale bar 1 km, Author).

Once the main channel of the Guadalquivir River was established, it first moved eastwards becoming closer to the city settlement. At some point during the Roman Republican period, the direction of the displacement was inverted, and the river channel then moved westwards further away from the city settlement (Figure 27).

Figure 27: Reconstructed movements of ancient channel of the Guadalquivir River during the 1st millennium BC (after Borja Barrera, 2014: 285, fig. 6).

This general displacement of the channel was more acute in the central part of the settlement. The meander there bent westward leaving Hispalis on the concave side of the curve (Figure 28). The displacement was complete by the second half of the first century BC. Although this was the main channel of the river, it is unclear if there were also other channels in the alluvial plain (Borja Barrera 2014, 290).

Figure 28: Approximate reconstruction of the hydromorphology of the Baetis River *circa* 1st century BC; Intramural area of Republican Hispalis (orange)(after González Acuña, 2011: fig. 25). The asterisk marks the location of the Plaza Nueva. The faded areas along the river correspond to the position of the meanders during the previous phase *circa* 3rd - 2nd centuries BC. Note the curvaceous nature of the meanders (scale bar 1 km, Author).

3.4.2 Roman Imperial stable phase

At the end of the first millennium BC at the beginning of the Roman Imperial period, a stable phase began, characterised by fluvial and riverbed stability in which the hydro and geomorphology of the river changed little. The position of the ancient channel remained stable, so the vast space between Hispalis and the Baetis River, where there were meadows that were previously affected by river floods, was occupied by the new growing colony (Barral Muñoz, 2009: 540-542). Those areas where the river used to flow in the Republican period were now assimilated by an important urban development, which occurred in Hispalis under the rule of the first imperial dynasties. The areas adjacent to the now stable river channel were occupied with port facilities, necropolis, industrial production centres, roads, and some residential areas (Borja Barrera 2014: 290).

This stable phase was instigated by several different factors such as an important fall in the relative sea level in the Mediterranean, temperatures above normal and low precipitations which created an arid environment: this phase is known as the Roman Warm period (Bianchi and McCave, 1999: 516; Greene, 1986: 83).

The relative sea level is the sea level compared to the level of the continental crust. Relative sea level changes can be caused by absolute changes of the sea level and/or by tectonic and isostatic movements of the continental crust; also, climatic and morphological influences on coastlines can cause localised regional sea level changes. Therefore, sea level changes are relative movements that vary from place to place (D'Angremond and der Velden, 2001: 18-19). The effects of eustatic and relative sea-level change have been identified in harbours and in major ports on the Mediterranean (Blackman, 1973).

Studies along different locations on the western Mediterranean coast are improving our understanding of historical sea level change. Some of these have used a multidisciplinary approach, including biomarkers found in Roman fish tanks, with the aim of documenting the relative sea level changes in the Mediterranean since Roman times to the present (Evelpidou *et al.*, 2012). The studies have concluded that the sea level in the Mediterranean during the 1st century AD was slightly lower than at present (Evelpidou *et al.*, 2012: 275). It seems that relative sea level changes since Roman times have been very minor, of the order of a few decimetres. It has also been suggested that the role of the sea level in shaping coastal changes is relatively minor in comparison with other geological phenomena, such as sediment inputs (Morhange *et al.*, 2013b: 371).

The lower sea level, which occurred during the 1st century AD, seems to have produced a change in the gradation and velocity of the Guadalquivir River. Fluctuations in sea level have a long-term impact on the riverine environment of rivers that flow into the sea. If the sea level rises, the gradient of the river in its lower course is reduced. Consequently, the velocity of the water carried by the river declines, and hence so does its ability to carry sediment. As a result, riverbeds increase by horizontally expanding and occupying nearby areas that become converted into flooding areas. This results in the sediment being mainly deposited near the river mouth (Campbell, 2012: 11).

On the other hand, if the sea level falls, the velocity of the water carried by the river increases, so its ability to carry sediment (i.e. downcutting) will increase accordingly. This results in rivers with fewer meanders (i.e. the river straightens) and riverbeds develop deeper and very stable channels that have narrower breadth (Figure 29). The latter scenario is what happened to the Guadalquivir River during the Roman Imperial stable phase from the 1st to the 3rd centuries AD (Borja Barrera 2014, 291).

The stable position of the river allowed the urban expansion of the city and the new morphology of the alluvial plain of the Guadalquivir River. Pollen analysis carried out in the southern part of the city shows that during this Roman Imperial stable phase, dry meadows predominated with 80% of the vegetation composed of grass and some crops of olive, hazelnut and chestnut (Borja Barrera 2014, 291).

This stability of the riverbed is not incompatible with the other aforementioned processes of the migration of channels, seasonal fluvial floods, or with daily tides, as indeed happened in Hispalis. This is demonstrated by some of the bore cores obtained by Barral Muñoz in her study of the palaeo-geomorphology of the Guadalquivir River in the area of Seville (2009: 541).

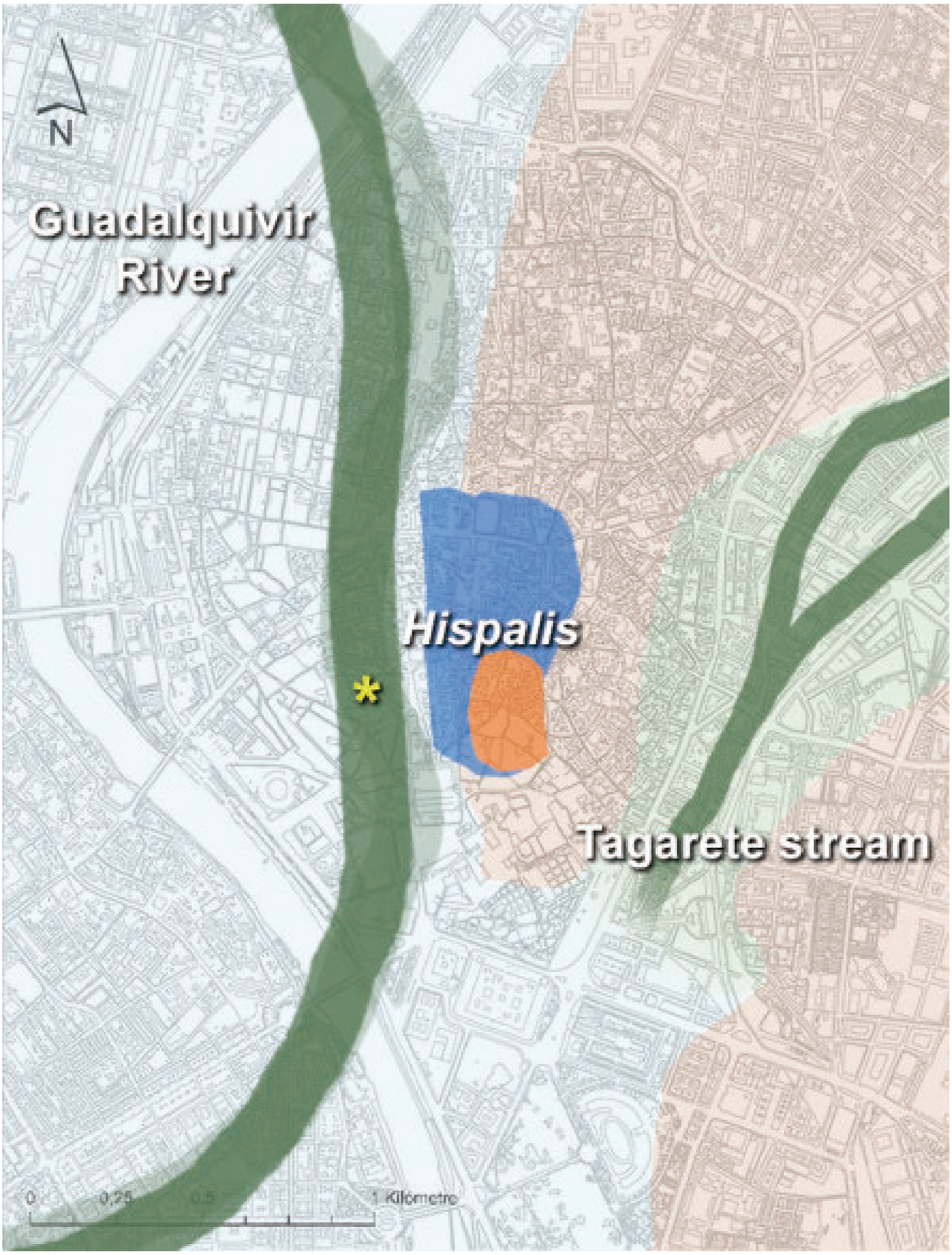

Figure 29: Approximate reconstruction of the hydromorphology of the Baetis River from the 1st to the end of the 2nd century AD; Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27). The asterisk marks the location of the Plaza Nueva. The faded areas along the river correspond to the positions of the meanders during the previous phase *circa* 1st century BC. Note that the meander adjacent to the city has straightened (scale bar 1 km, Author).

Aditionally, it has been suggested that at the end of the stable period, between the end of the 2nd and the beginning of the 3rd century AD, an extraordinary event took place. Evidence unearthed at the Patio de Banderas excavation suggests the occurrence of a high energy event. There is a stratum in which building structures have been crushed violently (Figure 30).

Figure 30: Roman structures violently collapsed at the south area of the Patio de Banderas excavation (after Tabales Rodríguez, 2015: 167).

The violent destruction documented, along with sand deposits at this stratum with an abnormal abundance of marine seashells that act as bioindicators, has been interpreted as evidence of a tsunami resulting from an extreme wave event (EWE). It has been suggested that this high energy event was so violent that it reached 7 m above mean sea level (i.e. a wave exceeding the surface level of the river by 5 m) and destroyed the southern area of an *horrea* complex (Figure 31) that stood on the location of the Patio de Banderas (*vide infra*) (Tabales Rodríguez, 2015: 165-186).

Figure 31: Reconstruction of the large *horreum* found at the Patio de Banderas excavation around AD 200, after the destruction caused by a tsunami (after Tabales Rodríguez, 2015: 186).

3.5 Textual evidence for the port of Hispalis

In the first century BC, the ancient settlement of Spal was already an indigenous walled settlement known as Hispalis. Probably in the year 45 BC, Julius Caesar bestowed the title of a Roman colony on the existing town (Ordóñez Agulla, 1998: 52, 54-55). According to Saint Isidore of Seville (*Etym.* 15, 1, 71), the colony was named *Colonia Julia Romula* Hispalis in honour of Julius Caesar's own and Rome's name. Information about the historical and juridical status of Hispalis can be found in Ortiz de Urbina and Santos Yanguas (1996), as well as in González Román and Padilla Arroba (2002).

This Roman colony was the main port for the Baetica region and one of the most important of Hispania. It played an important role in the civil wars between Julius Caesar and Pompey and, as such, there are textual references in the accounts of the conflict (*Caesar, Bell. Hisp.*: 27). Some of these are in relation to the port of Hispalis, which are of great interest for the present Thesis. What follows is a summary of them.

According to an account by Caesar, in 49 BC Hispalis had the capacity to build long ships, which taking into consideration the purpose for which they were built could be considered as seagoing war galleys (*Caesar, Bell. Civ.*: 2.18).

> *(...) Naves longas x Gaditanis ut facerent imperavit, complures praeterea Hispali faciendas curavit. (…)*[18]

A year later, in 48 BC, another account by Caesar describes how a fleet (i.e. *classem*) of 100 ships was built, prepared and supplied at Hispalis (*Caesar, Bell. Alex.*: 51, 56):

> *(…) Interim litteras accepit a Caesare, ut in Africam exercitum traiceret perque Mauretaniam ad finis Numidiae perveniret, quod magna Cn. Pompeio Iuba miserat auxilia maioraque missurus existimabatur. Quibus litteris acceptis insolenti voluptate efferebatur, quod sibi novarum provinciarum et fertilissimi regni tanta oblata esset facultas. Itaque ipse in Lusitaniam proficiscitur ad legiones arcessendas auxiliaque adducenda; certis hominibus dat negotium ut frumentum navesque C praepararentur pecuniaeque describerentur atque imperarentur, ne qua res cum redisset moraretur. (…)* (*Bell. Alex 51*)[19]

[18] (…)He ordered Cadiz to make ten warships and arranged for the construction of several more in Hispalis. (…) (Caesar transl. by Damon, 2016: 149).
[19] (…) Meanwhile he received despatches from Caesar bidding him bring an army across to Africa and, passing through Mauretania, come to the territory of Numidia; for Juba had sent large

(…) His rebus confectis totum exercitum lustrat; legiones quas in Africam ducturus erat et auxilia mittit ad traiectum. Ipse classem quam parabat ut inspiceret, Hispalim accedit ibique moratur, propterea quod edictum tota provincia proposuerat, quibus pecunias imperasset neque contulissent, se adirent. (…) (*Bell. Alex 56*)[20]

Strabo confirms that the ships built in the region were constructed with local timber and that the size and number of merchant vessels were notorious, especially for those sailing towards Puteoli and Ostia (*Strabo, 3.2.6*).

(…) τά τε ναυπήγια συνιστᾶσιν αὐτόθι ἐξ ἐπιχωρίας ὕλης (…) τὴν δὲ ἀφθονίαν τῶν ἐκκομιζομένων ἐκ τῆς Τουρδητανίας ἐμφανίζει τὸ μέγεθος καὶ τὸ πλῆθος τῶν ναυκληρίων· ὁλκάδες γὰρ μέγισται παρὰ τούτων πλέουσιν εἰς Δικαιαρχείαν καὶ τὰ Ὤστια, τῆς Ῥώμης ἐπίνειον· τὸ δὲ πλῆθος μικροῦ δεῖν ἐνάμιλλον τοῖς Λιβυκοῖς.[21]

Strabo described that riverboats were also built to navigate up the Baetis as far as Corduba, yet that those riverboats were no longer merely dugout canoes, as they used to be constructed in antiquity (*Strabo, 3.2.3*).

(…) μέχρι δὲ Κορδύβης τοῖς ποταμίοις σκάφεσι, πηκτοῖς μὲν τὰ νῦν, τὸ παλαιὸν δὲ καὶ μονοξύλοις· (…)[22]

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reinforcements for Cn. Pompeius and would, it was thought, send larger ones. When Cassius received these despatches he was in transports of immoderate delight at the thought of his being offered so magnificent a chance of new provinces and a highly fertile kingdom. And so he set out in person for Lusitania to summon the legions and fetch auxiliaries, allotting certain men the task of organising in advance supplies of corn and 100 ships, as well as assessing and levying contributions of money, so as to avoid any delay on his return. (…) (Caesar transl. by Way, 1955: 93).

[20] (…) This done, he reviewed his entire army and then despatched to the point of embarkation the legions he intended to take into Africa, with their auxiliary troops. He himself proceeded to Hispalis to inspect the fleet he was building up; (…) (Caesar transl. by Way, 1955: 101).

[21] (…) And they build their ships there out of native timber; (…) The abundance of the exports of Turdetania is indicated by the size and the number of the ships; for merchantmen of the greatest size sail from this country to Dicaearchia, and to Ostia, the seaport of Rome; and their number very nearly rivals that of the Libyan ships. (…) (Strabo transl. by Jones, 1923: 33, 35).

[22] (…) and, as far as Corduba, for the river-boats (at the present time these are builded boats, whereas in antiquity they were merely dugout canoes); (…) (Strabo transl. by Jones, 1923: 25).

3.6 Epigraphic evidence for the port of Hispalis

In Seville, Roman inscriptions have been known from antiquity or unearthed in different excavations. They provide us with valuable information for better understanding of the people who worked in the ancient port of Hispalis, as well as other trade operations in relation thereof.

In Seville four inscriptions from the 2nd century AD have been found regarding associations of fluvial boat operators, as follows (Figure 32 and Figure 33): first, the *lyntrarii* (*CILA* 2/1, 32)[23]; second, the *scapharii hispalenses* honouring the *procurator ad ripam baetis, Sextus Iulius Possessor* (*CILA* 2/1, 23)[24]; third, the *scapharii qui Romulae negotiantur* honouring the emperors Antoninus Pius (AD 138-161) and Marcus Aurelius (AD 161-180) (*CILA* 2/1, 8[25] and *CILA* 2/1, 9)[26]; and finally, the *scapharii Romulae consistentes* honouring *L. Castricius Honoratus* (*CILA* 2/1, 26)[27] *primuspilus* and the technical collaborator of the *procurator* in the duties of maintaining the river, allowing the associations of boatmen to carry out their obligations.

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[23] *CIL* II 1175 = *CILA* 211, 32: *C(aio} Aelio C(ai) f(ilio) C(ai) n(epoti) / Quir(ina) Avito / lyntrariorum / omnium patro/no lyntrari(i} Ca/nanienses Oduci/enses Naevenses*.

[24] *CIL* II 1180 = ILS I403 = *CILA* 2/1, 23 = *AE* 1965, 0237 = *AE* 1971, 171 = *AE* 1991, 993: *Sex(to) Julio Sex(ti) f(ilio) Quir(ina) Possessori / praef(ecto) coh(ortis) III Gallor(um) praeposito nume/ri Syror(um) sagittarior(um) item alae primae Hispa/norum curatori civitatis Romulensium Mal/vensium tribuno mi[l(itum) leg(ionis)] XII Fulminat[ae] / curatori coloniae Arcensium adlecto / in decurias ab Optimis Maximisque / Imp(eratoribus) Antonino et Vero Augg(ustis) adiu/tori Ulpii Saturnini praef(ecti) annon(ae) / ad oleum Afrum et Hispanum recen/sendum item solamina transfe/ renda item vecturas navicula/riis exsolvendas proc(uratori) Augg(ustorum) ad / ripam Baetis scapharii Hispalen/ses ob innocentiam iustitiam/que eius singularem.*

[25] *CIL* II 1168 = *CILA* 2/1, 8 = *ILS* 7270: *Imp(eratori) Caes(ari) divi Hadrianif(ilio) / divi Traiani Parthici nepoti / divi Nervae pronepoti / T(ito) Aelio Hadriano Antonino / Aug(usto) pont(ifici) max(imo) trib(unicia) pot(estate) VIIII / imp(eratori) II co(n)s(uli) IIII p(atri) p(atriae) / scaphari qui Romulae / negotiantur / d(e) s(ua) p(ecunia) d(onum) d(ederunt)* (AD 146).

[26] *CIL* II 1169 = *CILA* 211, 9 = ILS 355: *M(arco) Aurelio Vero / Caesari Imp(eratoris) Cae/saris Titi Aelii Ha/driani Antoni/ni Aug(usti) Pii patris patriae filio / co(n)s(uli) II / scaphari qui Romulae / negotiantur / d(e) s(ua) p(ecunia) d(onum) d(ederunt)* (AD 146).

[27] *CIL* II 1183 = *CILA* 2/1, 26: *L(ucio) Castricio Q(uinti) f(ilio) / Honorato p(rimo) p(ilo) / homini bono / scaphari(i) / Romul(ae) consist(entes) / ob innocentiam / et singularem / iustitiam eiius / d(e) s(ua) p(ecunia) p(osuerunt).*

Figure 32: Photographs of two inscriptions dedicated by *scapharii* from Hispalis *CILA* 2/1, 8 (left) and *CILA* 2/1, 26 (right) (Salvador Ordóñez Agulla).

Sextus Iulius Possessor was the Imperial official that supervised and preserved the Baetis River, including the intensive activity of the port of Hispalis. The boatmen of Hispalis were under his jurisdiction, and honoured him after he had served as procurator of the Baetis River and supervisor of the oil supply from Hispania and *Mauretania* (*CILA* 2/1, 23). The *corpus oleariorum*, acting in the vicinity of Hispalis, honoured their *curator* with a statue (from which only the pedestal with the inscription has survived); he had the title of *diffusor olei ad annonam urbis* (*AE* 2001, 1186)[28].

[28] *HEp* 10, 2000, 576 = *AE* 2001, 1186 = *HEp* 17, 2008, 122: *M(arco) Iul(io) H[e]rmesian[o] / diffusori olei ad annon[am] / urbis c[urator]i corpo[ris] / olea[riorum st]ationi[s?] / Romul[ae ---]i[---]te[---] / huic corpus [ole]ari[orum] / splend[idissi]mum / mer[entissimo s]tatu[am] / pon[enda]m iussit / M(arcus) Iulius Hermes Fro[nti]nianus / filius honore accepto / impensam remisit*. *cf.* interpretation of the inscription by Remesal Rodríguez, 2008: *M. Iul(io) H[e]rme[s]ian[o] / diffusori olei ad annon[am] / urbis [curator]i corpo[ris] / olea[riorum st]ation[um?] / Rom[ae et] P[u]te[olis?]*

Figure 33: Photograph of *CILA* 2/1, 23 *in situ* at the base of the Giralda (Salvador Ordóñez Agulla).

This inscription provides definitive confirmation of the relationship between the imperial *annona* and the *diffusores olei* who worked in the province coordinating and tracking the movement of olive oil from the production centres to Hispalis, as

/huic cor[p]us [ole]ari[orum] / splend[idissi}mum ob / mer[ita eius s]tatu[am] / pon[enda]m [decr]e[v]it / M Iul(ius) Hermes Fro[nti]nianus / filius honore accepto / impensam remisit.

well as arranging shipping contracts with the *navicularii* (Ordóñez Agulla, 2003: 72). The text also refers to a *corpus oleariorum* possibly located at a *statio* Romulensis, confirming the idea that these inscriptions came from what once was the commercial quarter of the port of Hispalis (Chic *et al.*, 2001: 361).

Other inscriptions from Roman Hispalis pertain to oil traders (*AE* 2001, 1187)[29], wine dealers (*CILA* II, 2)[30] and iron traders *negotians ferrarius* (*CILA* II, 69)[31] which could be related to the construction of ships that, besides large amounts of timber, needed substantial quantities of iron for nautical manufacture such as fittings and anchors (Ordóñez Agulla, 2003: 66 note 38).

3.7 Exports from Hispalis and the ships that carried them

The intention of this section is to briefly discuss the different raw materials and foodstuffs that were exported from Hispalis, from the end of the Roman Republic into the Late Antique period, with the main objective of trying to estimate the number of riverine boats as well as seagoing ships necessary to transport them. This section, therefore, focuses in the calculation of the number of boats and ships that were used at Hispalis. Other complex issues pertaining to Roman economy, maritime commerce, and Mediterranean trade networks, among others, are briefly

[29] *HEp* 10, 2000, 577 = *AE* 2001, 1187: *Miner[vae] / Valeria Qu[inta(?)] / Valeri Valentis [f(ilia)] / ad cultum operi[s] / a patre optumo(!) exorna[ti(?)] / in honorem corporis / oleariorum d(onum) d(edit).*
[30] *CILA* II, 2; *HEp* 3, 1993, 353; *AE* 1987, 495: *Libero Pat[ri / vina]ri(i) Romulae con[sist(entes) / ex d(ecreto) d(ecurionum)] Rom(ulensium) accepto so[lo d(onum) d(ederunt)].*
[31] *CIL* II 1199 = *CILA* II, 69 = *HEp* 9, 1999, 521 = *AE* 1999, 822 = *AE* 1999, 889: *T(itus) Rufonius Quintia[nus] T(iti) Ru/foni Brocch[in]i f(ilius) negotiantis ferrari incol(ae) / Rom(ulensis) ann(orum) X m(ensium) IX d(ierum) XI / p[ius] in suis s(it) t(ibi) t(erra) l(evis) animula / innocens.*

mentioned but will not be discussed in detail since they fall out of the scope of the Thesis.

Lionel Casson (1951: 136) was one of the first classical scholars to argue the importance of maritime transport in the ancient Mediterranean, noting that *"Sailing ships were the backbone of ancient commerce and travel"*. Jean Rougé (1966) shed light in the mater by studying the organization and institutional framework of Roman maritime commerce. Later on, Duncan-Jones (1974: 368) supported Casson's Thesis with economical calculations of the cost of transport in Roman times. Taking into consideration the commercial haulage rates from the Diocletian's Edict on Maximum Prices, as well as information contained in papyri from Egypt about costs for river transport, he calculated that, during the late Roman Empire, it was almost five times more cost efficient to transport goods by sea rather than by river, while it was at least thirty-four times more economical to move commodities by ship rather than by land (Duncan-Jones, 1974: 368). More recently, other calculations have been made for the cost of transport in Roman times (Russell, 2013: 95-96, table 4.1) and the obtained ratios are similar or even greater than those made by Duncan-Jones (1974: 368).

However, other scholars disagreed and tended to down play the role of maritime transport across the ancient Mediterranean (Jones 1964: 843; 1974: 248; Finley 1985: 199, published first in 1973; Hopkins 1983: 105). The truth is that, even today, seaborne transport provides the most cost-effective method of moving large volumes of goods over long distances. Accordingly, more recent studies have emphasised the importance of seaborne commerce to the wider economy from the classical period up to the Middle Ages (e.g. Horden and Purcell, 2000; McCormick, 2001; Adams, 2012).

Roman commerce relied heavily on seaborne transportation (D'Arms and Kopff, 1980) as one of their major mains of distribution (Morley, 2007). Despite the fact that quantifying the Roman economy is not an easy undertaking without problems (Bowman and Wilson, 2009), the study of shipwrecks in the Roman Mediterranean (Parker, 1992) has been used to try to calculate the volume of commercial traffic across the Mediterranean during the Roman Period (Wilson, 2009; 2011b).

3.7.1 Exports from Roman Baetica

According to Michel Ponsich (1998: 179) the major assets of Baetica were its mines, agriculture, animal husbandry, and fishing. From the end of the Roman Republic onwards, Hispalis became very important as the trade-centre for the exportation of different raw materials and foodstuffs produced in the Guadalquivir valley towards Rome and different parts of the Mediterranean. In fact, Strabo wrote about this, describing Hispalis as the most famous emporium of Baetica:

> *(...) μετὰ δὲ ταύτην καὶ τὴν τῶν Γαδιτανῶν ἡ μὲν Ἴσπαλις ἐπιφανής, καὶ αὐτὴ ἄποικος Ῥωμαίων: νυνὶ δὲ τὸ μὲν ἐμπόριον συμμένει (...)*[32]

[32] (...) After Corduba and the city of the Gaditanians, Hispalis, itself also a colony of the Romans, is most famous, and still remains the trade-centre of the district (...) (Strabo transl. by Jones, 1923: 21).

In the words of Simon Keay (2016: 310) *"The commercial success of Hispalis was inextricably tied to the demands of Rome - initially for precious metals, and subsequently olive oil, the success of mine contractors and landowners in meeting them, and the activities of merchants and shippers who ensured that commodities were transported downriver to Hispalis and onwards to Rome and beyond"*.

In the 1st century AD, silver, lead, and copper was extracted from a number of mining areas located along the Sierra Morena mountain range (Figure 34), north of the Baetis, between Aznalcollar in the west and Corduba in the east (Domergue 1990). By analysing the stamps and markings on lead ingots found at different shipwrecks in the Mediterranean, Domergue (1998) proposed a model for the process by which the metal was transported downriver to Hispalis to be transhipped and exported. Although the evidence upon which the hypothesis is based is not discussed, Keay (2012: 9; 2016: 309) indicates that *"Hispalis also acted as a centre for the transhipment of gold bound for Rome from the mines of northern Tarraconensis, which arrived at the port by virtue of the Via de la Plata from the region of Asturica Augusta (Astorga)"*; the precious metal was shipped across the Lacus Ligustinus, out to the Atlantic Ocean, and through the Western Mediterranean towards Rome.

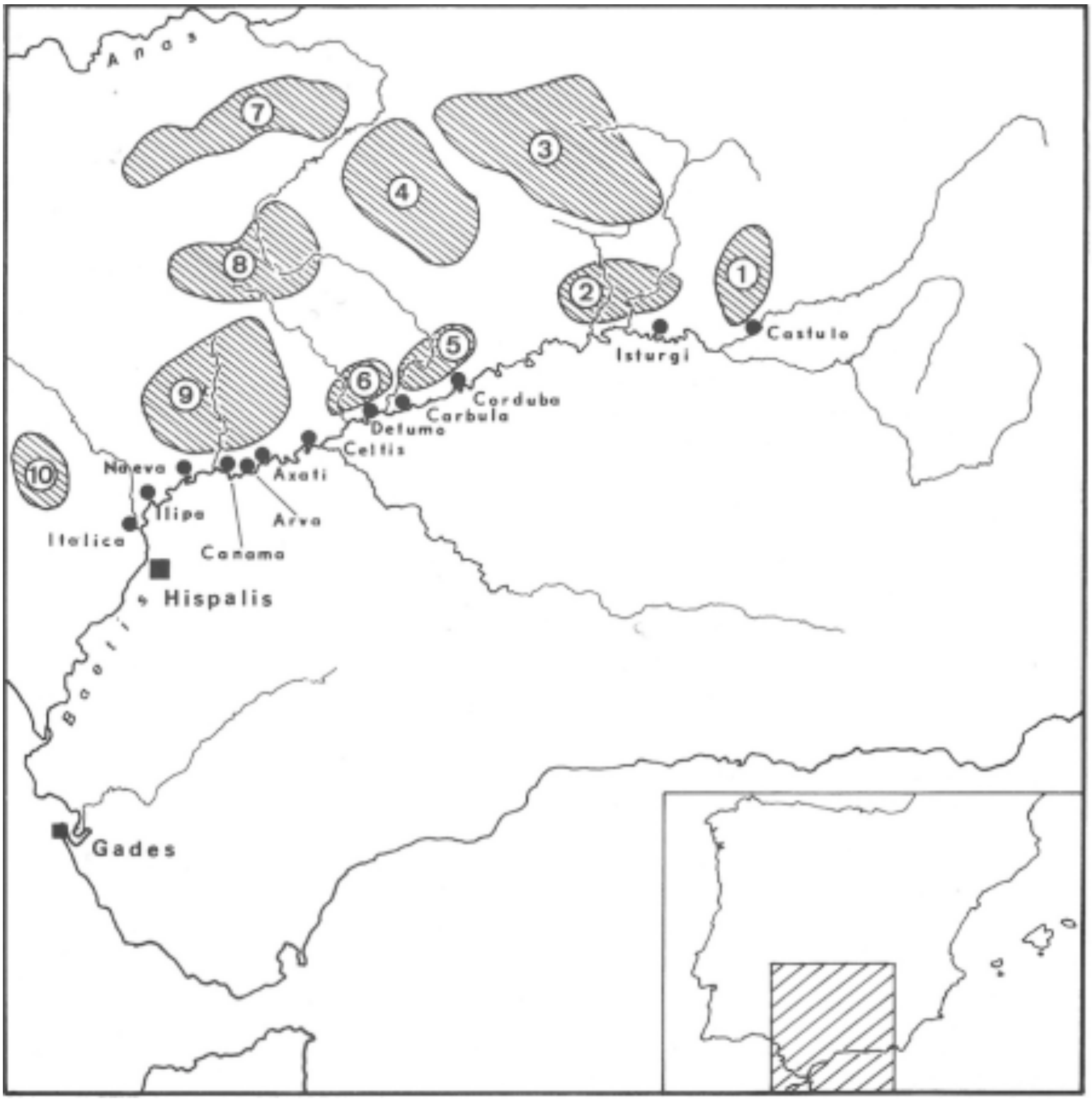

Figure 34: The mining areas of the Sierra Morena north of the Baetis, together with the right-bank ports where metal ingots could have been loaded heading to Hispalis (after Domergue, 1998: fig. 3).

From the 1st until c. the mid-3rd century AD, Baetica exported different types of foodstuffs such as grain (Rickman: 1980: 107-108; Chic García, 1997) to a lesser extent, fish sauce, and large quantities of olive oil. According to David Mattingly (1988a: 33), in the Roman Empire *" (...) olive oil was a basic food source, the prime lighting fuel and the essential base for numerous medicaments, soaps, skin oils, perfumes, and cosmetics."* He estimated that olive oil consumption in the Roman

Empire could have been twenty litres per capita on average (Mattingly, 1988b: 22). This would have mean that, in order to satisfy the needs of the Mediterranean population of 25-50 million, at least 500,000,000 litres of olive oil needed to be produced every year (Mattingly, 1988b: 22). This figure reveals how essential olive oil was for the economy of the Empire as well as for the provinces that produced it such as Baetica, in Spain, or Tripolitania and Tunisia in North Africa. Baetica was a unique case that reveals the extent to which Romans were willing to go to produce surplus olive oil to satisfy the demands of the Roman Empire.

Olive oil production has been detected at a myriad of villas and rural settlements across different areas along the Guadalquivir (Figure 35). Most of these sites were discovered during surveys conducted in the 1960s and 1970s (Ponsich 1974; 1979; 1987; 1991; Mattingly 1988a).

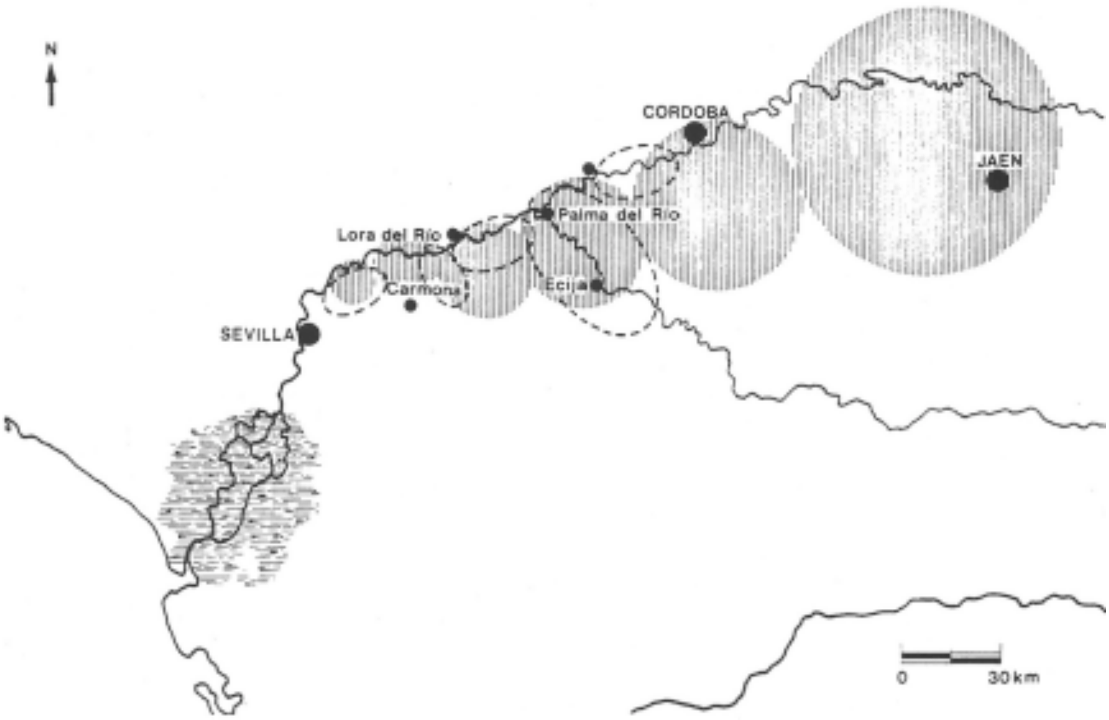

Figure 35: Map showing the areas engaged on oleiculture along the Baetis Valley during the Roman period (after Ponsich, 1998: fig. 1).

Evidence for the scale of production comes from the distribution of the kilns that produced the Dressel 20 amphorae; to date, a total of c. 100 kilns have been found (Remesal Rodriguez 1998) (Figure 36). The evidence that we have suggests that c. 75 % of all the known Dressel 20 kiln sites were active by the middle of the 2nd century AD. In particular, this occurred from the later 1st century AD onwards, with the 2nd century being a particularly intense period of settlement and exploitation.

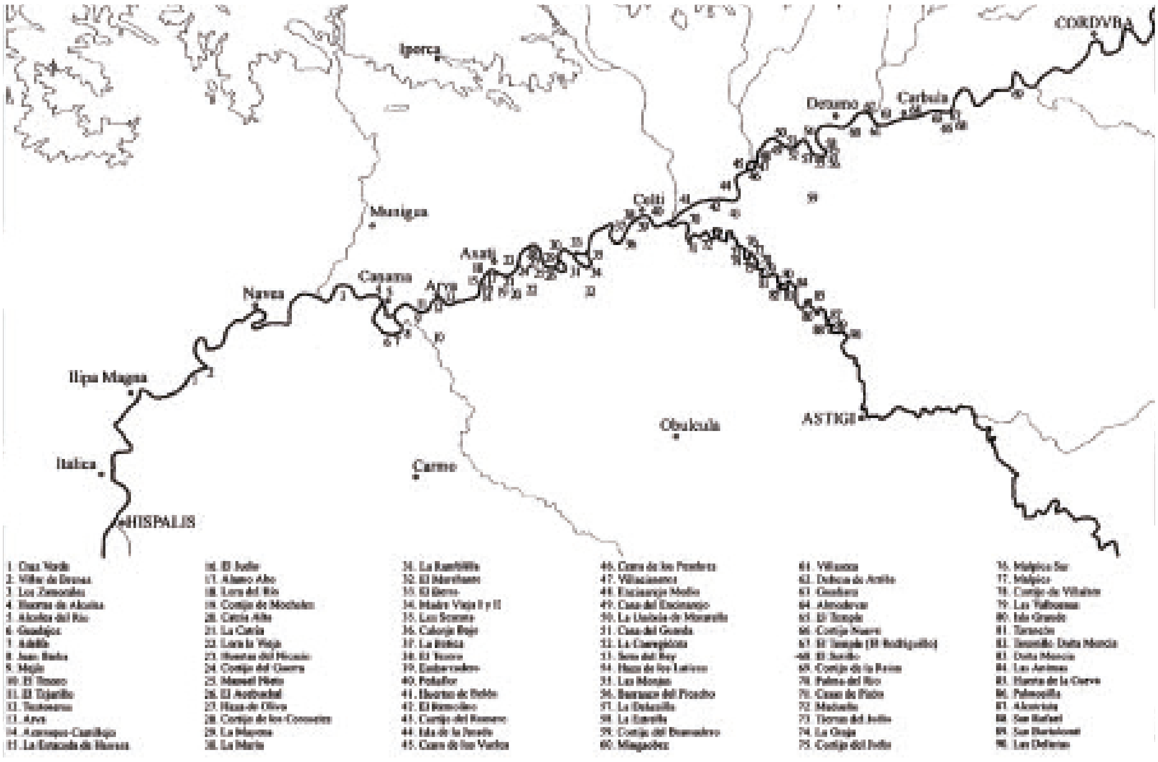

Figure 36: The Guadalquivir River and the location of Dressel 20 kiln sites (after Remesal Rodríguez 2012: fig. 13.3).

The importance of oil production is also illustrated by an inscription (*AE* 2001, 1186) from the mid-2nd-century AD date currently located at the foot of the Giralda in Seville (*vide supra*). It attests the existence at Hispalis of a *diffusor olei ad annonam urbis* (Chic Garcia *et al.* 2001). This inscription (*vide supra*) confirms that state officials were present in Hispalis in order to coordinate and track the movement of Baetican olive oil as an important component of the *annona* of the city of Rome (Wilson, 2008: 187-188). It has been suggested that the state intervention in the olive oil supply had the aim of ensuring price stability through reliable supply by bulk state purchase and resale (Bowman and Wilson, 2009: 20). There are other inscriptions from Hispalis that inform us about other provincial administrative officials (Ordoñez Agulla, 2014: 113-115). One of them, also now at the foot of La Giralda (*CILA* 2/1, 23), offer us information about an equestrian *procurator*, *Iulius Possessor*, who, according to some authors, seems to have supervised the export of the Baetican olive oil in relation to the *annona* (Remesal Rodríguez, 1991).

The olive oil was transported inside Dressel 20 amphorae from the rural estates to a series of fluvial ports along the Guadalquivir and then transported by riverboats to Hispalis (*vide supra*). As we have seen, a few inscriptions that mention corporations of *scapharii* and *lyntrarii* were unearthed in Seville (*vide supra*). These associations of boatmen were responsible for the transport of olive oil and other goods down the Guadalquivir to Hispalis. In light of the current epigraphic information that we have to date, it seems that the *scapharii* were based at Hispalis and were closely associated with the imperial authorities. Whereas the *lyntrarii* were based at river ports along the Guadalquivir (Remesal Rodríguez, 2012). The organization of maritime and fluvial traffic, as well as the administrative control of the raw materials and foodstuffs transhipped through Hispalis, was complex and involved different agents and associations (Remesal Rodríguez, 2012). At the port of Hispalis, administrative controls of trade occurred and, as the centre for transhipment, tolls and taxes were paid for all the traded commodities (De Laet, 1949; Duncan-Jones, 2006).

Dressel 20 amphorae are found in large numbers at Rome and at sites across the Western Mediterranean, the northwest provinces, and in the Eastern Mediterranean (Bernal Casasola, 2001). These amphorae have painted inscriptions known as *tituli picti*, which were drawn on their external walls, containing complex information that includes the fiscal district, from which the amphora was exported, and the consular date (Remesal Rodríguez, 1998: 191-192). Analysis of the *tituli picti* and stamps on the amphorae suggest that the total production of oil was particularly high for the period between the later 1st century and the earlier 3rd century AD (Chic Garcia, 2001). Rome was a primary destination of these, with Monte Testaccio acting as a witness to the large scale of imports down to the mid-3rd century AD. The data obtained from the recent excavations (Blázquez Martínez, Remesal Rodríguez and Rodríguez Almeida 1994; Blázquez Martínez and Remesal Rodríguez 1999, 2001, 2003, 2007, 2010, 2016) are beginning to provide valuable quantitative information for the later 2nd to mid-3rd century AD. However, our understanding of earlier periods is hampered since the excavations at Monte Testaccio excavations have not reached the earlier 2nd and 1st-century AD levels (Keay, 2016: footnote 98).

The archaeological record from Monte Testaccio, an artificial mound in Rome composed almost entirely of waste fragments of broken amphorae dating from the Roman Empire, provides us with valuable quantitative information about the amount of foodstuffs and manufactured goods that departed from Hispalis. Scholars first estimated that Monte Testaccio in Rome is comprised of 53 million Dressel 20 type amphorae (Rodríguez Almeida, 1984). However, more recent estimates, by the same archaeological team that have been excavating the site since the 1980s, have decreased the number to approximately 25 million (Remesal Rodríguez, 1998: 197; Blázquez, 2001: 41-43). The information contained in these *tituli picti* attest that about 85% of the amphorae from Monte Testaccio originated from Baetica (Remesal Rodríguez, 1998: 197).

All these amphorae, alongside many other cargoes, departed from the port of Hispalis (Remesal Rodríguez, 1998: 188). José Remesal Rodriguez, calculated the annual production of olive oil bound to Rome as follows: dividing the estimated 25 million amphorae from Monte Testaccio by the 250 years of the hill's history, it represents about 100,000 amphorae per year. A Dressel 20 amphora had an average capacity of 70-75 litres. Including the weight of the amphora, a Dressel 20 filled with oil would have weighed about 100 kg (Chic García, 1988: 3; Berni Millet and García Vargas, 2012). Therefore, the direct olive oil trade per year between Hispalis and Rome alone consisted of 100,000 Dressel 20 amphorae or the equivalent of 10,000 tons of freight traffic. This is roughly 7,000,000 litres of olive oil produced in Baetica and shipped to Rome per year (Remesal Rodríguez, 1998: 197).

However, considering that about 85% of the amphorae from Monte Testaccio are from Baetica, Chic García calculated the annual production of olive oil from Baetica to Rome as 6,605,504 kg per year (Chic García, 2006). Nevertheless, we do not know how many amphorae from the Monte Testaccio have been lost (e.g. reused as building material) through the centuries. Moreover, we should acknowledge the fact that it is highly unlikely that every single amphora that once departed from Hispalis going towards Rome ended up in its famous waste mound (Remesal Rodríguez, 1998: 197). Taking this into consideration, for the estimations in this Thesis, which only aim to provide overall representative values, the general figure of 7,000,000 litres per year will be used.

These figures are rough estimates representative of the olive oil trade that Hispalis had with Rome alone. However, as Remesal Rodríguez (1986) first, and Chic García (2006) later rightly noted, massive quantities of olive oil from Baetica were also exported to supply the Roman army. Menéndez Argüín (2001:189) estimated that a Roman legion of 5,000 men would have consumed 80,000 kg per year. Using this figure, Chic García has calculated that, from the reign of Trajan onwards, the four legions of Germania (i.e. *circa* 20,000 men) would have needed 314,350 litres of olive oil, or the equivalent of 4,490 Dressel 20 amphorae per year; similar numbers could be estimated for the four legions deployed in Britannia (Carreras Monfort, 2000). Chic García emphasizes that the calculations regarding the Roman legions are conservative since they do not take into account the use of olive oil by auxiliary troops (Chic García, 2006: 281-282).

Christoph Schäfer recently has proposed that the Roman legions in the Rhine frontier were supplied with oil from Baetica via an Atlantic maritime route (Schäfer, 2016; 2017). There is plenty of evidence that indicates the existence of an Atlantic route to connect southern Iberia (and the Mediterranean) to the North Atlantic since prehistoric times (Cunliffe, 2001; 2017) and archaeological evidence from the Roman period is abundant (Carreras and Morais, 2012). Christoph Schäfer suggests that the Atlantic route for shipping oil to the Roman legions in the Rhine frontier was neither longer nor riskier than the traditionally accepted Mediterranean route (i.e. Gades to Arelate) but rather both faster and less expensive (Schäfer, 2016; 2017). In this sense, the strategic position of Hispalis as a maritime port of the Atlantic façade would suit perfectly within the proposed Atlantic route for the transportation of goods to the northern regions of the

Empire. Additionally, and although Rome and the Roman army were the main consumers for the olive oil produced in Baetica, they were not the only ones and olive oil Dressel 20 amphorae have been found in many distant fringes of the Roman Empire (Bernal Casasola, 2001); therefore that should be factored in as well.

To sum up, and despite the limitations of the data and the rough calculations made, on the basis of the 25 million of amphorae calculated by Remesal Rodríguez, (1998: 197) and Blázquez (2001: 41-43), Chic García (2006) estimates that the annual production of olive oil in Baetica would have been of at least 13,000 metric tons (Chic García, 2006: 282), which equals to 13,000,000 litres. That implies a mind-blowing figure of 185,715 Dressel 20 amphorae per year; or translated into weight, 18,571 tons of freight traffic being shipped every year from the port of Hispalis to different destinations in the Roman Empire.

These estimations, as impressive as they might look, are likely to be conservative because of three main reasons: they are based on the limited data that we have (and we have only a fraction of it); the total number of amphorae have been evenly divided by centuries; and the estimates account for the trade with Rome and the army alone.

First, we have seen that it is highly unlikely that every single Dressel 20 amphora that once departed from Hispalis towards Rome ended up at Monte Testaccio at Rome (Remesal Rodríguez, 1998: 197) so we only have a fraction of the total.

Second, these generic figures have been calculated by dividing the total number of amphorae by the total number of years of the trade with Rome, resulting in an even distribution. However, we know that Roman trade was not evenly distributed through the centuries. The study of Mediterranean shipwrecks suggests that the highest period of seaborne commerce was around the 1st century AD (Wilson, 2009). Keay (2016: 305) suggests that perhaps it was rather the 2nd century AD, if we take into consideration the increase in the number of ships with greater tonnage. Evidence from amphorae deposits in Hispalis as well as sites in the Guadalquivir valley in general, confirms that exports grew in the course of the later 1st century AD and the first half of the 2nd (García Vargas 2012a; Chic García 2001). Consequently, it is possible to suggest that the estimations of annual olive oil production could have been greater in that period. Unfortunately, to confirm this hypothesis we will have to wait until the excavations at Monte Testaccio reach the earlier 2nd and 1st-century AD levels (Keay, 2016: footnote 98).

Third, these figures account for Baetica's annual olive oil production and its distribution to the state, both at Rome and for the army alone. However, olive oil was not sold exclusively to the Roman state and that needs to be considered, although we do not have a way to quantify that production. We have seen that Dressel 20 finds confirm that olive oil from Baetica was exported to all the corners of the Empire and beyond (Bernal Casasola, 2001).

To summarize, the estimate of 25 million amphorae in the Monte Testaccio (Remesal Rodríguez, 1998: 197; Blázquez, 2001: 41-43) that equals 7,000,000 litres of olive oil produced in Baetica and shipped to Rome per year (Remesal

Rodríguez, 1998: 197) or the total production of olive oil from Baetica sold to the state estimated at 13,000 metric tons (Chic García, 2006: 282), as impressive as that might seem, in my view, is likely to be conservative. For comparison, the proposed olive oil production in Baetica is similar to that calculated by David Mattingly for Tripolitania: he estimated that Lepcis Magna alone could have produced up to 15,000,000 litres annually, and that the entire Tripolitania province about 20,000,000 litres (Mattingly, 1988b: 37).

Consequently, the estimates above will be used in the Thesis to calculate the number of riverine barges and seagoing ships necessary for the transportation of the commodities exported from Hispalis as well as to illustrate the commercial value of this economic enterprise (*vide infra*).

3.7.2 Flat-bottomed riverboats and seagoing freighters

Chic García (2006) also tried to estimate how many riverboats would have been necessary to transport the 100,000 Dressel 20 amphorae derived from the annual olive oil production bound for Rome. Citing Drain (1972: 596), Chic García uses historical values for traditional riverboats that operated in the Guadalquivir able to carry 6,900 kg of cargo each; this type of riverboat would have been able to carry 70 Dressel 20 amphorae, so to transport 100,000 Dressel 20 amphorae from the production centres (*figlina*e) towards the port of departure (Hispalis), 1,428 trips would have been necessary (Chic García, 2006: 280-281). These estimates only pertain to the trade with Rome, yet we have seen (*vide supra*) that this trade was possibly about half of the total volume of the annual olive oil production. Therefore, Chic García concludes that a total of about 3,000 trips of riverboats

(Chic García, 2006: 282) would have been necessary. The calculations made by Chic García (2006) only seem to take into account the weight of the Dressel 20 amphorae; however, other factors such as the size and arrangement of amphorae as well as seasonality also have to be considered (*vide infra*).

With the aim of calculating the number of riverboats that existed in the Baetis River during Roman times, Chic García used 15th century information, citing Collantes de Terán Sánchez (2001: 160, 178-179). The historical documents state that, according to official records, 40 commercial riverboats operated in the Guadalquivir from Cordoba to Seville in the 15th century; Chic García then estimates at about 200 the number of riverboats during Roman times (2006: 282). Thus to complete the estimated total number of 3,000 trips, each of the 200 riverboats would have had to complete 15 trips.

The estimates of Chic García in regards the size and the numbers of riverboats present on the river in the Roman period, as valid as they are, use a comparative analysis of boats of the Guadalquivir River with those of the Late Middle Ages and, consequently, they have to be treated with caution. However, we can propose new estimates using contemporary flat-bottomed riverboats and barges used during the Roman period that have been found in other European rivers.

If we consider the size and cargo capacity of the known archaeological examples of flat-bottomed riverboats and river barges (*vide supra* Table 1) the following can be observed: on one hand, small riverboats would have had an average cargo capacity close to four tons, thus about half the capacity of the boats from the modern period described by Chic García; river barges, on the other hand, would have had an average cargo capacity largely depending on their size, ranging from 20 to 55 tons that, for the purpose of obtaining illustrative values, could be estimated at 35 tons on average.

Flat-bottomed Roman river barges with an average cargo capacity of 35 tons would have been able to carry 350 Dressel 20 amphorae full of olive oil, if we only consider their weight. However, if we also take account of their size, this estimate would mean that the amphorae were necessarily stacked into two rows. Dressel 20 amphorae had a maximum diameter of 56-65 cm (Berni Millet and García Vargas, 2012); then, it would have been possible to fit slightly fewer than about four Dressel 20 in one square metre. Roman river barges had average dimensions of approximately 20 metres long by 3 metres wide (i.e. 60 square metres of loading surface). This would have theoretically allowed them to carry a maximum of 240 Dressel 20 amphorae in one single row of amphorae.

240 Dressel 20 amphorae would have had a weight of 24 tons, thus not reaching the 35 tons average cargo capacity of a flat-bottomed Roman river barge. Therefore, a second row of 110 Dressel 20 amphorae on top of the previous one (with a weight of an additional 11 tons) would have completed the load of each flat-bottomed river barge. If two rows of amphorae were stacked, it is possible that approximately 200 amphorae composed the lower row and 150 the top one. However, because the particular shape of the Dressel 20 amphorae is not ideal for stacking, it is also possible that barges were only loaded with one row of amphorae (not reaching their average cargo capacity for safety). In this more conservative

scenario, it is plausible to estimate that each flat-bottomed river barge would have carried as few as 200 Dressel 20 amphorae.

Hence, the estimated 100,000 Dressel 20 amphorae that were shipped from Hispalis to Rome per year would have then needed 500 trips (or 286 if the cargo was loaded into two rows) on-board flat-bottomed river barges of 35 tons of cargo capacity each. If the Chic García estimate of an olive oil production of at least 13,000 metric tons per year (2006: 282) is correct, the 185,715 Dressel 20 amphorae would have needed 929 trips (or 531 if the cargo was loaded into two rows) trips on-board flat-bottomed river barges.

Estimating the number of barges used during the Roman period in the Baetis Rivers is not an easy task, but we can attempt some calculations. However before we do so, two important factors have to be taken into account: first, the length of the sailing season; second, the particularities of olive oil production.

In Roman Times journeys by commercial ships used for overseas trade involved in long-distance voyages were frequently undertaken during the summer, especially by large vessels (Beresford, 2013: 269). Vegetius (*Epitoma rei militaris*, 4, 39) explained that the sailing season was from 27 May to 14 September. According to his account, winter sailing (i.e. 10 November to 10 March) was too dangerous because of the difficulties caused by the minimal daylight, long nights, dense cloud-cover, foggy air, and the violence of winds doubled by rain and snow. An edict from AD 380 by the emperor Gratian decreed that ships were to leave port no earlier than April 13 and no later than October 15, with the start of November bringing an end to seafaring (*Codex Theodosianus*: XIX, IX, III, Pharr *et al.*, 1952). Therefore winter was regarded as "out-of-season" for classical seafarers, the period of *mare clausum*, the "closed sea".

For a long time, classical scholars assumed that the ancient Mediterranean suffered a seasonal dislocation and, during the wintertime, went into *"hibernation to await the coming of the spring"* (Casson 1995: 271). However, and despite the dangerous winter conditions, there is substantial evidence to suggest that voyages took place across winter seas. Therefore, the common acceptance of the wintertime closure of sea-lanes, or *mare clausum*, should be questioned (Tammuz, 2005: 156; Beresford, 2013: 268-269, 272). Nevertheless, despite the fact that voyages took place across winter seas, it seems true that there was a generalised seasonal downturn in seaborne transport and trade from the middle of autumn to the following spring, particularly on those routes engaging in coastal navigation (Tammuz, 2005: 156); this was certainly because of the general less favourable weather conditions. This generalised seasonal downturn remains true in the Mediterranean to this day for sailing vessels.

Also, olive oil production has some restrictive particularities. Olives from the trees are harvested when they reach ripeness (green-turning-to-black stage) that occurs at the end of the autumn or the beginning of the winter, and always before the winter frosts. The olives are milled immediately (usually within a few hours after harvest) to minimize oxidation and enzymatic reactions (Baldoni and Belaj, 2009: 399). The extracted olive oil is always obtained in a 24h period after harvest. Olive oil is an organic foodstuff that decays naturally and, consequently, it is perishable.

Compared with other fresh products (i.e. fruit, meat, fish, etc.), which spoil in hours of a few days, olive oil has a slower decay rate, which allows it to maintain all its qualities for about one year from the day of extraction. Consequently, when compared with fresh products, olive oil has been traditionally considered, and used as, a preservative substance.

Taking into account the sailing season and the production of olive oil, two observations can be made. First, olives are harvested and olive oil was produced right at the end of the sailing season (end of the autumn or the beginning of the winter). Therefore, produced olive oil, which was stored into Dressel 20 amphorae, had to wait until the beginning of the sailing season to be exported and shipped overseas. Consequently, the winter months (December, January, February, March), when seaborne transport was reduced, were used to transport the Dressel 20 amphorae from their production centres (*figlinae*) downstream on the Baetis River towards the port of Hispalis. There, the amphorae were temporarily stored in *horrea* until they were finally exported overseas. Second, because of the perishable nature of olive oil and its estimated shelf life of about one year, export of oil from the port of Hispalis to the rest of the Empire was probably highly concentrated at the beginning and during the optimal sailing season (April, May, June, July), and not evenly distributed through the year. Otherwise, olive oil that would have departed for Hispalis at the end of the summer would have reached its destination with only a few months before it would have spoiled.

Given the aforementioned, the river barges transporting Dressel 20 amphorae from the olive oil production centres towards Hispalis had to complete the estimated 929 trips in approximately three months (i.e. 90 days); during the winter months there was probably days when conditions were not suitable for navigation (Boetto, 2016: 276), hence the three months estimate instead of four.

Because of its very reduced gradient, the speed of the Guadalquivir River is slow, being no more than three knots (i.e. 16.5 km/h). That means that from the most distant production centre to Hispalis, the journey down the river would last a minimum of 10 hours (i.e. one working day) if no intermediate stops were made.

The loading and stowage of the barge would have been carried out by stevedores, as evidenced by the iconography in the ports of Ostia and Narbone (Tchernia, 1997: 117, 119 and 127). A Dressel 20 filled with oil would have weighed about 100 kg (Chic García, 1988: 3; Berni Millet and García Vargas, 2012). Because of the weight of the filled Dressel 20, two stevedores were necessary to carry the amphora slung under a pole that rested on their respective shoulders. In the mid-19th century, two to three days were sufficient to unload a 60-ton ship carrying slate by stevedores (Stevens, 1863: 78). Consequently, loading a flat-bottomed barge with 200 Dressel 20 amphorae cargo weighing about 20 tons would have taken no more than one day of work, and a similar time would have been necessary for unloading.

Navigating upstream empty, either with sail, poles, or animal traction, would have taken no more than four days. So, in total, a return trip would have taken seven days or a week. In 90 days a barge could then make 13 return trips.

The estimated 500 trips per year necessary to transport 100,000 Dressel 20 amphorae to Hispalis (with a final destination of Rome) would have needed 39 barges making 13 return trips each. The 929 trips per year necessary to transport an olive oil production of at least 13,000 metric tons per year (Chic García, 2006: 282), or 185,715 Dressel 20 amphorae, would have needed 72 river barges making 13 return trips each.

It is worth noting that this estimate of 39 to 72 Roman river barges operating in the Baetis River is close to the modest flotilla of 20-30 *caudicariae* estimated by Boetto (2016: 282) needed to transport cereal between Ostia and Rome. These numbers are also comparable to the 40 commercial riverboats that operated in the Guadalquivir River from Cordoba to Seville in the 15th century (Collantes de Terán Sánchez, 2001: 160, 178-179). Alternatively, as we have seen, Chic García estimated at 200 the number of smaller riverboats during Roman times (2006: 282). However, he only took into consideration the weight of the amphorae and medieval examples of riverboats, decisions that, in my opinion, weaken his estimates. Smaller riverboats were absolutely necessary to load and unload cargoes from the freighters, and Hispalis probably had a considerable number of them. The truth was probably that a mixture of a few types of flat-bottomed riverboats or river barges operated in the Baetis River, and these are probably the *scaphae* and *lintres* used by their respective professional associations of boatmen attested by the epigraphy of Hispalis (*vide supra*).

Taking these figures into account, we can also calculate how many ships were necessary to carry the amphorae that transported the olive oil. Roman freighters, or ships of burden, were called *navis oneraria* and two types are well known, the *ponto* and the *corbita* (Casson, 1995: 169). The smallest craft suitable for overseas shipping was 70 to 80 tons of burden, and the *corbita* would have had this capacity. Freighters of 350 to 500 tons, although considered big, were by no means rare (Casson, 1995. 171-172). The *Madrague* de *Giens* shipwreck is one of the largest Roman freighters (i.e. *navis oneraria*) excavated to date. It was a *ponto*, a ship able to sail on open seas, of the class *muriophorio* (i.e. 10,000 amphorae carrier) with a cargo capacity of 375 tons (Pomey, 1982: 146).

Taking into consideration the aforementioned, a 400-ton Roman freighter could carry 4,000 Dressel 20 amphorae containing 280,000 litres of oil. The 100,000 Dressel 20 amphorae that were shipped from Hispalis to Rome every year would have needed 25 large Roman freighters of 400 tons of cargo capacity each. Strabo reported that merchant freighters and seafarers sailing from and to Italy preferred the high seas route because of its fair weather and regular winds that blew at a fixed time each year (Strabo 3.2.5). This optimal period of fair weather and regular winds, in this high seas maritime route between Rome and Seville, mostly corresponds to the months of May, June, and July.[33] A direct seagoing voyage from Rome to Hispalis would have taken about 16 days, and the return journey would have taken about 14 to 19 days between April and September (Arnaud, 2005; Meeks *et al.*, 2016). That is slightly more than a month of sailing, in total, for a return trip. Consecuently, between Rome and Hispalis, a ship could have made several return trips within a sailing season, but not too many.

[33] Pascal Arnaud personal comment.

Stevedores would have carried out the loading and stowage of the Roman freighters, as evidenced by the iconography in the ports of Ostia and Narbone (Tchernia, 1997: 117, 119 and 127). In the mid-19th century, seven or eight working days, from the time the ship was berthed and ready for loading, were sufficient for stevedores to load a 600-ton ship carrying coal (Stevens, 1863: 78). Consequently, and considering that some extra days are always needed for activities such as provisioning the ship, clearing customs, performing maintenance of the hull and rigging, etc., the Roman freighter would have berthed at port for about 15 days. A similar time would have been necessary for unloading the ship at its destination.

To sum up, a return voyage from Rome to Hispalis, including loading and unloading of cargo plus some extra days to account for other factors (unforeseen circumstances, bad weather, etc.), can be estimated to be close to 3 months. Consequently, within the six months of optimal sailing season (*vide supra*) Roman freighters could have been able to make two return trips between Rome and Hispalis. In this scenario, about a dozen large merchant ships, with a full load displacement of *circa* 350-500 tons (*vide supra*), would have had been used to transport the 100,000 Dressel 20 amphorae that were shipped from Hispalis to Rome every year. If the Chic García estimate of an olive oil production of at least 13,000 metric tons per year (2006: 282) is correct, the 185,715 Dressel 20 amphorae would have needed 47 large Roman freighters each of 400 tons of cargo capacity. Or, if they had made two return voyages per season, about 25 large merchant ships would have been necessary.

We can carry out this calculation for the smallest seagoing merchantmen, such as a small *corbita*. In this scenario, a small Roman *corbita* with a cargo capacity of 80 tons could carry 800 Dressel 20 amphorae. The 100,000 Dressel 20 amphorae that were shipped from Hispalis to Rome per year would have then needed 125 *corbitae* of 80 tons of cargo capacity each. However, fewer ships would have been necessary if return voyages were made. Loading an 80-ton *corbita* with 800 Dressel 20 amphorae of cargo would have take about three or four working days (Pomey and Tchernia, 1978: footnote 39), from the time the ship was berthed and ready for loading; a similar time would have been necessary for unloading the ship.

To sum up, considering that a return seagoing voyage from Rome to Hispalis takes about a month, plus 8 days for loading and unloading of cargo, plus some extra days to account for other factors (*vide supra*), the total time for transportation can be estimated at about 6 weeks. Consequently, within the six months of optimal sailing season (*vide supra*) Roman *corbitae* could have been able to make about four return trips between Rome and Hispalis. Thus, a flotilla of roughly 30 *corbitae* of 80 tons of cargo capacity each could have transported 100,000 Dressel 20 amphorae between Hispalis and Rome per year in four return voyages. If the Chic García estimate of an olive oil production of at least 13,000 metric tons per year (2006: 282) is correct, the 185,715 Dressel 20 amphorae would have needed 232 *corbitae* of 80 tons of cargo capacity each. Or, if every ship had made four return voyages, a flotilla of about 60 *corbitae* of 80 tons of cargo capacity each would have been sufficient.

To summarize and conclude this section, we can estimate that a dozen large (400 tons) Roman freighters or, alternatively, 30 smaller ships of burden (80 tons) were necessary for the Rome oil trade alone. Additionally, if we consider the Chic García estimates of total annual production of olive oil, these numbers would increase to 25 large Roman freighters or 60 smaller ships of burden. This is interesting when compared to the calculations proposed by Tchernia (2011: 258-259) who estimated that about 786 seagoing ships of 150 to 350 tons would have been used to supply Rome with cereal, oil, and wine. To these seaborne freighters, we need to add from 39 to 72 flat-bottomed river barges estimated to have been operating in the Baetis River.

3.8 Direct archaeological evidence for the port of Hispalis

The archaeology of the city of Seville (Beltrán Fortes and Rodríguez Gutiérrez, 2014) is challenging because two main issues: first, practically the entire area that ancient Seville originally occupied is covered by the tell of city, which reaches seven metres in height from the deepest archaeological strata and, consequently, only a handful of archaeological excavations have reached them. Second, a symptomatic problem of the archaeology of Seville is that very little information is published. Although, in theory, by law all archaeological excavations in Seville have to produce a written archaeological report,[34] these are largely unpublished and their quality varies greatly. Consequently, and despite the hundreds of salvage archaeological excavations resulting from public works conducted in Seville in the

[34] Summaries of the available reports, from 1985 to 2006, were compiled in the yearly publication *Anuario Arqueológico de Andalucía* available in PDF format at: http://www.juntadeandalucia.es/organismos/cultura/areas/bienes-culturales/actividades-arqueologicas/paginas/anuario-arqueologico.html

last seventy years (Figure 37), what we actually know about the topography of Roman Hispalis is very basic with limited detail. Gonzalez Acuña (2011) demonstrated this in his extensive study of the topography of Hispalis that today represents the most comprehensive work on the subject.

Figure 37: Archaeological excavations conducted in Seville in the last 70 years (red dots) studied and compiled by González Acuña (2011). Note that the 1981 Plaza

Nueva excavation (yellow asterisk) was not studied (scale bar 500 m, after González Acuña, 2011: fig. I.14).

The topographical aspects of Hispalis that are accepted have been pieced together by combining numerous small pieces of information that are quite difficult to interpret and combine with other surrounding evidence. Essential facts are that the ancient Roman *Baetis* ran through the modern city centre away from the current course of the Guadalquivir, and that the Tagarete stream ran through the south of the city (*vide supra*). The existence and position has been established of major roads, commercial and residential areas, singular public spaces, and cemeteries, as well as the approximate extension and position of the Republican and Imperial city walls (Gonzalez Acuña, 2011; Beltrán Fortes and Rodríguez Gutiérrez, 2014a)(Figure 38 and Figure 39).

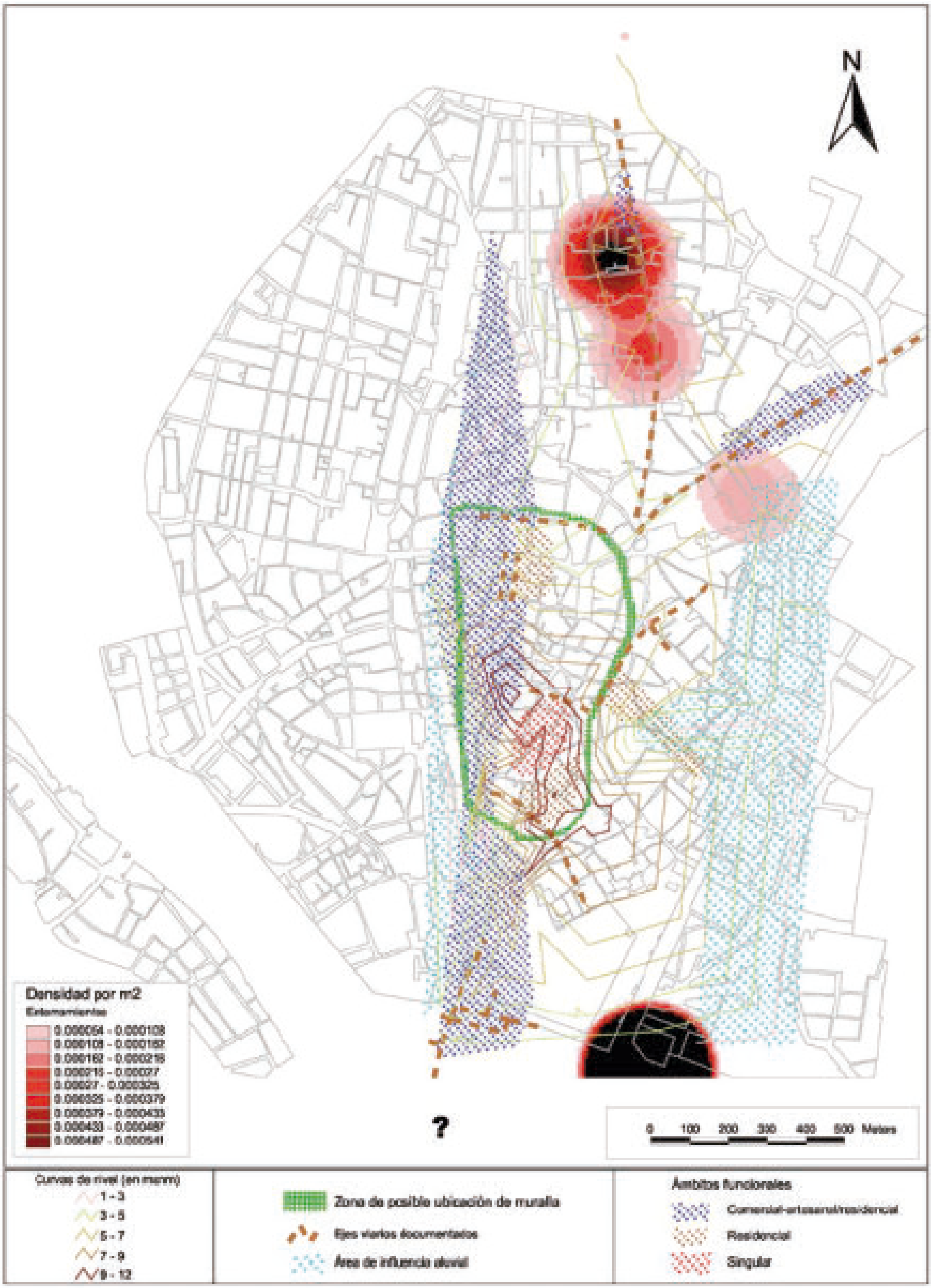

Figure 38: Map of Roman Hispalis around AD 50 to AD 150; city wall (green line), commercial areas (dark blue dots), singular public spaces (red dots), residential areas (brown dots), major roads (brown dotted lines) (scale bar 500 m, after González Acuña, 2011: fig. III.8).

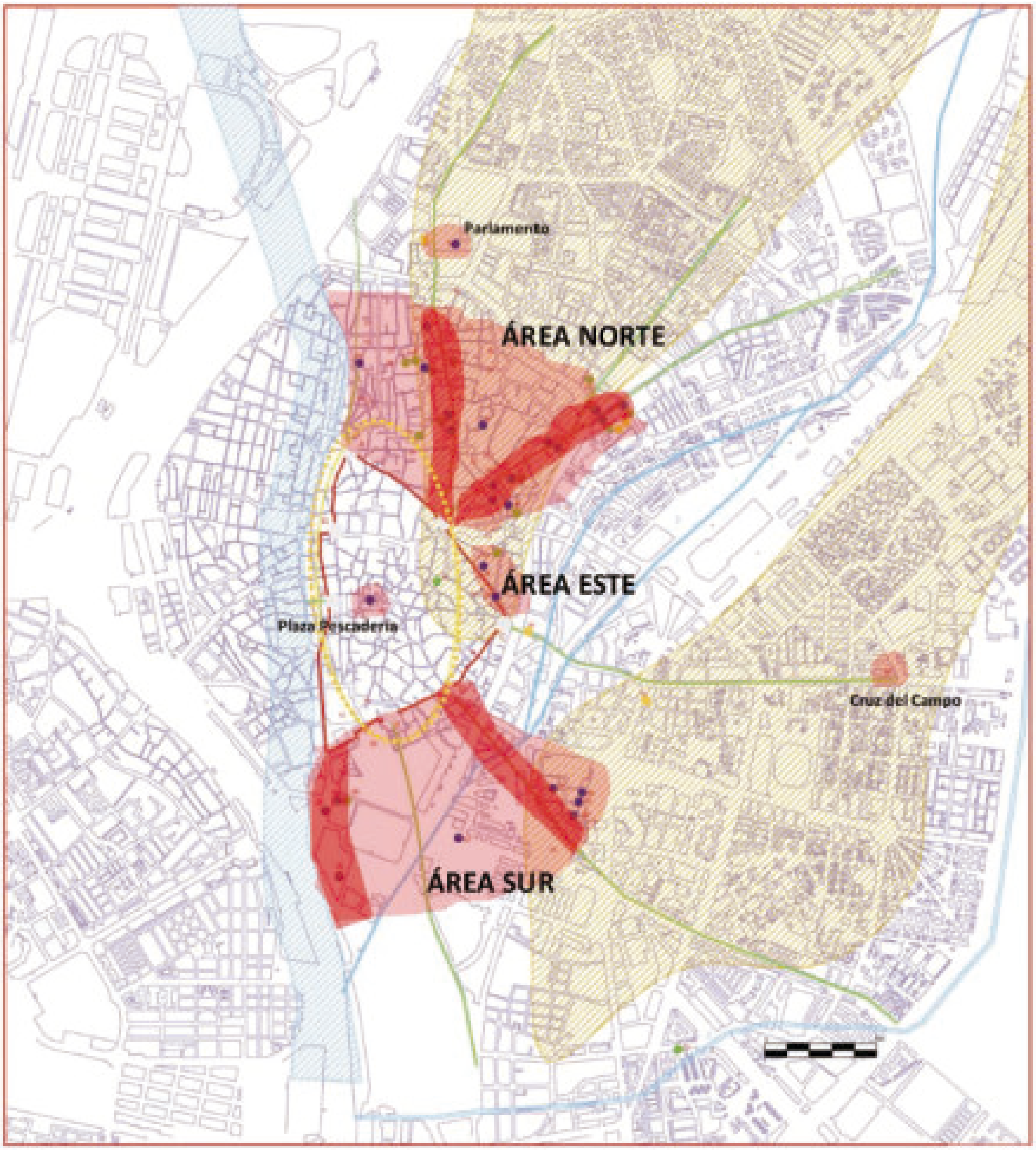

Figure 39: Map of Roman Hispalis in the Roman Era; areas where necropolis and cemeteries have been found (red areas), major roads (green lines), and the position of the *Baetis* River and other water courses (blue) (scale bar 500 m, after Beltrán Fortes and Rodríguez Gutiérrez, 2014a: fig. 33).

The evidence from which these basic topographical aspects have been proposed comes from many excavations, and the locations of some are compiled in Figure 40. In the 1970s, Blanco Frejeiro (1992: 50) proposed the hypothesis that in Hispalis there existed a *forum* of the corporations similar to the one in *Ostia Antica*.

In the 1980s, Campos Carrasco (1989; 1993) expanded Blanco Frejeiro's hypothesis, proposing the location of the Republican and Imperial *fora*. Currently these hypotheses, as well as others, have been dismissed (Beltrán *et al.*, 2005; González Acuña, 2011: 173-177; Beltrán Fortes and Rodríguez Gutiérrez, 2014a) and new, more conservative, interpretations of the topography of Hispalis have been offered. What all the archaeological excavations at Seville seem to suggest is that Hispalis achieved its maximum period of development from the middle of the 1st century AD to the early to middle 2nd century AD (*vide infra*).

Towards the end of the last century, some scholars believed that nothing was then known about the ancient port of Hispalis (Blackman, 1990: 124). This was based on the scarce archaeological remains found in relation to port facilities within Roman Baetica during the 20th century. Additionally, the absence of discoveries in an *ad hoc* field survey conducted in the mid 1970s (Hohlfelder, 1976), plus the lack of scientific publications in any language other than Spanish, probably led to this assumption. There were, however, a number of archaeological discoveries of port infrastructures in Seville during the 20th century, leading local archaeologists to question this assumption (Ordóñez Agulla, 2003: 66). Nevertheless, discoveries were scarce, many of them lacked a proper archaeological methodology, and only accounts and a few graphic documents have survived from them. What follows is a summary of these archaeological excavations (Figure 40).

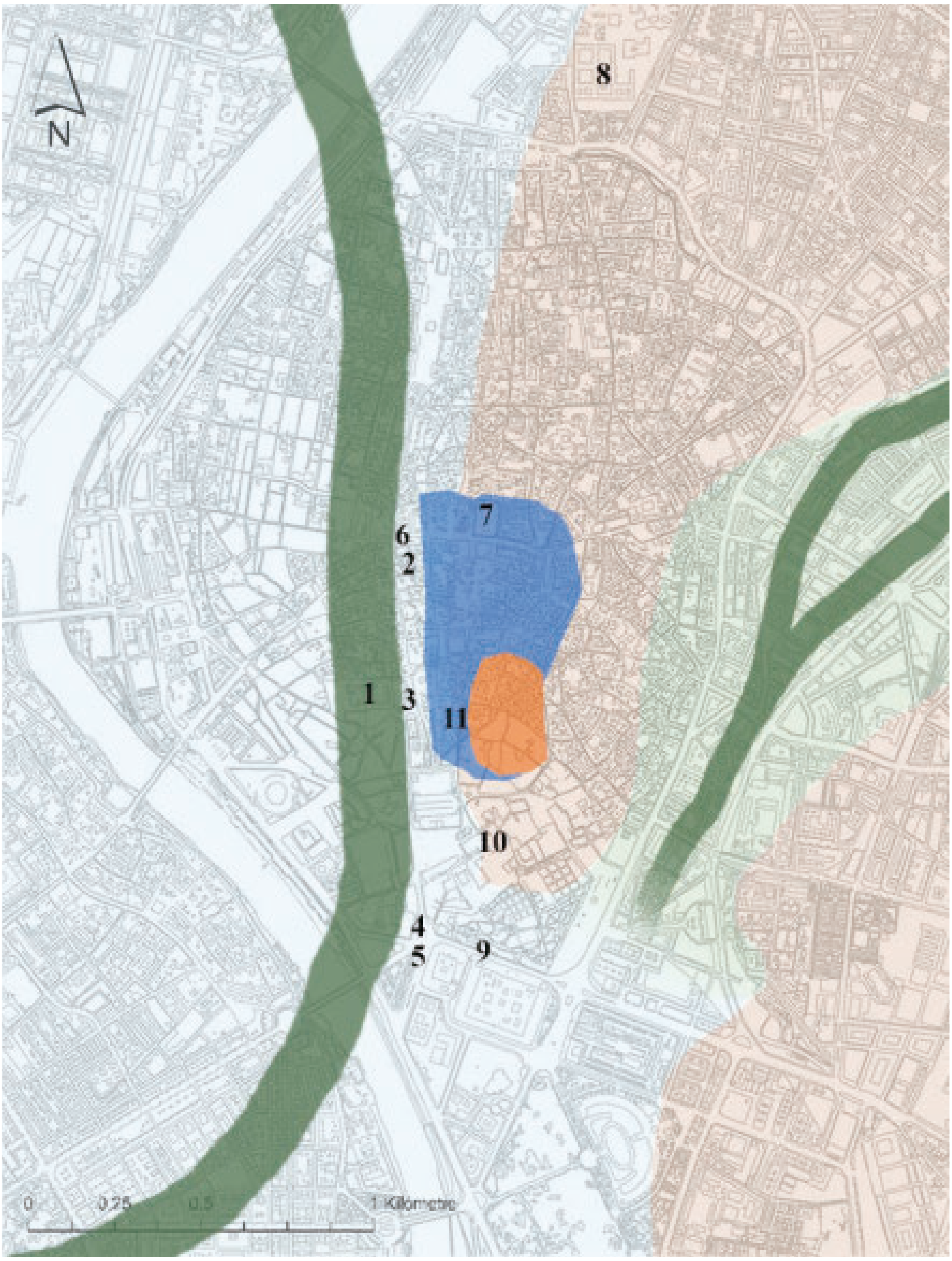

Figure 40: Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27). Archaeological excavations in Seville: 1, Plaza Nueva; 2, Cine Imperial and Calle Cuna; 3, Plaza de San Francisco; 4, Puerta de Jerez; 5, Avenida de Roma; 6, La Campana; 7, Mercado de la Encarnación; 8, Parlamento de Andalucía; 9, Calle San Fernando; 10, Patio de Banderas (Alcázar); 11, Calle Francos (scale bar 1 km, Author).

3.8.1 The Plaza Nueva salvage excavation of 1981

As we have seen, very little is known about the exact position, morphology, or facilities of the ancient and now lost port of Seville; but we understand that the ancient riverbed passed through the area occupied today by the Plaza Nueva Square. In different public works carried out there (because of various urban development projects) several archaeological findings, in direct relation to the ancient port and its use, were discovered. The study of these archaeological remains is of paramount importance because they could provide essential information for a better understanding of the ancient port of Seville that, despite its importance, remains largely unknown by scholars.

In the site of the Plaza Nueva, the monastery of the Great House of San Francisco stood for seven centuries. This Franciscan monastery was the largest and most important ecclesiastical institution in Seville (and one of the largest in Spain) until the 19th century. It was destroyed by fire in 1810 and it was confiscated by the state during the 1835 Ecclesiastical Confiscations of Mendizabal (i.e. the expropriation, and privatization, of monastic properties in Spain) (Castillo Utrilla, 1988).

After the ruins of the monastery of the Great House of San Francisco were demolished in 1840, a public square was built on its site with the works starting in 1851 and finishing by 1857 (Figure 41, Figure 42 and Figure 43). This public square had several names throughout the 19th and early 20th centuries, and in 1931 was named Plaza Nueva, a name that is currently in use (AA.VV., 1993: vol. 2, 139-144).

Figure 41: The last remains of the monastery of the Great House of San Francisco around 1845 during its demolition, on the eastside of the Plaza Nueva (Francisco de Leygonier y Haubert).

Figure 42: The Plaza Nueva of Seville during its construction in 1856, in the background the remains of the monastery of the Great House of San Francisco are still visible (University of Seville).

Figure 43: The Plaza Nueva of Seville in 1876 completely finished (Jean Laurent).

In 1981, construction work for the future underground railway system of Seville began at the site Plaza Nueva. There, a vertical pit was excavated with the goal of providing access to the future underground railway tunnels serving as the central station. The vertical pit was constructed with a circular reinforced concrete structure of about 26 m in diameter (Figure 44), which, progressively, perforated the ground at Plaza Nueva reaching 40 m in depth (Rein Duffau, 1994). Abundant archaeological remains were found in Plaza Nueva ranging from the Iberian to Islamic periods. Mr Fernando Fernández Gómez was in charge of the archaeological retrieval (i.e. salvage) of material recovered at the subway tunnel works. According to him, different *strata* or archaeological levels were discovered during the subway public works at Plaza Nueva (Fernández Gómez personal communication).

Figure 44: Photograph of the Plaza Nueva construction pit in 1981 (top) (ABC, Sevilla). Approximate position of the pit on the square (red circle) and the boat remains (yellow oval) (bottom)(Author).

Of all the archaeological materials found in the tunnel pit of Plaza Nueva, two finds were most significant: the remains of a small wooden boat and an iron anchor. These two artefacts were found in different *strata* or archaeological levels. In early June 1981 the remains of a wooden boat were found 11 metres from the surface in a *stratum* where pottery sherds from the Islamic period were found in abundance

(Guerrero Misa, 1984: 95). The anchor was found 4 metres beneath the boat (i.e. at 15 metres from the surface) (Fernández Gómez, 2007: 168). The iron anchor and the wooden boat will be discussed later in detail in Chapters 4 and 5 respectively.

Finally, within and beneath the *stratum* where the anchor was found, archaeological material from the Roman period appeared. These were described as pottery and amphora sherds identified as: one handle of an Iberian *amphora* and multiple sherds of Dressel 8, 11, 17, 19, 20 amphora types among other ceramic materials from the Roman period (Guerrero Misa, 1984: 95). Beyond that *stratum*, no archaeological materials were found (Fernández Gómez personal communication).

The amphora sherds, the iron anchor, and the boat found at Plaza Nueva in 1981 seem to indicate that this location was an anchorage area in the ancient port of Hispalis, at least during the historical periods to which these archaeological materials belong. This discovery, therefore, could help to determine the position of the Guadalquivir River during these historical periods, and could assist in establishing the exact location and characteristics of the ancient port of Hispalis.

A substantial part of the present Thesis was the documentation, study, and analysis of the Plaza Nueva archaeological materials found in Seville in 1981, never studied until now (see Introduction). Guerrero Misa (1984: 95) reported that a wooden boat, an iron anchor, and ceramic remains were salvaged from the Plaza Nueva site (*vide supra*). However, inspection by the author of the archaeological materials from Plaza Nueva at the Archaeological Museum of Seville revealed that other wooden remains were recovered from the site and not mentioned by Guerrero Misa, and these might be related to harbour facilities.

Within the timbers kept at the museum, there are remains of more than 20 large wooden cylindrical pieces. From them, parts of at least nine distinguishable cylindrical wooden trunks are present. Only one of them seems to be complete, and not fragmented (Figure 45). These wooden posts were not mentioned by Guerrero Misa (1984: 95) in his report of the Plaza Nueva findings. These cylindrical fragments of wooden posts were probably found and recovered from the same pit at Plaza Nueva.

Figure 45: The remains of the only complete wooden post found at Plaza Nueva (scale 15 cm, Author).

The wooden posts are straight cylindrical pieces of wood. The only complete preserved one, is *circa* 75 centimetres long and *circa* 20 cm in diameter. They are tree trunks from which branches have been cut and the bark has been removed. The wood of the posts is in an extremely desiccated condition; consequently, it is light in weight, extremely brittle, and has a dark golden brown colour. Based on visual observations, the wood seems to belong to the genus *Pinus*. Wood identification analysis of the nine distinguishable posts, concluded that six were made of *Pinus alepensis*, whereas the other three were only identifed as *Pinus* sp. (see Chapter 5).

They were sharpened at one end, creating points in the shape of an elongated pyramid with a square base. The opposite end of each post was cut flat creating a butt end. The butted ends presented a residue of white plaster, mortar, or paint that has remained on the surface. Their short length of the posts and the white residue on their ends suggests that the posts were probably pile foundations for buildings or other structures of the ancient port of Seville (*vide infra*).

Figure 46: Remains of three of the wooden posts found at Plaza Nueva. Note their sharpened ends (scale 15 cm, Author).

Unlike the wooden piles (that were mentioned nowhere in the accounts and publications of the excavations), Guerrero Misa (1984: 95) reported that a few (i.e. around six) amphora sherds were salvaged from the Plaza Nueva site (*vide supra*). However, inspection by the author of the archaeological materials from Plaza Nueva revealed that at least 77 amphora sherds were recovered from the site. These are currently kept in the museum and have never been studied before.

It is almost certain that more amphora sherds were salvaged from the excavation pit. This could be deduced from the pencil numbers written on the surface of the ceramic remains (some sort of early classification), which reached the number 110 on the sherds. Another indicator is the fact that only diagnostic sherds are kept within the museum collection. All the amphorae show wear and abrasion, which seems to indicate that they were disposed of and remained in the river.

Roman era amphorae were not the only ceramics found and retrieved at the salvage excavation; in fact, Roman ceramics were the smallest group of all the ceramics found at the Plaza Nueva (Figure 47). The majority of the ceramic remains found and retrieved belong to the Islamic period and they are described studied in detail in Chapter 5.

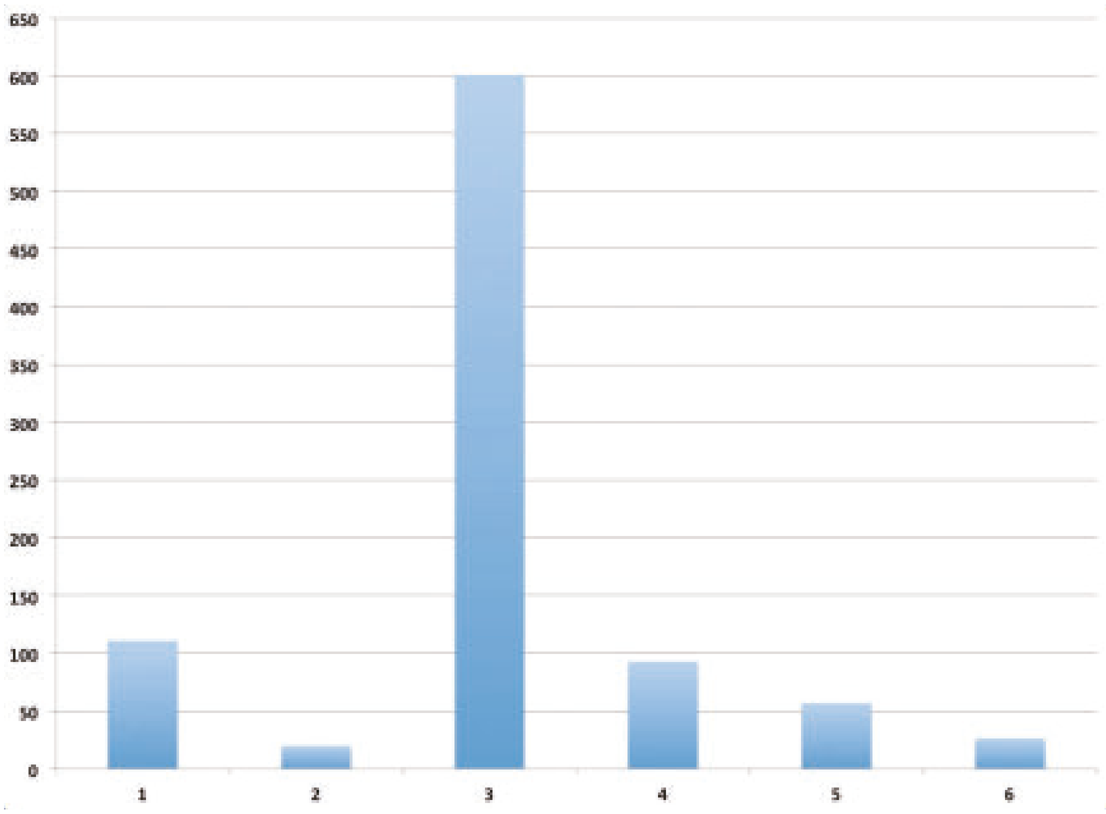

Figure 47: Comparative chart of the different ceramics found and retrieved at Plaza Nueva in 1981 arranged by chronology: 1, Roman 1st to 5th c. (111 pieces); 2, Islamic 10th to 11th c. (20 pieces); 3, Islamic 12th to 13th c. (601 pieces); 4, Islamic 13th c. (93 pieces); 5, Christian 14th to 16th c. (57 pieces); and 6, modern 17th to 19th c. (26 pieces).

As part of the present Thesis, the 77 amphora sherds were photographed, drawn[35], identified, and classified[36] according to their respective origin and chronologies[37]. Representative samples of the amphorae from Plaza Nueva were selected and arranged in twelve plates, for different historical periods and provenance, and they are compiled in Table 2.

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[35] Archaeological drawings were completed with the assistance of Ms Cinta Maestre.

[36] Classification of the amphorae fragments was conducted under the supervision of Dr Enrique García Vargas from the University of Seville.

[37] Classification of the amphorae was conducted using archaeological *comparanda* from two on-line catalogues: "Roman Amphorae: a digital resource" from the University of Southampton, and the "Amphorae ex Hispania" from the *Institut Català d'Arqueologia Clàssica* (ICAC).

FIG. # / PLATE #	BOX #	EXCAVATION REF. #	PENCIL #	FRAGMENT	CLASSIFICATION	CHRONOLOGY	FABRIC ORIGIN[38] / COMMENTS
48/1	17		AN 5	Rim	Ramón group 11	3rd – 2nd centuries BC	Fabric from Bay of Cadiz
48/1	18		84	Handle	Undetermined Punic amphora		Fabric from Bay of Cadiz
48/1	6		AN 7	Handle	T-7.4.3.3	Mid 2nd century BC - end of 1st century BC	Fabric from Bay of Cadiz / Punic amphora
49/2	17		AN 1	Foot	Dressel 1	1st century BC	Fabric from Campania (Italy)
49/2	21		AN 33	Foot	Dressel 1	1st century AD	Fabric from Campania (Italy)
49/2	19		AN 9	Rim, neck and partial handle	Ovoid 4	1st century BC	Fabric from Guadalquivir Valley
50/3	23	PN81/4/601		Rim	Dressel 20	Second half 1st century AD - first half 2nd century AD	Fabric from Guadalquivir Valley
50/3	20		89	Rim	Dressel 20	End of 1st century AD - first half 2nd century AD	Fabric from Guadalquivir Valley
50/3	5	PN81/4/526		Foot	Dressel 20	End of 1st century AD - beginning of 2nd century AD	Fabric from Guadalquivir Valley
50/3	25		AN 23	Handle	Dressel 20	Second half 2nd century AD	Fabric from Guadalquivir Valley
50/4	20		91	Handle and body	Dressel 20 mini	1st century AD	Fabric from Guadalquivir Valley
50/4	7		AN 21	Handle	Dressel 20 parva	1st century AD	Fabric from Guadalquivir Valley
50/4	17		AN 2	Handle	Dressel 20	1st century AD	Fabric from Guadalquivir Valley
50/4	7			Handle	Dressel 28	1st - 2nd centuries AD	Fabric from Guadalquivir Valley
50/4	24		A 35	Partial handle and body	Possible Dressel 2-4 Gaul	1st century AD	Fabric from Gaul
50/5	19		AN 12	Foot	Haltern 70	1st century AD	Fabric from Guadalquivir Valley
50/5	35			Foot	Haltern 70	1st century AD	Fabric from Guadalquivir Valley / Graffito on surface done before firing
50/5	7		AN 19	Handle	Haltern 70	1st century AD	Fabric from Guadalquivir Valley
50/5	13			Handle	Haltern 70	1st century AD	Fabric from Guadalquivir Valley
50/5	7		AN 17	Handle	Haltern 70	1st century AD	Fabric from Guadalquivir Valley
50/6	19		AN 13	Rim	Dressel 9/11	1st century AD	Fabric from Bay of Cadiz
50/6	19		AN 11	Rim	Dressel 9/11	1st century AD	Fabric from Bay of Cadiz
50/6	17		AN 4	Rim	Dressel 7/11 or Beltrán II B inicial	End of 1st century AD - beginning of 2nd century II AD	Fabric from Bay of Cadiz
51/7	24		A 41	Handle	Dressel 7/11	1st century AD	Fabric from Malaga area

[38] Amphorae production from Baetica could be divided into different groups according to the origin of their fabric. From the interior: those from the Guadalquivir Valley, and those from the Genil Valley. From the coast: those from the Bay of Cadiz, those from the Strait of Gibraltar area, and those from the Malaga area (García Vargas personal comment).

FIG. # / PLATE #	BOX #	EXCAVATION REF. #	PENCIL #	FRAGMENT	CLASSIFICATION	CHRONOLOGY	FABRIC ORIGIN[38] / COMMENTS
51/7	24		A 42	Partial handle and body	Dressel 7/11	1st century AD	Fabric from Malaga area
51/7	24		A 44	Handle	Dressel 7/11	1st century AD	Fabric from Malaga area
51/7	24		A 36	Handle and neck	Dressel 7/11	1st century AD	Fabric from Bay of Cadiz / Very late type
51/8	7		AN 20	Handle	Beltrán II B	1st – 2nd centuries AD	Fabric from Bay of Cadiz
51/8	7		AN 22	Handle	Dressel 14	Second half 1st century AD – beginning 2nd century AD	Fabric from Lusitania (Tagus-Sado)
51/8	18		81	Foot	Dressel 14	Second half of 1st century AD	Fabric from Malaga area
51/8	18		74	Rim	Beltrán II B	End of 1st century AD	Fabric from Bay of Cadiz
52/9	19		AN 10	Foot	Dressel 2-4	1st - 2nd centuries AD	Fabric from Italy
52/9	18		76	Rim	Gauloise 4	1st - 3rd centuries AD	Fabric from South of Gaul
52/9	20		87 / AN 8	Rim, neck and handle	Lusitanian III	Mid 2nd century – 3rd AD	Fabric from Lusitania (Tagus-Sado)
53/10	13			Rim	Dressel 20	3rd century AD	Fabric from Guadalquivir Valley
53/10	18		109	Rim	Dressel 20	End of 2nd century AD – beginning of 3rd century AD	Fabric from Guadalquivir Valley
53/10	21		AN 32	Rim, neck and partial handle	Dressel 20	3rd century AD	Fabric from Guadalquivir Valley
53/10	18		110	Rim	Dressel 20	3rd century AD	Fabric from Guadalquivir Valley
	20		97	Rim	Dressel 20	3rd century AD	Fabric from Guadalquivir Valley
	18		78	Foot	Dressel 20	3rd century AD	Fabric from Guadalquivir Valley
	21		AN 30	Rim	Dressel 20	3rd century AD	Fabric from Guadalquivir Valley
	21		66	Rim	Dressel 20	3rd century AD	Fabric from Guadalquivir Valley
54/11	24		A 43	Rim, neck and handle	Dressel 23	4th century AD	Fabric from Guadalquivir Valley
54/11	13			Rim and handle	Keay 23	4th – 5th centuries AD	Fabric from the Strait of Gibraltar area
54/11	49	PN81/4/517		Foot	Keay 19	4th – 5th centuries AD	Fabric from Malaga area
54/12	20		99	Handle and neck	N. African	2nd – 4th centuries AD	Fabric from North Africa
54/12	18		80	Foot	N. African II or III	3rd – 4th centuries AD	Fabric from North Africa
54/12	21		64	Foot	N. African II	3rd century AD	Fabric from North Africa
54/12	21		AN 32-35?	Foot	Keay 25	4th – 5th centuries AD	Fabric from North Africa
54/12	21		56	Rim	Keay 62	End of 5th century AD – 6th century AD	Fabric from North Africa

Table 2: Amphorae from Plaza Nueva arranged in 12 plates by chronological order.

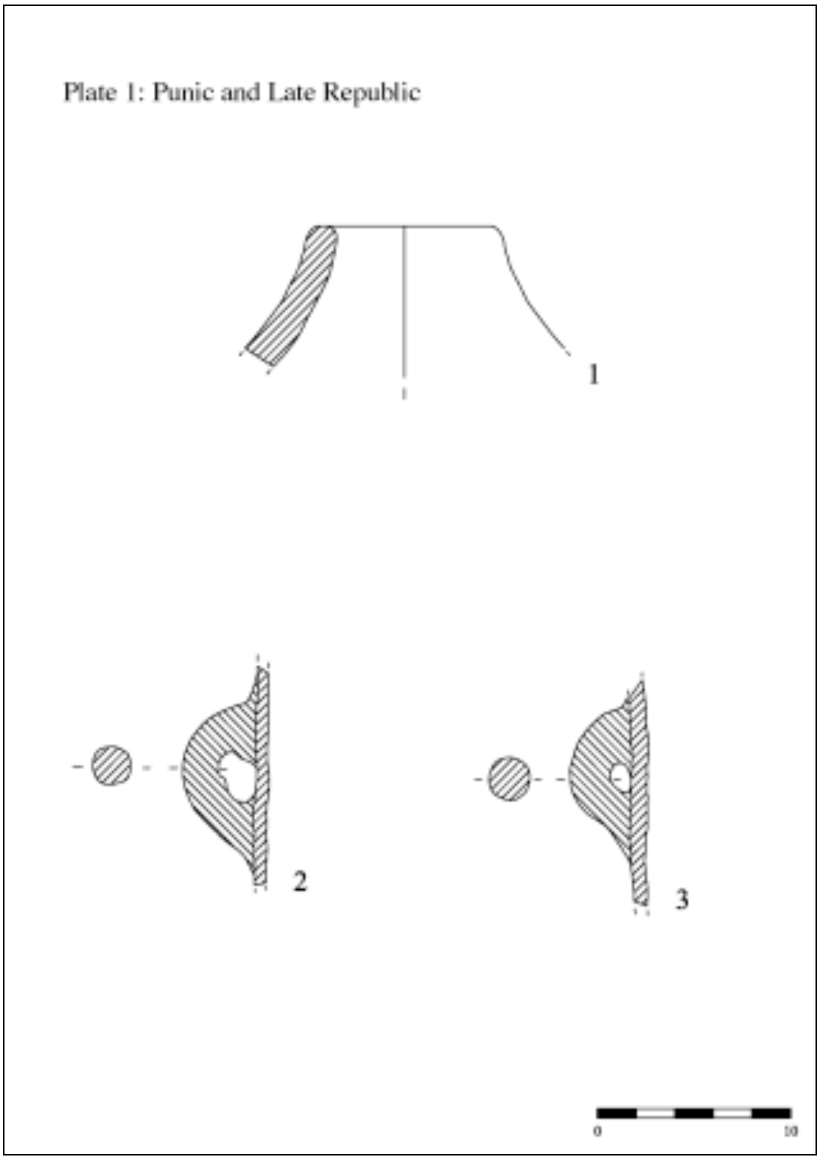


Figure 48: Plate 1, amphorae from 3rd – 1st centuries BC (scale bar 10 cm).

Punic amphorae from the Bay of Cadiz with chronologies of 3rd – 1st centuries BC represent the Late Punic-Republic period transition (Figure 48). These amphorae are characteristic of fish sauce imports. These types of foodstuffs were imported to Seville from the time when the settlement of Spal started to be built around the late 5th century BC, and were more clearly introduced in the 4th century BC (García Fernández and Ferrer Albelda, 2010).

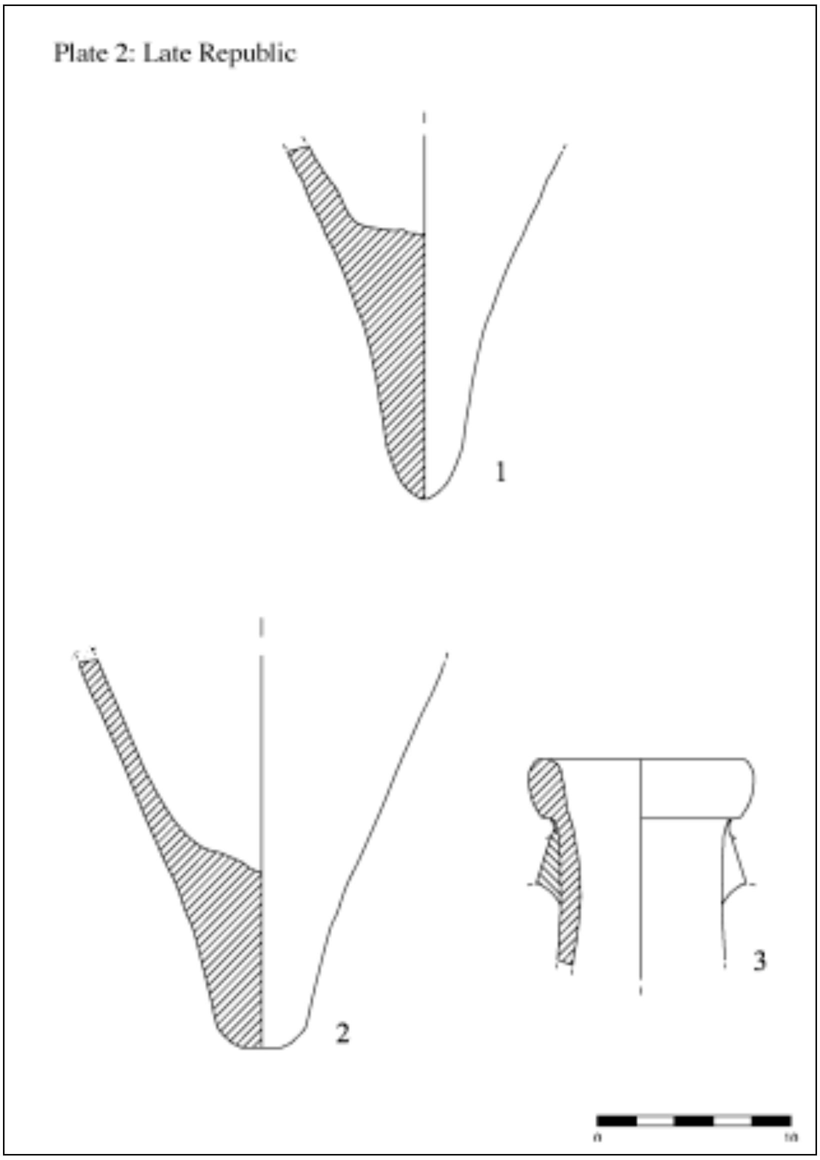


Figure 49: Plate 2, amphorae from 2nd – 1st centuries BC (scale bar 10 cm).

Italian wine amphorae from the end of the 2nd century BC or beginning of the 1st century BC (i.e. Dressel 1) represent the late Republican period (Figure 49: #1 and #2), which in Seville is characterised by increasing wine imports from Italy (García Vargas, 2009: 451; Bernal Casasola, *et al.*, 2013: 368-369, fig. 9). In the second third of the 1st century BC, workshops around the Guadalquivir basin began to imitate Italian wine amphorae (García Vargas, 2012b: 195-201; García Vargas *et al.*, 2011); this is represented in the Plaza Nueva amphorae assemblage (Figure 49: #3).

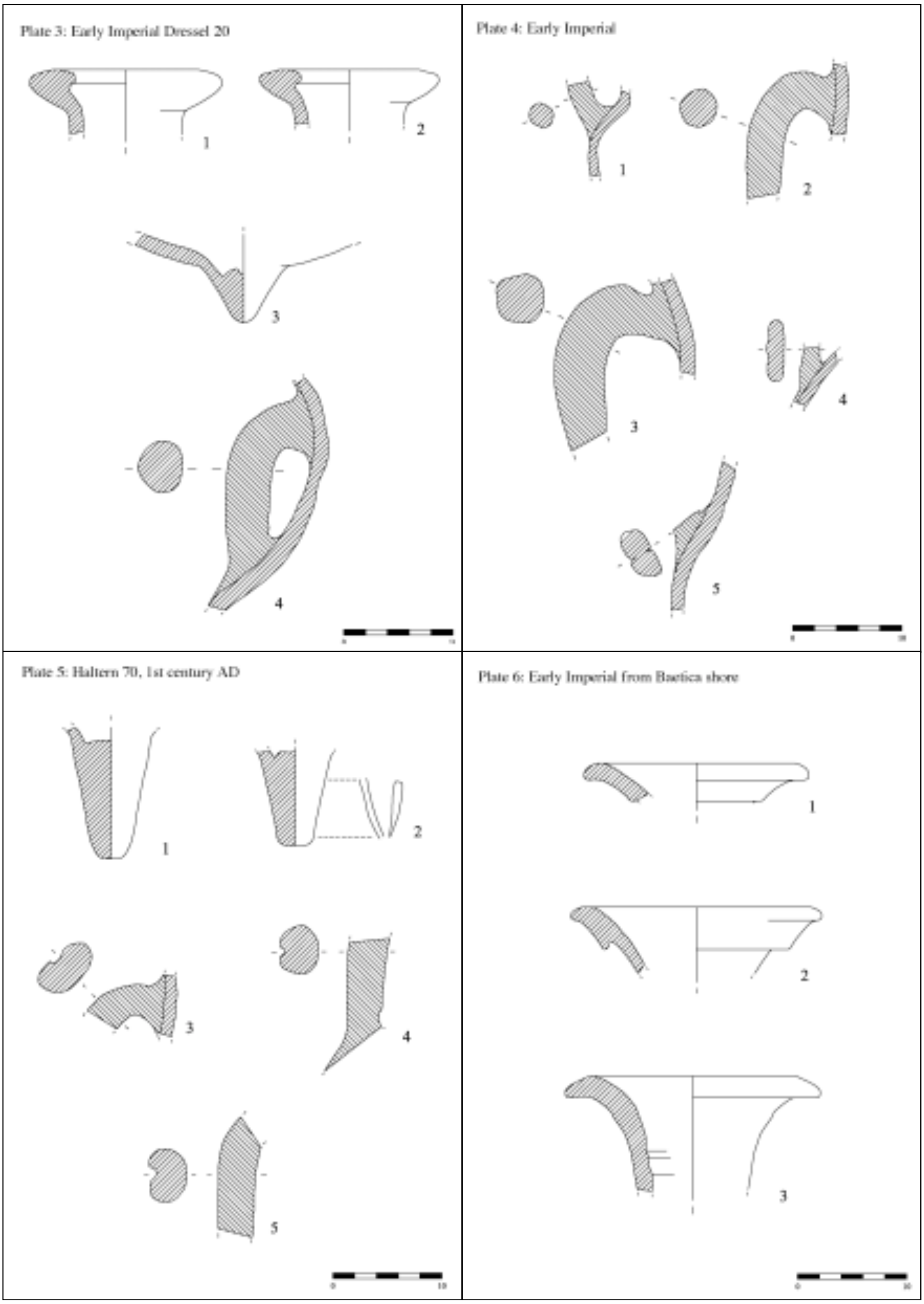


Figure 50: Plates 3, 4, 5 and 6, amphorae from the 1st century AD (scale bar 10 cm).

The 1st century AD is a key period in Seville from the economic and commercial point of view. During the late Julio-Claudian and especially the Flavian dynasty, provincial economic systems were consolidated as a result of the municipalisation of Hispania (Caballos Rufino, 2001). Many of the amphorae from the Plaza Nueva assemblage are representative of this period (Figure 50 and Figure 51, Plates #3 to #8). There are examples of local productions of Dressel 20, Haltern 70, and fish sauce amphorae from the shores of Baetica; also Dressel 7-11 and early Beltrán IIB types, the majority of them from the Bay of Cadiz (García Vargas, 2012a: 255) but also from Malaga, from which Dressel 14 were exported (García Vargas, *et al.*, 2015).

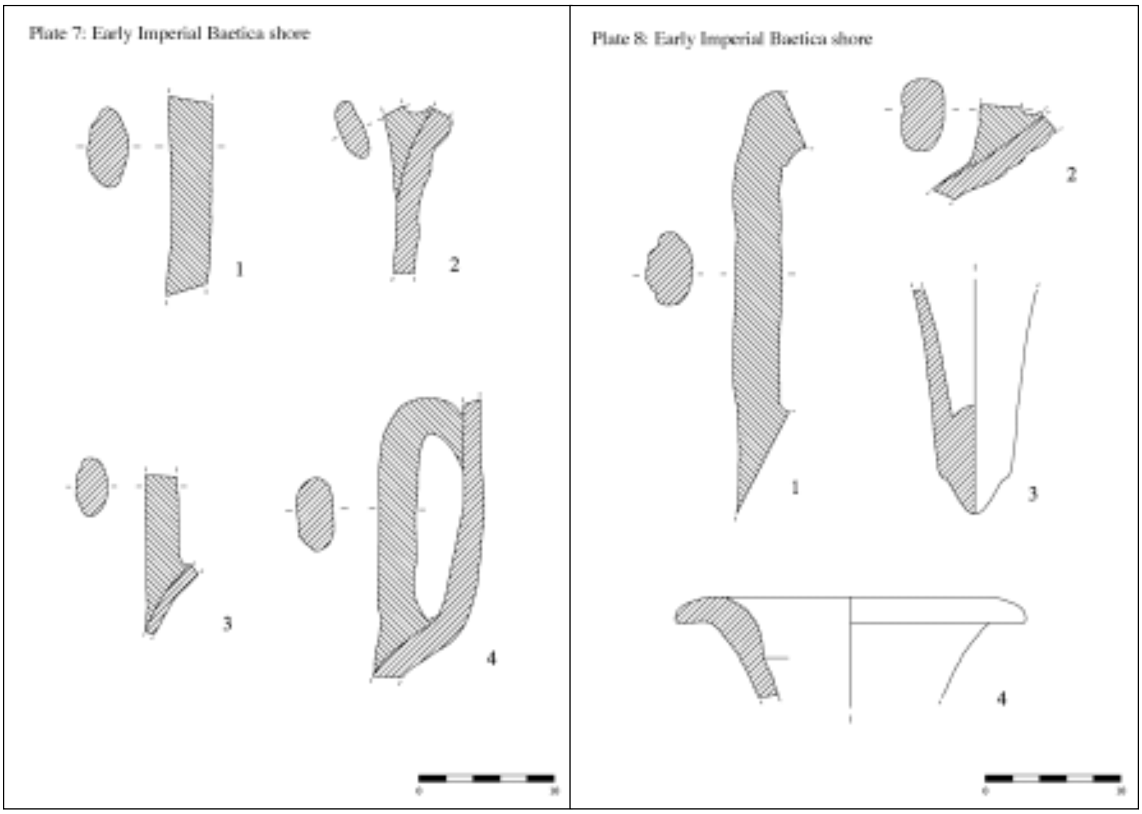


Figure 51: Plates 7 and 8, amphorae from the 1st century AD (scale bar 10 cm).

Imports from outside the Iberian Peninsula are represented by Italian amphorae (Dressel 2-4, Figure 52, Plate 9: #1) and French amphorae (Gauloise 4, Figure 52, Plate. 9: #2). These imports are characteristic in Hispalis during this period. The largest Roman amphorae assemblages excavated within Seville, at Mercado de la Encarnación (Amores *et al.*, 2007), Calle San Fernando (García Vargas, 2012a), and Patio de Banderas (García Vargas *et al.*, 2015), have additional imports from other regions such as Lusitania or the Eastern Mediterranean. The Plaza Nueva assemblage probably lacks these other imports due to its small size (i.e. only fifty diagnostic sherds).

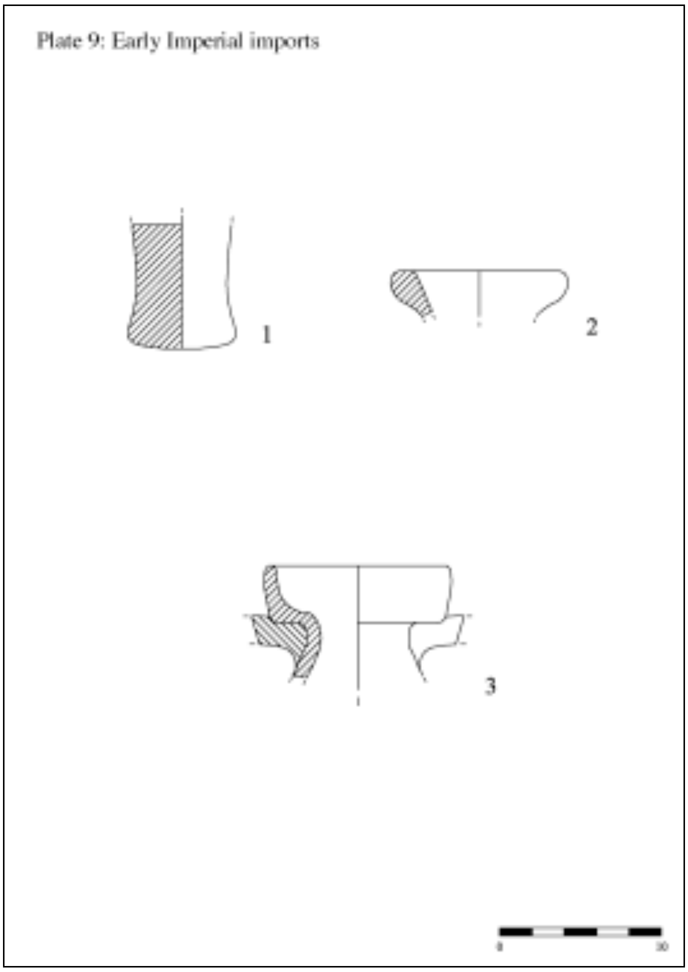


Figure 52: Plate 9, amphorae imports from the Imperial period (scale bar 10 cm).

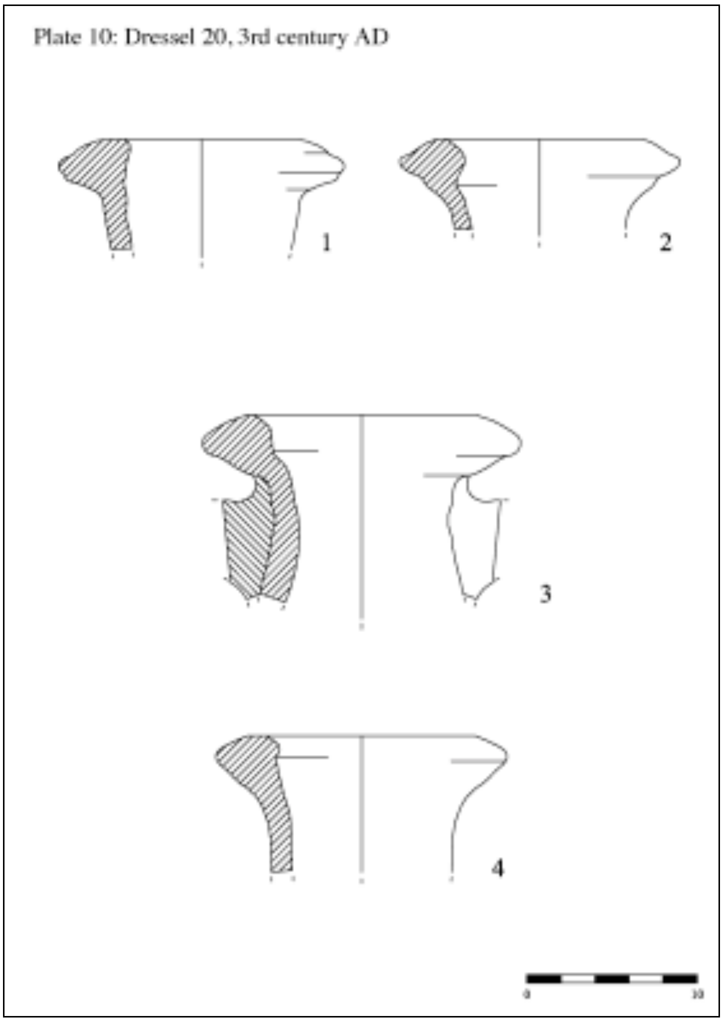


Figure 53: Plate 10, amphorae from the 3rd century AD (scale bar 10 cm).

Different amphorae types from the 3rd century AD represent the transition to the late Imperial period. From the Baetica region, late Dressel 20 type oil amphorae (oil amphorae are the largest group in the Plaza Nueva assemblage); from Lusitania, amphorae type 3 (Figure 52, Plate 9: #3); there is one wine amphora imported from the Tagus-Sado region, which are common in 3rd century amphorae assemblages from the lower Guadalquivir (García Vargas, 2016).

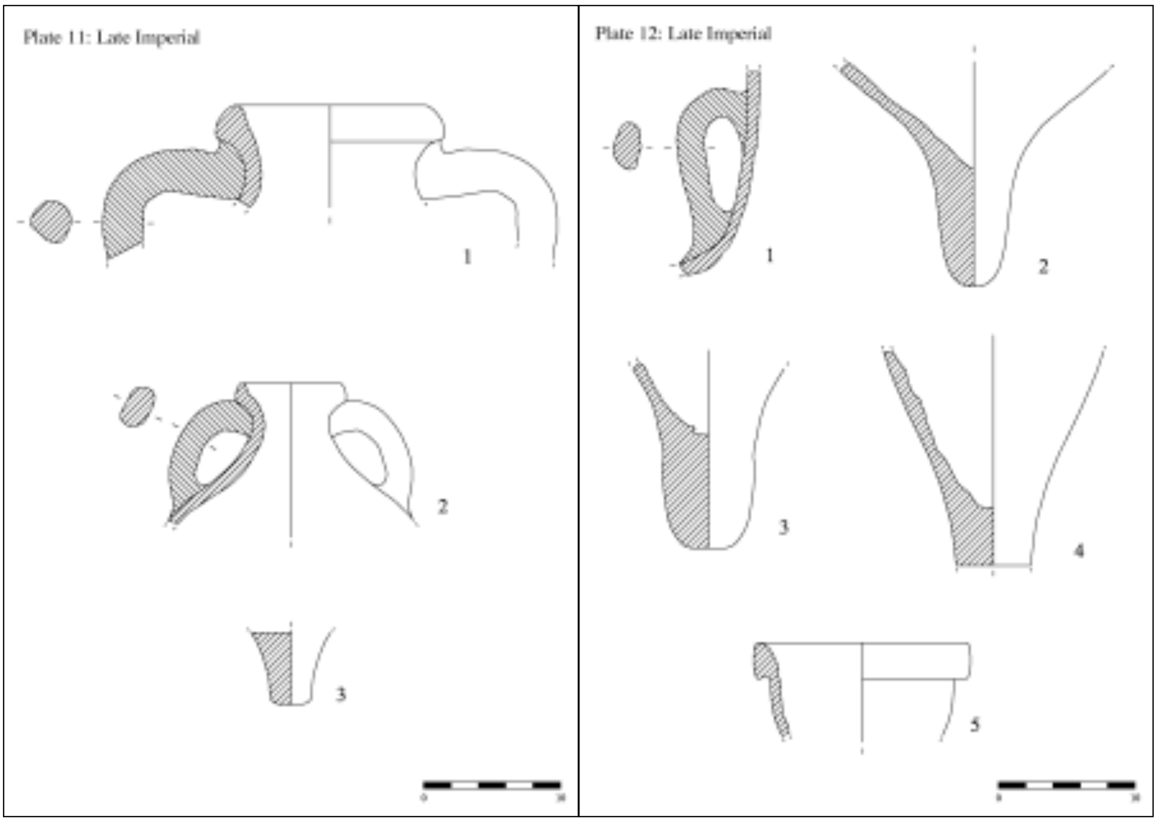


Figure 54: Plates 11 and 12, amphorae from the 4th to 6th centuries AD (scale bar 10 cm).

Finally, within the Plaza Nueva assemblage, there are also examples of oil amphorae remains from the 4th and 5th centuries AD (Figure 54, Plate 11); these are Dressel 23 types (Berni Millet and Moros Díaz, 2012), produced after the Dressel 20 type (*cf*. Keay, 1984: type XIII). North African amphorae (Figure 54, Plate 12) include the feet of generic shapes from the 3rd century such as an African II type (Bonifay, 2004); feet from African IIA types (Figure 54, Plate 12, #2 and #3); from the 4th and 5th centuries AD handles and feet of a Keay 25 type which Bonifay (2004) classifies as African III type (Figure 54, Plate 12: #1 and #4). There is a rim of a Keay 62 type (Figure 54, Plate 12, #5) from the last decades of the 5th century AD or the first decades of the 6th century AD (Bonifay, 2004: 137-140). This amphora fragment has the latest chronology of the assemblage: this type has also been found in Seville in the Plaza de la Pescadería excavation, where a water cistern from the Imperial period was found filled with late antique dumps from the mid 6th century AD (Maestre Borge *et al.*, 2010: fig. 4.4-5).

Regarding the ceramics from the Roman period found at Plaza Nueva, the following observation can be made. All the ceramics documented from the Roman period, mostly amphorae, present wear and abrasion on the surface. This seems to be the product of a lengthy period of rolling around in the bed of the Baetis River during Roman times. Consequently, the remains seem to be waste material discarded into the river.

Despite its reduced size, the assemblage of amphorae remains from Plaza Nueva is representative of the imports and exports found in other archaeological excavations in Seville to date (García Vargas, 2012a; 2012b; García Vargas *et al.*, 2015). In broad terms, all the different historical phases or periods of trade activities of the ancient Hispalis, exemplified by amphorae remains, are present at Plaza Nueva. However, due to the limited number of pieces within the assemblage (i.e. 50 amphorae), it is representative mainly in the qualitative sense rather than in quantitative terms.

This is shown for the most prolific period of trade of ancient Hispalis, the 1st century AD. Around half of the amphorae found at Plaza Nueva belong to this period; in fact the 1st century AD amphorae from Plaza Nueva are documented in 6 out of 12 Plates (i.e. Plates 3 to 9).

Amphorae from the Late Imperial period and Late Antiquity (3rd to 6th centuries AD) are also represented in the Plaza Nueva assemblage, in accordance with other excavations conducted in Seville. Two characteristic periods of imports to Hispalis (García Vargas, personal comment) are represented in the assemblage: the 3rd century AD (especially the first half) and the 5th and 6th centuries. However, the Plaza Nueva assemblage has more African amphorae compared with other assemblages excavated in Seville (García Vargas, personal comment). In other excavations within Seville, African amphorae represent smaller quantities compared with the larger numbers of amphorae from Baetica, from the Eastern Mediterranean (especially during the 5th and 6th centuries) and amphorae from Lusitania, which are very numerous from the 3rd century onwards, as represented by the Plaza de la Encarnación assemblage (Amores *et al.*, 2007). In fact, there is only one amphora from the 4th - 5th centuries (a Keay 19 type, Figure 54, Plate 11: #3) that could be from Lusitania but, according to its fabric, is more likely to be from the Mediterranean shores of Baetica (García Vargas, personal comment).

3.8.2 The Cine Imperial theatre findings

From 1944 to 1952 the Teatro-Cine Imperial theatre, located at 25 Calle Sierpes (Figure 40, number 2), underwent a drastic remodelling, being first demolished to the ground to be later rebuilt anew as a cinema theatre (Soto Vazquez, 2001: 312 note 4). During these public works, important archaeological discoveries relating to the ancient port of Hispalis were made.

Unfortunately, a proper archaeological intervention was not attempted, and only reports and some plans have survived. These were made by the voluntary efforts of local archaeologist Mr Francisco Collantes de Terán Delorme and the architect Mr José Galnares. The former reported this, and other archaeological discoveries, in his doctoral Thesis submitted in 1956, which was not published until 1977 (Collantes de Terán Delorme, 1977). At the Cine Imperial site, geological deposits consisting of fluvial sands positioned on top of a clay deposit were found; Collantes de Terán Delorme identified these deposits as remains of an ancient palaeo-channel of the Baetis River (Collantes de Terán Delorme, 1977: 34). He also pointed out that discovery of these deposits confirmed the first account (of which we know) made by Rodrigo Caro in the 17th century. This scholar from Seville published a work on the history and antiquities of Seville (Caro, 1634) in which, among many other interesting things, he suggested the existence in antiquity of two channels of the Guadalquivir River. He explained that remains from the ancient channel (long lost in the 17th century) could be found when digging up deep trenches in certain streets.

> *(…) Efto fe manifiefta mas, porque en muchas partes, abriendo çanjas en lo muy profundo, hallan arena lavada, que es feñal de la antigua corriente del rio. (…)* (Caro, 1634: fol. 25)[39]

Collantes de Terán Delorme also described that in the fluvial sand deposit at the Cine Imperial site, a complete Roman amphora was found perfectly preserved. Also, regularly driven into the mud deposit, several wooden (pine) piles of 1.50 m in length and pointed at their ends were found. He identified these wooden piles as foundations for Roman buildings (Collantes de Terán Delorme, 1977: 34).

[39] (…) This is manifested, because in many places, opening trenches in the very deep, washed sand is found, which is a sign of the ancient corridor of the river (...) (translation by author).

Collantes de Terán Delorme reported nothing else about this site, but in 2010 D. González Acuña found two original site drawings (plan and section) (Figure 55 and Figure 56) of the Cine Imperial site (González Acuña, 2010: 88-89; 2011: 416-418) while researching in Collantes de Terán Delorme´s personal archives. González Acuña described the remains documented in the drawing from a shallower position to the deepest objects and structures as follows:

- Large jars encrusted in the stratum (depths -2.1 to -2.5 m).
- Large open space with a total area of 68 m^2 in which the floor was made of square tiles (depths of the upper surface -2.5 to -2.6 m).
- Remains of a wall labelled in the drawings "Muro antiguo 2"[40] which has an east-west orientation (depth of the upper surface -2.8 m). It runs 64 cm away parallel to the north end of the tiled floor.
- Remains of four parallel walls interconnected by other longer walls that seem to be made of stone ashlars. The remains are *circa* 15 m in length with an east-west orientation, yet the four parallel walls have north-south orientation. The parallel walls have different thicknesses and depths of their upper surfaces ranging from -3.4 to -4.2 m, seeming to become deeper (i.e. inclined) towards the west[41] (Figure 55 and Figure 56).
- Remains of a conduit made of brick masonry with an east-west orientation and inclined to the west[42]; it seems to be built by a flat foundation topped with a semi-circular ceiling all made of brick masonry.

[40] "Ancient wall 2"
[41] González Acuña (2011: 417) described the inclination towards the east; however, this seems to be a mistake caused by south orientation of the original plan drawing.
[42] *Ibidem*.

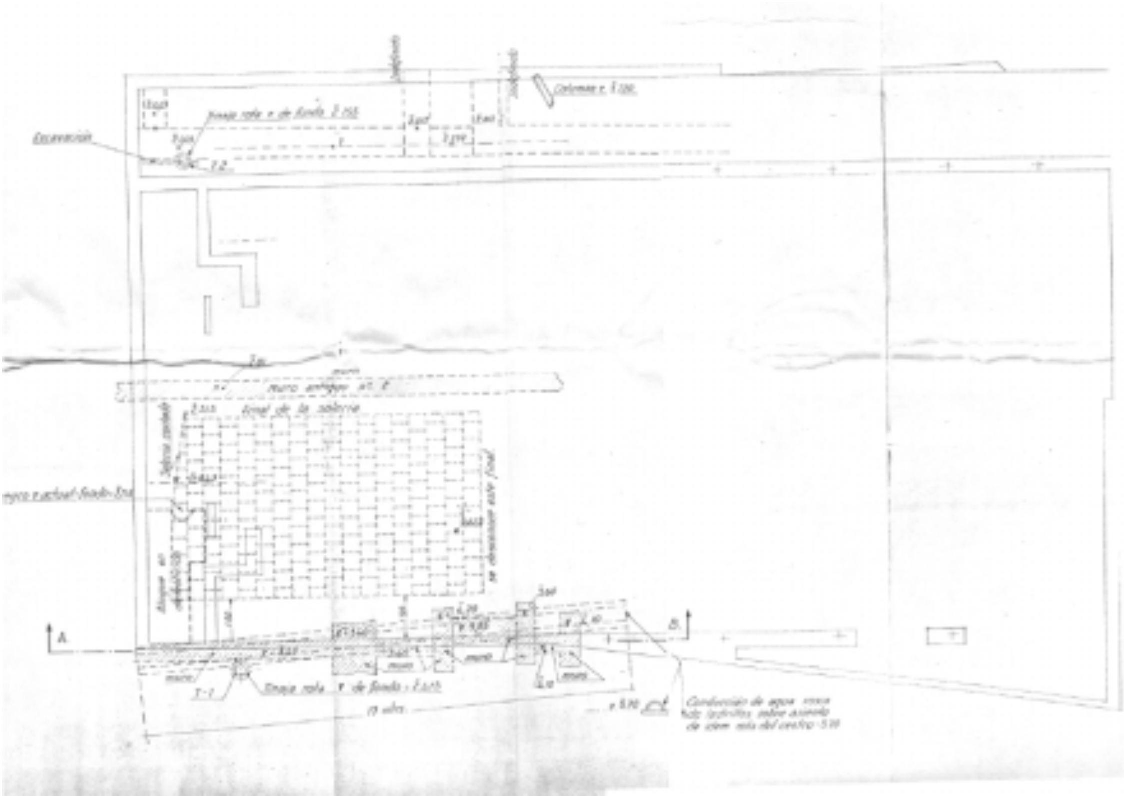


Figure 55: Original site plan of the Cine Imperial site (González Acuña, 2010: 88).

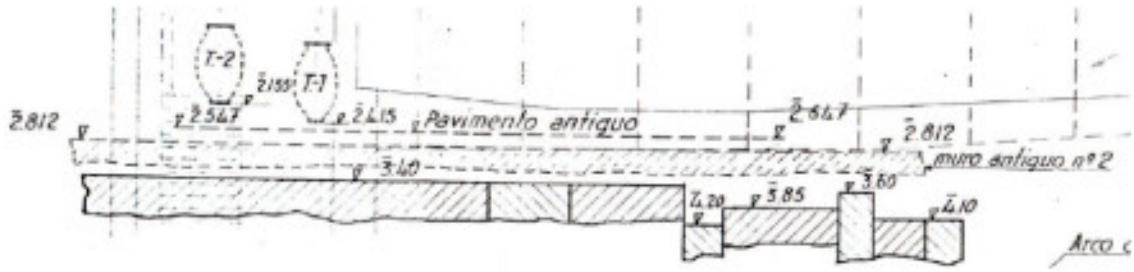


Figure 56: Original site section of the Cine Imperial site (González Acuña, 2010: 89).

González Acuña tentatively reconstructed the archaeological stratigraphy of the Cine Imperial site. He compared the depths and construction techniques documented in the drawings with nearby archaeological excavations (within the city centre of Seville) in which the Roman remains had been properly recorded. His proposed reconstructed stratigraphy is as follows:

- Sewage conduit (possibly from the early Roman Empire).

- Ashlar walls (Roman era).
- The position of the open space with tiled floor indicated a more recent chronology; based on nearby findings[43], González Acuña gave a tentative date later than the 4th or 5th centuries AD, with caution (González Acuña, 2010: 89; 2011: 417).

3.8.3 The trench from Puerta de Jérez to the Plaza de San Francisco Square

A few years later, in 1960 during the construction of a new underground sewage collector in Seville, different archaeological remains were found during the execution of the public works. In a 5 m deep and 300 m long trench that extended from the Puerta de Jerez Square to the Plaza de San Francisco Square (Figure 40, numbers 3 to 4), ancient building foundations (including the remains of what seemed to be the Roman and Islamic city walls), thousands of Islamic pottery shards, and other archaeological remains were unearthed. Mr J. M. de Carriazo Arroquia, the archaeologist in charge of supervising the public works, soon published a brief account of the discoveries in the local press (*ABC de Sevilla*, 16 September 1960: 5-9), which was later republished in an academic journal (Carriazo Arroquia, 1974-1975). Unfortunately, he never published a final report/work of his many findings.

Among the archaeological remains found in these public works, Carriazo described the presence of large wooden piles (Figure 57) in the Plaza de San Francisco Square, which he identified as foundations for Roman buildings (Carriazo Arroquia, 1974-1975: 96). He probably proposed this hypothesis taking into

[43] Mercado de la Encarnación site and Calle Cuna excavation (Jiménez Sancho, 2014).

consideration previous findings of similar wooden piles found in the construction of the Cine Imperial site (*vide supra*) and Collantes de Terán Delorme's hypothesis which identified these wooden piles as foundations for Roman buildings (Collantes de Terán Delorme, 1977: 34).

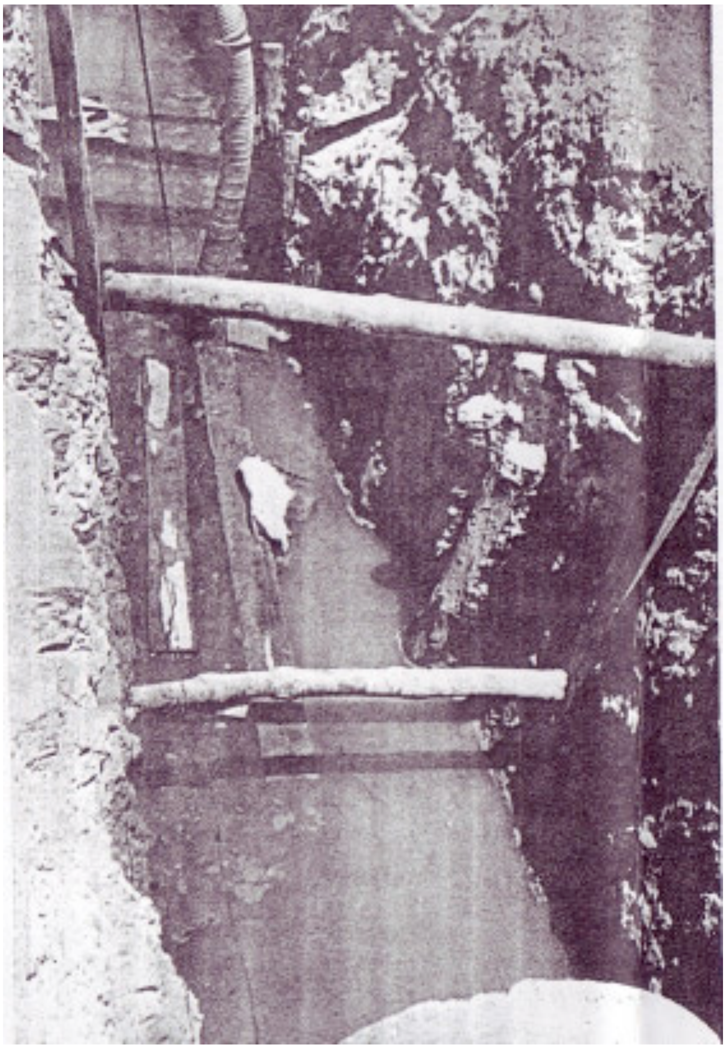


Figure 57: Wooden piles found in the Zanja de la Avenida (Archivo Collantes de Terán Delorme).

Carriazo also proposed that these wooden piles were the same Roman wooden foundations that Saint Isidore of Seville mentioned in his etymologies (Carriazo Arroquia, 1974-1975: 96-97). Saint Isidore explained the origin of the Roman name of the city of Seville, Hispalis, in one passage of his Etymologies (XV, 1, 71).

> *(…) Hispalim Caesar Iulius condidit, quam ex suo et Romae urbis vocabulo Iuliam Romulam nuncupavit.* Hispalis *autem a situ cognominata est, eo quod in solo palustri suffixis in profundo palis locata sit, ne lubrico atque instabili fundamento cederet. (…)*[44]

A. Blanco Frejeiro (1992) supported Carriazo's hypothesis that the original function of the wooden piles was as foundations for Roman buildings, yet Blanco proposed that these buildings were close to the ancient river channel. Carriazo's hypothesis was not challenged until 1984, when Guerrero Misa (1984: 96) proposed that the wooden piles found at the Plaza de San Francisco Square were remains of wooden port structures. He referred to wooden remains of piers or a long wharf where ships docked to load and unload cargo or passengers. He supported this new hypothesis by the discovery of ancient nautical finds at Plaza Nueva Square, a few metres apart from the Plaza de San Francisco Square where Carriazo described the presence of large wooden piles in 1960.

Other archaeological remains found at the Zanja de la Avenida were what Carriazo described as the foundations and core of the Roman city wall, made of extremely hard concrete (i.e. *opus caementicium*) (Adam, 1994: 76) that *"broke many of the steel tips of the pneumatic hammers"* used to dig the trench (Carriazo Arroquia, 1974-1975: 93). According to Carriazo these foundations were also discovered during the construction of the adjacent Coliseo España theatre built in the 1920s. Because these Roman *opus caementicium* foundations are located far away

[44] (…) Julius Caesar founded Hispalis (i.e. Seville), which he called Julia Romula for his own and Rome's name. But Seville was nicknamed after its site, because it was placed in swampy ground on piles (*palus*; *his palis* = 'on these piles') driven deep so that it would not succumb to its slippery and unstable foundation (…) (Isidore transl. by Barney et *al.*, 2006: 305).

towards the south of the believed location of the Roman city walls and extremely close to the ancient channel of the Baetis River, Ordóñez Agulla (1998: 157-158) interpreted them as foundations of a Roman quay. Outside this section of the Roman wall (i.e. towards the south) graves were found and in the area at the south end of the Avenida de la Constitución Roman walls built with *tegulae*, as well as columns made of brick, were unearthed (Carriazo Arroquia, 1974-1975: 92-93, 95). *Tegulae* walls and columns made of brick were also discovered in the nearby (i.e. 100 m towards the south) excavations of Avenida de Roma (Camiña and Gamarra, 2004; Gamarra and Camiña, 2006), as well as in the Patio de Banderas excavation (Tabales Rodríguez, 2015); the Roman buildings erected with these construction elements have been identified as *horrea* of warehouses (*vide infra*).

3.8.4 The Avenida de Roma salvage excavation

From July 2002 until October 2003, a salvage archaeological excavation was conducted as a result of the construction of an underground car park at Avenida de Roma (Figure 40, number 5). During the archaeological excavation numerous archaeological remains and several ancient structures, belonging to different historical periods, were unearthed.

The different structures relating to the Roman period are of special interest. These include: structural remains of Roman buildings (Figure 58) that could be associated with storage and distribution of commercial products (i.e. *horrea* or *tabernae*); remains of kilns and workshops (i.e. *figlina*) dedicated to the production of ceramic containers (i.e. amphorae), mostly intended for the transport of foodstuffs; and finally, other large remains of structures that, given the proximity of the site to the banks of the Guadalquivir River, could be related to port infrastructures (i.e. quays) of Hispalis.

Figure 58: Remains of Roman *horrea* or *cubicula* unearthed at Avenida de Roma (Salvador Ordóñez Agulla).

Unfortunately, this commercial archaeological excavation was not carried out adequately, with less than desirable documentation standards for the archaeological remains. Consequently, the final report and publication of the excavation (Camiña and Gamarra, 2004; Gamarra and Camiña, 2006) offers just a brief description of the remains, which is very basic and without a scientific analysis of the nature and significance of the structures found. These reports seem to massively undervalue the apparent abundance, quality, and significance of the structures found during the excavation at Avenida de Roma.

The remains of a possible quay found at Avenida de Roma are of special interest for the present Thesis. On the west end of the excavation, in the deepest area and very close to the location of the ancient palaeo-channel of the Baetis, a poorly preserved structure made of masonry was unearthed. This discovery was unnoticed by the archaeologists in charge of the excavation and, consequently, not reported (Camiña and Gamarra, 2004; Gamarra and Camiña, 2006). Fortunately, Dr Salvador Ordóñez Agulla from the University of Seville visited the excavation as an expert consultant and noticed the structures, taking two photographs (Figure 59 and Figure 60).

Figure 59: Remains of a Roman period masonry structure unearthed at Avenida de Roma (Salvador Ordóñez Agulla).

Figure 60: Detail of the remains of a Roman period masonry structure unearthed at Avenida de Roma (Salvador Ordóñez Agulla).

The masonry structure was flanked by a Roman *via* and next to the *figlina* found in the excavation (González Acuña, 2010: 90). The relationship between *figlinae* and loading areas of port structures has been proposed in other towns in the Baetis (Chic García and García Vargas, 2004). It is very difficult to interpret the remains documented in the photograph: the upper elements seem to belong to a large structure made of masonry over a foundation of concrete. The preserved structure could be part of a stone quay from the Roman period. Its location to the south of the foundations discovered at the Avenida de la Constitución by Carriazo, but in the same alignment, could support the hypothesis that these are indeed the remains of a Roman quay.

Figure 61: Pierced mooring stones exposed at a Roman quay, along the Tiber in Rome (Blackman 1982b: fig. 2).

The precise arrangement of the remains is difficult to ascertain in the light of the two single photographs preserved. They could represent a terraced structure or, perhaps, the remains of stairs to facilitate access from and to the quay. This type of structure from a stone quay could be similar to those of the port of Rome (Figure 61) (Mocchegiani, 1982) and the quays at Portus (Figure 62). González Acuña, (2010: 90) also proposed that they might be similar to nearby examples such as Celti (Amores and Keay, 1999: 245) or Ilipa Magna (Millán León, 1989), although the nature and function of the structures of the former example is still open to debate (*vide supra*).

Figure 62: Remains of the Roman quay at the *Canale di Imbocco* del *Porto di Traiano* (Author).

3.8.5 The Plaza Campana findings

The latest discovery of archaeological remains that seem to be related to harbour structures of the Roman port occurred in October of 2014. During the public works for the installation of an underground garbage container, at the junction of Martín Villa and La Campana streets, an ancient structure was found.

A core of *opus caementicium* (i.e. Roman concrete) made of mortar, bricks and *tegulae* fragments, faced with an *opus quadratum* wall (Adam, 1994: 106) built with ashlar blocks of local stone, constituted the structure found. Only three courses of ashlar blocks are preserved in the wall, with heights (in metres above sea level) of +4.6 m (top) and +3/2.7 m (bottom), although the *opus caementicium* core has a height of +5.6 m (Figure 63). The archaeologists have dated this structure to the 1st c. AD, although they do not specify the dating method used; however, it seems that the chronology was based on the type of materials used and the morphology of the wall.

Figure 63: Remains of a Roman structure unearthed at La Campana street (Francisco Borja Barrera).

On top of the *opus quadratum* wall there is another wall built at a later period by reusing the ashlars of the Roman wall. Different building materials were used in this second wall; reused Roman ashlars (i.e. *spolia*) in courses with alternating stretchers and headers (Adam, 1994: 110), including rubble and bricks in the junctures. This wall has a footing, which protrudes 60 cm from the face of the wall, made of small ashlars over a single row of bricks. This second wall has heights of +6.27 m (top) and +4.77 m (bottom). The archaeologists have dated this second wall to the 10th c. AD, but they do not mention the basis of this estimate. The ashlars from these two walls seemed to have been systematically used as *spolia* from the 12th century onwards, when they were probably reutilised in the construction of the new city wall erected by the Almohads (Jiménez *et al.*, 2014).

3.9 Indirect archaeological evidence for the port of Hispalis

Besides direct evidence of port infrastructures at Hispalis, other archaeological evidence has been unearthed in Seville that provide indirect evidence for their existence.

At the Mercado de la Encarnación, in the northern part of the river port, commercial workshops in relation to the river were excavated. A fish-sauce factory, with five large tanks built from *opus signinum* (Figure 64) for the production of fish-sauce, and a potter's workshop that produced oil lamps were found (González Acuña, 2011: 415-416). Both factories were dated to the mid 1st century AD and were decommissioned at some time between AD 70 and 120 to make way for residential housing (González Acuña, 2010: 87), suggesting major changes in the configuration of the north harbour of the port at this time.

Figure 64: The fish-sauce tanks at the Mercado de la Encarnación excavation (after González Acuña, 2010: fig. 5).

At the Parlamento de Adalucía (Tabales Rodríguez, 2003) and Avenida de Roma (Camiña and Gamarra, 2004) excavations, two *figlinae* for the production of different types of amphorae were unearthed. A total of six furnaces composed the former (Figure 65), and its period of use has been established in two phases from *circa* AD 50 and 150, but it was out of use by AD 200. In the latter, another furnace was excavated, in association with a *horreum* and a deposit of several intact Dressel 20 amphorae with 1st century AD chronology (González Acuña, 2010: 85-86; 2011: 415-416).

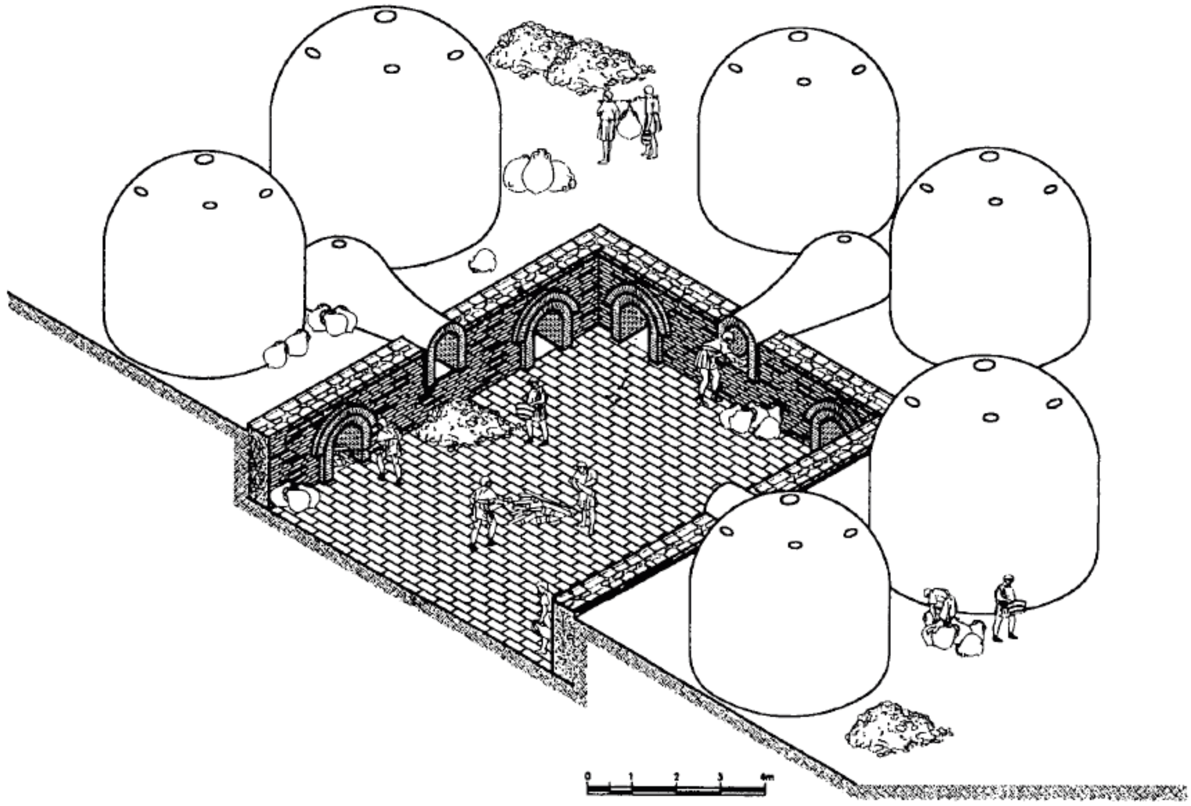


Figure 65: Reconstruction of the six furnaces of the *figlina* found at the Parlamento de Adalucía (after Tabales Rodríguez, 2001: 393).

Roman warehouses and *horrea* used for the storage of goods (Rickman, 1971: 1980) relevant to the maritime commerce of the port have been found in several locations at Seville (Ordóñez Agulla and González Acuña, 2011). The best-studied examples are those from the Mercado de la Encarnación (González Acuña, 2011: 458-465), Avenida de Roma (Camiña and Gamarra, 2004; González Acuña, 2011), Calle San Fernando (Hunt and Pozo, 2004), and the Patio de Banderas (Tabales Rodríguez, 2015). In the Patio de Banderas, part of Los Reales Alcazares, archaeological excavations uncovered the remains of a large warehouse or *horreum* (Figure 66). Built from *opus africanum*, it was first erected in the 1st century BC and later on was rebuilt as a two-naved structure on a more substantial scale in the late 1st century AD, to finally disappear at the end of the 2nd century or at the beginning of the 3rd (Tabales Rodríguez, 2015: 83, 117-120).

Figure 66: Reconstruction of the large *horreum* around AD 60-90, found at the Patio de Banderas excavation (after Tabales Rodríguez, 2015: 185).

The evidence from the different *horrea* found in Seville suggests that the period between the later 1st and the early to mid 2nd century AD witnessed an important development of port-associated facilities. This expansion was bound to the storage of Baetican olive oil prior its transhipment and export from Hispalis to Rome (as an important component of the *annona*) and other ports of the empire (González Acuña, 2010: 103-104; García Vargas, 2013: 261-262).

The area between the Reales Alcázares and the cathedral has produced a number of important 2nd century AD inscriptions commemorating officials involved in the administration of the export of olive oil to Rome (Ordóñez Agulla, 2014: 108-110). These led Blanco Frejeiro (1992: 50) to propose, in the 1980s, the hypothesis that this area may have been the site of a *forum* of the corporations similar to the one in

Ostia *Antica*. Currently this hypothesis has been dismissed (Beltrán *et al.*, 2005; González Acuña, 2011: 173-177) and new interpretations have been offered. On the one hand, there is the discovery of an inscription mentioning *olearii* (Chic García *et al.*, 2001), as well as other inscriptions found which are related to this *collegium* (Ordóñez Agulla and González Acuña, 2011: 171-174; González Acuña, 2011: 212-214). On the other hand, there is the discovery of a large 2nd century AD warehouse in the Calle Francos in connection with a big structure in the Calle Placentines, which have structural similarities to the *Grandi Horrea* from Ostia (Figure 67). These prompted the proposal that this may have been the site of a *statio* of the *collegium* of the *olearii* (González Acuña, 2010: 96-101; 2011: 424-430).

Figure 67: Structures found at Calle Francos in Seville (left) *cf Grandi Horrea* from Ostia (right)(after González Acuña, 2011: figs. 8.14 and 8.15).

In 2007, the site adjacent to the old Cine Imperial, excavated in 1947 by Collantes de Terán Delorme (*vide supra*), was properly excavated and documented. In this excavation at number 10, Calle Cuna, five different historical periods, or phases, were recognised (Jiménez Sancho, 2015).

- Phase I corresponds to the consolidation of the ancient channel of the Baetis River and its riverbank with amphorae dumps, prior to the anthropic occupation of this urban sector. This phase is documented from 2.5 to 3 metres above sea level.
- Phase II attests the first urbanization of the area; collectors and sewers, as well as the first warehouses dated to the Flavian period were documented at 3 metres above sea level.
- Phase III begins from the end of the 1st century and the beginning of the 2nd century and ends around the 5th century AD. This phase coincided with a period of certain stability in the fluvial dynamics (*vide supra*). New collectors were built and new long storage rooms (naves) were erected using the same layout used in the previous phase at about 4 metres above sea level. During the 4th or 5th century, these naves were compartmentalised, reaching about 4.5 metres above sea level, and adapting the space to residential use.
- Phase IV, extends from the end of the 5th to the 11th century. The reactivation of river dynamics (*vide infra*) is documented at the site by thick clay deposits, reaching about 4.5 to 5.5 metres above sea level, and in which evidence of human occupation almost disappears.

- In Phase V, from the 10th or 11th century, the site is no longer affected by fluvial dynamics and it has completely become a residential area. This phase is documented from 5.5 to 8 metres above sea level.

The excavation at Calle Cuna 10 site has confirmed the harbour association of the structures detected at the Cine Imperial, and shown that by the 5th century the whole area had already been transformed for domestic use. Additionally, the influence of river dynamics on the anthropic use and occupation of the left bank of the river has been clearly documented in this site.

Also, religious buildings connected to maritime commerce and the port have been found in Seville. According to Rodrigo Caro in 1606 in the Reales Alcázares, a basalt statue of the Godess Isis with child Horus was found (Caro, 1634: 8), which is now lost. The discovery of this statue suggests the existence of a temple dedicated to Isis, or *Iseum*, which, according to Vitruvius (1.7.1), was related with maritime commerce and port emporia as attested, for example, by the *Iseum* existing at Ostia (Ordóñez Agulla, 2003: 73-74; González Acuña, 2011: 209-211). Numerous, yet very fragmented, opulent building materials such as slabs and decorative carvings of various marble types, tessellae from mosaics, and remains of frescoes, seem to potentially support the hypothesis of the existence of a Temple of Isis in the area of the Reales Alcázares south of the excavated *horreum* (Tabales Rodríguez, 2015: 118-120, 169-183).

Additionally, at the Avenida de Roma excavations (Camiña and Gamarra, 2004) a possible *sacellum* was discovered. A large hall of 64 m^2, decorated with a perimeter band of an epigraphic mosaic, which mentioned the donors of the *pavimentum* as the *Publilii*, *Atticus* and *Herculanus*, was unearthed and dated to the 1st century AD (Figure 68). Two fragmentary inscriptions, found in the same room, with a dedication to *Mercurius Augustus* attest to the religious function of the space in relation to the imperial cult (Ordóñez Agulla and González Acuña, 2011: 166).

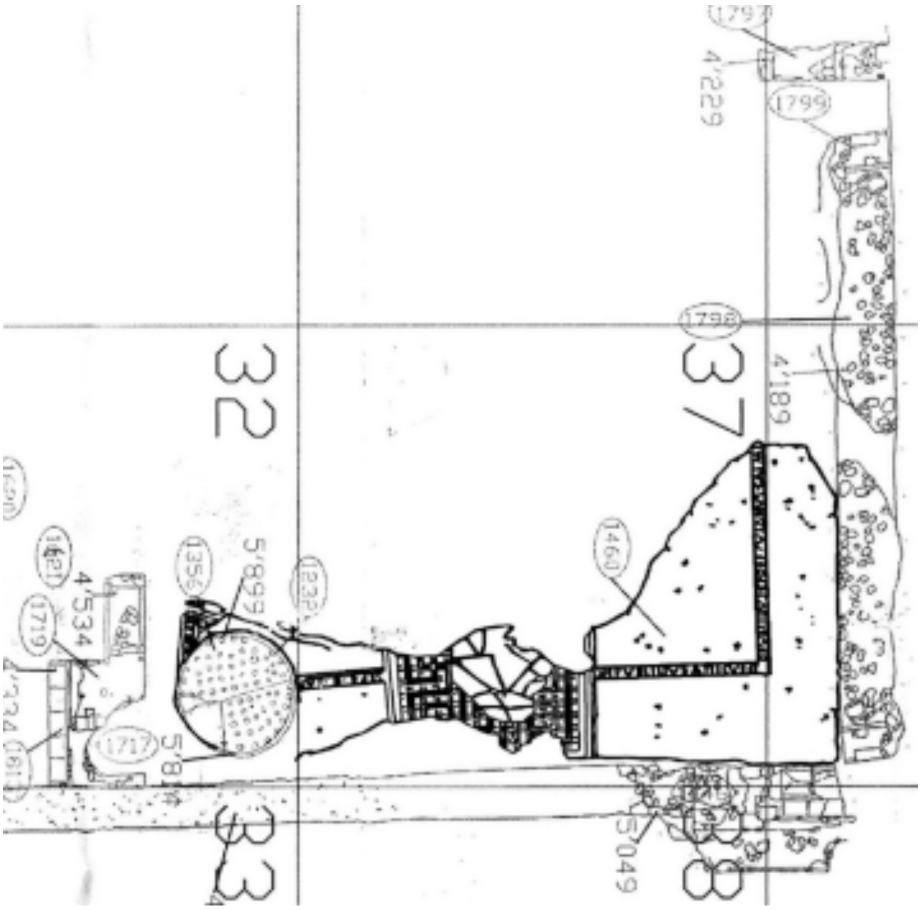


Figure 68: Mosaic inscription of the *sacellum* found at Avenida de Roma (after González Acuña, 2010: fig. 10).

3.10 Concluding remarks on the Roman port of Hispalis

3.10.1 Summary of the development of the port during the Roman period

Taking into account the descriptions in classical texts, the epigraphy of Hispalis, and the archaeological remains unearthed and studied, as well as the palaeo geomorphology of the Guadalquivir River, it is possible to propose a general description of the evolution of the port of Hispalis during the Roman Era.

During the so-called "Roman imperial stable phase", the ancient port of Hispalis seems to have experienced its greatest commercial activity and urban development. The humble port facilities from the Republican period, located in the east riverbank adjacent to the settlement, were expanded southwards towards the mouth of the Tagarete stream. During the Augustan and Julio-Claudian periods (27 BC - AD 68), the port facilities of Hispalis experienced a substantial increase in maritime commercial activity. A commercial harbour district was erected at the south of the city that included storehouses (*horrea* and *cubicula*), small shrines (*aedicula*), and, probably, commercial corporations such as the one unearthed at Avenida de Roma which has an epigraphic mosaic funded by donors of the *pavimentum* the *Publilii*, *Atticus* and *Herculanus*, (Garcia Vargas, 2013: 259).

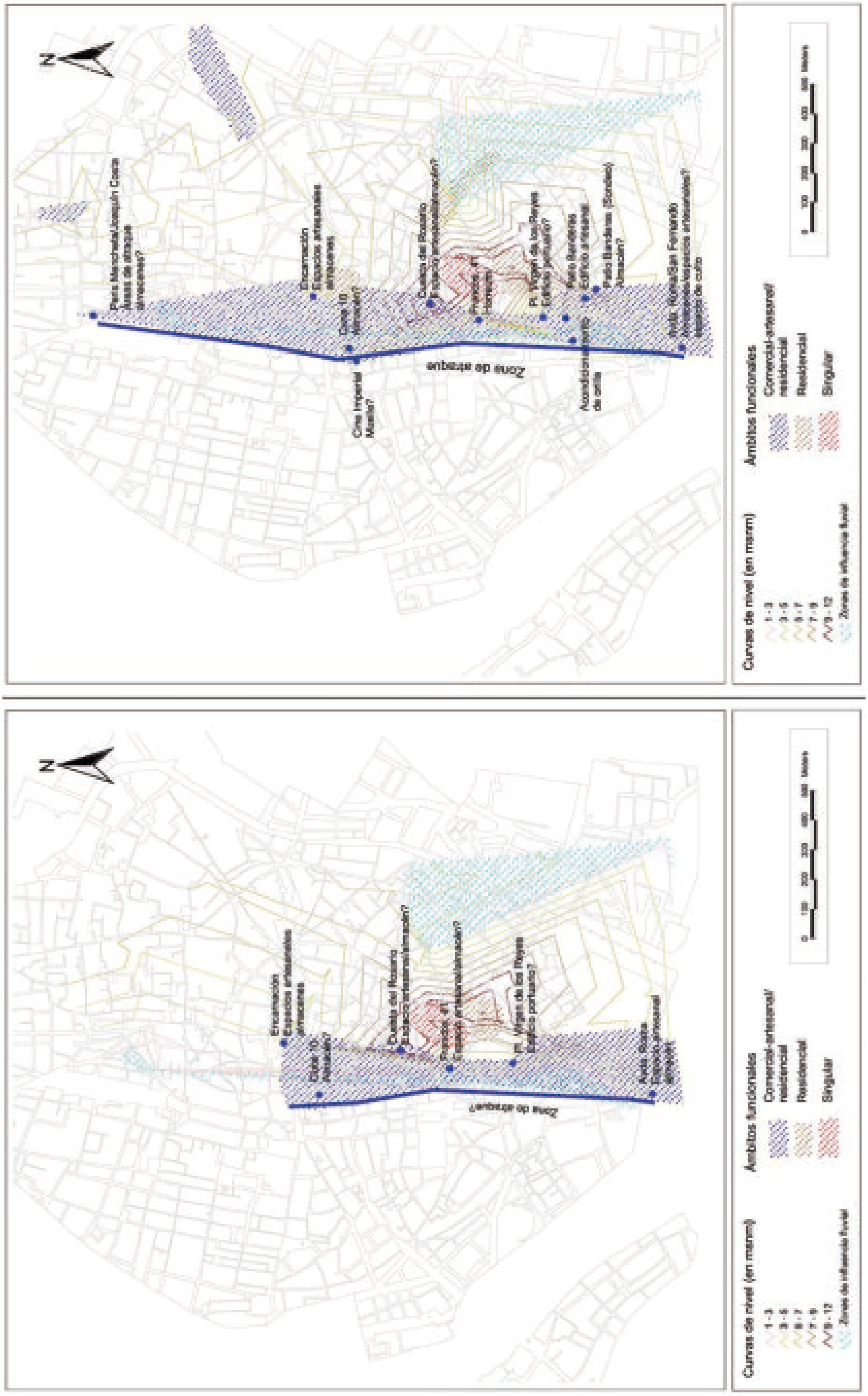


Figure 69: Topography of the port of Hispalis: 1st half of the 1st c. AD (bottom) and 2nd half of the 1st c. AD. Commercial-industrial areas (blue dots), residential areas

(beige dots), and singular areas (red dots)(scale bar 500 m, after González Acuña, 2011: figs. VIII.18 and 19).

Different archaeological excavations have shown that the facilities of the southern harbour district were abandoned and transformed into a large necropolis around the mid 2nd century AD (Garcia Vargas, 2014: 203). By the end of the 2nd or the beginning of the 3rd century AD all the remaining southern harbour areas were covered by alluvial deposits due possibly a tsunami, or high energy event, which destroyed the southern area of the *horrea* complex that stood on the location of the *Patio de Banderas* (Tabales Rodríguez, 2015: 165-186).

It is around the same time, between the mid 2nd and the beginning of the 3rd century AD, that the epigraphic evidence suggests the development of a new commercial district, located in the east riverbank adjacent to the city. The discovery of a large 2nd century AD warehouse in the Calle Francos in relation to a large structure in the Calle Placentines, similar in construction to the *Grandi Horrea* from Ostia, has led to the proposal that it is the site of a *statio* of the *collegium* of the *olearii* (González Acuña, 2010: 96-101; 2011: 424-430). The abandonment of the south harbour area in parallel with the development of a new commercial district, suggests a reorganization of the maritime commercial activities of the port of Hispalis. This transformation is also directly related to the commencement, at the 2nd century AD, of the *annona* oil trade with Rome (Garcia Vargas, 2013: 262). It is particularly in that period when thousands of Dressel 20 amphorae were shipped to Rome in *naves onerariae*, departing from the port of Hispalis.

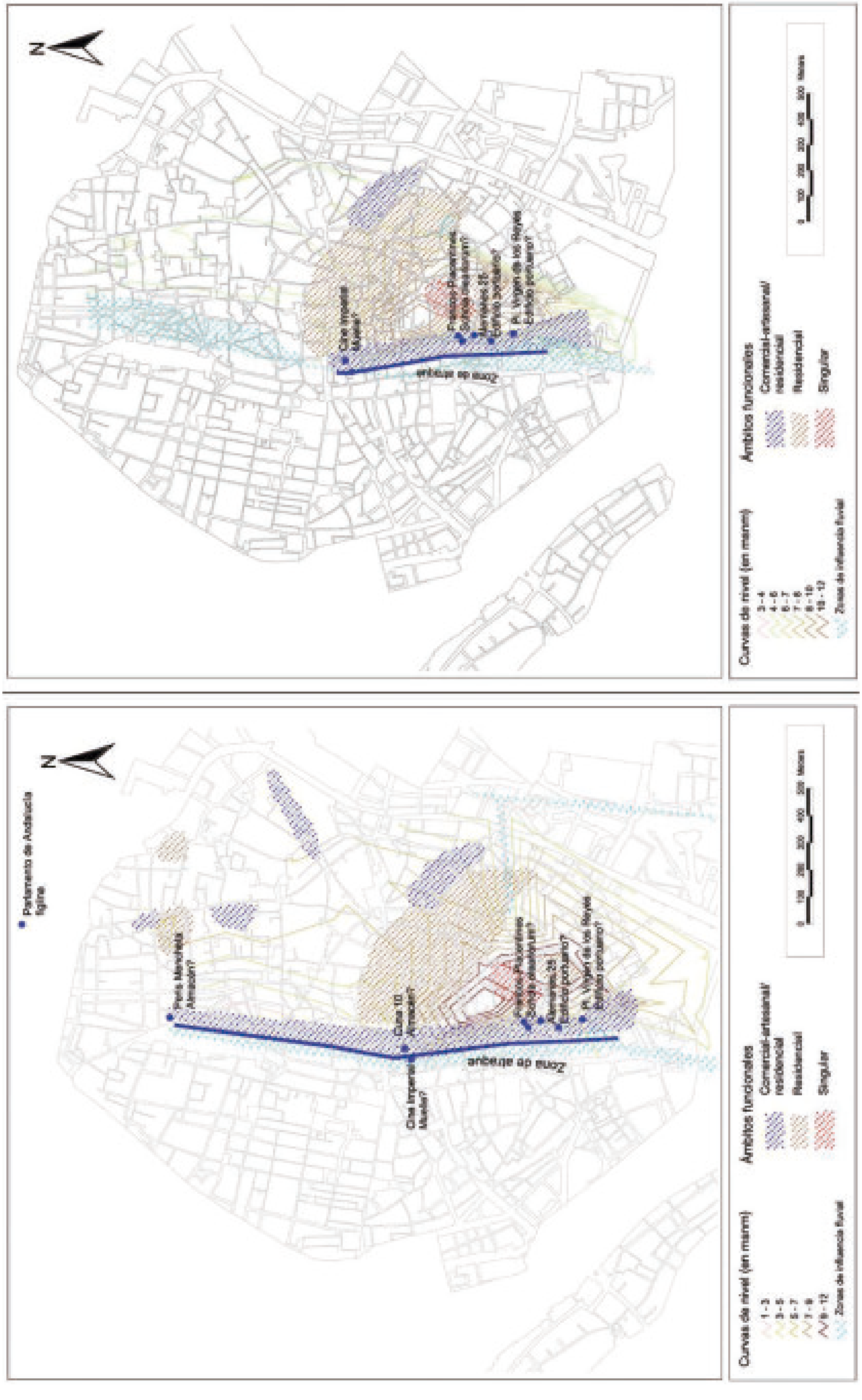


Figure 70: Topography of the port of Hispalis: 1st half of the 2nd c. AD (bottom) and between the 3rd c. AD and the 1st half od the 5th c. AD. Commercial-industrial

areas (blue dots), residential areas (beige dots), and singular areas (red dots)(scale bar 500 m, after González Acuña, 2011: figs. VIII.20 and 21).

Garcia Vargas (2014: 204) has suggested that this harbour, located directly in front of the site of a *statio* of the *collegium* of the *olearii*, was therefore strongly associated with the officials in charge of supplying the city of Rome and the armies in the Empire borders, attested by epigraphic documents from Hispalis (*vide supra*). The harbour would have been primarily focused on the ships in relation to the Imperial acquisition of Baetican foodstuffs, and this would allowed for a more concentrated operational area. After the decay of the *annona* system around AD 260, it is probable that the extent and the bulk of maritime traffic at this harbour were reduced (Garcia Vargas, 2014: 204-205).

To the north located both inside and outside the city walls, the harbour district of the eastern bank of the Baetis had commercial, storage and craft production areas, which were built during the Julio-Claudian period (27 BC - AD 68). Around the end of the 1st or the beginning of the 2nd century AD, these commercial areas were replaced by luxurious residential areas (Garcia Vargas, 2013: 259-260) that remained as such until the mid 5th century (see Chapter 4).

The three harbours of Hispalis seem to have been connected by a long riverfront on the east bank of *circa* 1.5 km in length. It has been proposed that the wharf length of a harbour (Figure 71) could serve as indicator of its capacity (Wilson *et al.*, 2012: 382). Although the fragmentary nature of the archaeological record in Seville does not allow us to get a clear idea of the precise configuration and extent of the harbour facilities, the potential 1.5 km of wharf length at Hispalis is comparable to the 1.2 km of Lepcis Magna (Wilson *et al.*, 2012: 382) and the one at Ostia, (Keay, 2016: 309).

Site	Harbour area (ha)	Wharfage length (m)	Reference
Portus (total)	234	c. 13,890	Keay (Chapter 2: n. 64); Morelli, Marinucci and Arnoldus-Huyzendveld 2011
Claudian basin	c. 200	c. 2,860	Wharfage figure includes various canals
Trajanic hexagon	33.3	2,100	Keay (Chapter 2, this volume)
Darsena	1.08		
Alexandria, Portus Magnus	>226	12,380	Calculated from plan in Goddio and Fabre 2008: 38
Puteoli (total)	67.9		Calculated from plan in Brandon, Hohlfelder and Oleson 2008: 376 fig. 1
Portus Iulius	53.9		Calculated from plan in Brandon, Hohlfelder and Oleson 2008: 376 fig. 1
Portus Baianus	14		Calculated from plan in Brandon, Hohlfelder and Oleson 2008: 376 fig. 1
Antium	25–30		Felici 1995: 61
Ephesus	c. 18–24		Calculated from Google Earth
Caesarea Maritima (outer basin)	20		Oleson 1988: 152
Hadrumetum	20		Bartoccini 1958: 12
Centumcellae	14	No more than 2,000	Calculated from plan in Caruso, Gallavotti and Aiello 1991
Carthage (circular and rectangular harbours)	14		Romanelli 1925: 92
Terracina	11		Calculated from plan in De Rossi 1980: 100, fig. 25
Lepcis Magna	10.2	1,200	Bartoccini 1958: 12–13
Torre Astura	7.8		Calculated from Marzano 2007: 49, fig. 5
Kenchreae (Corinth)	3		Kingsley 2004: 140
Cosa	2.5		Gazda 1987: 75
Giglio Porto	c. 2		Calculated from plan in Ciampoltrini and Rendini 2004: 138 fig. 6*
La Mattonara	1.24		Calculated from plan in Higginbotham 1997: 94 fig. 18
Villa port at San Simone	0.84		Degrassi 1955: 136
Ventotene (Pandateria)	0.7		Franco 1996: 297

*The units of the scale bar of this plan are not specified and the plan has clearly been greatly reduced from the stated 1:20,000 scale; checking against Google Earth indicates that the scale bar must represent 30 m in 2 m and 10 m units.

Figure 71: Size, harbour area, and wharf length of selected harbour basins of the Roman Mediterranean (after Wilson *et al.*, 2012: Table 20.11).

3.10.2 Discussion: harbour infrastructures of Roman Hispalis

González Acuña has interpreted the remains at the Cine Imperial as the remnants of port structures. He described the archeological remains as a structure of four parallel ashlar walls interconnected by longer ones (Figure 72), inclined, following the natural slope of the ancient channel's riverbank (i.e. west), interpreting them as remains of a Roman quay or landing stage (González Acuña, 2010: 89). González Acuña has interpreted the remains as a framework that created regular square compartments; these were later filled with dumped sand, rubble, concrete, or a mixture of materials, in order to confer structural strength on the quay. González Acuña supports his hypothesis with archaeological examples of Roman quays from the 1st c. AD in Londinium (Milne, 1993: 55-67) and Oiasso (Urteaga, 2003: 206), where structures were made of timber framework, as well as with another archaeological example from the 4th c. AD in Burdigala. However in this case, the structures are made of a combination of stone masonry and a wood framework (Barraud, 2003: 217). Piles driven into the ground in order to further secure the framework often reinforced these structures (Milne 1993: 58-60). González Acuña suggests that the wooden piles found by Collantes de Terán Delorme (1977: 34) could have had the function of reinforcing the quay framework.

González Acuña's hypothesis that the remains of the Cine Imperial site were a quay from the Roman era is plausible, especially if we take into account that the remains were found in a stratum of fluvial sand (Collantes de Terán Delorme, 1977: 34) at a depth (i.e. *circa* 3 metres above the sea level) affected by the daily rise of the river due to tides.

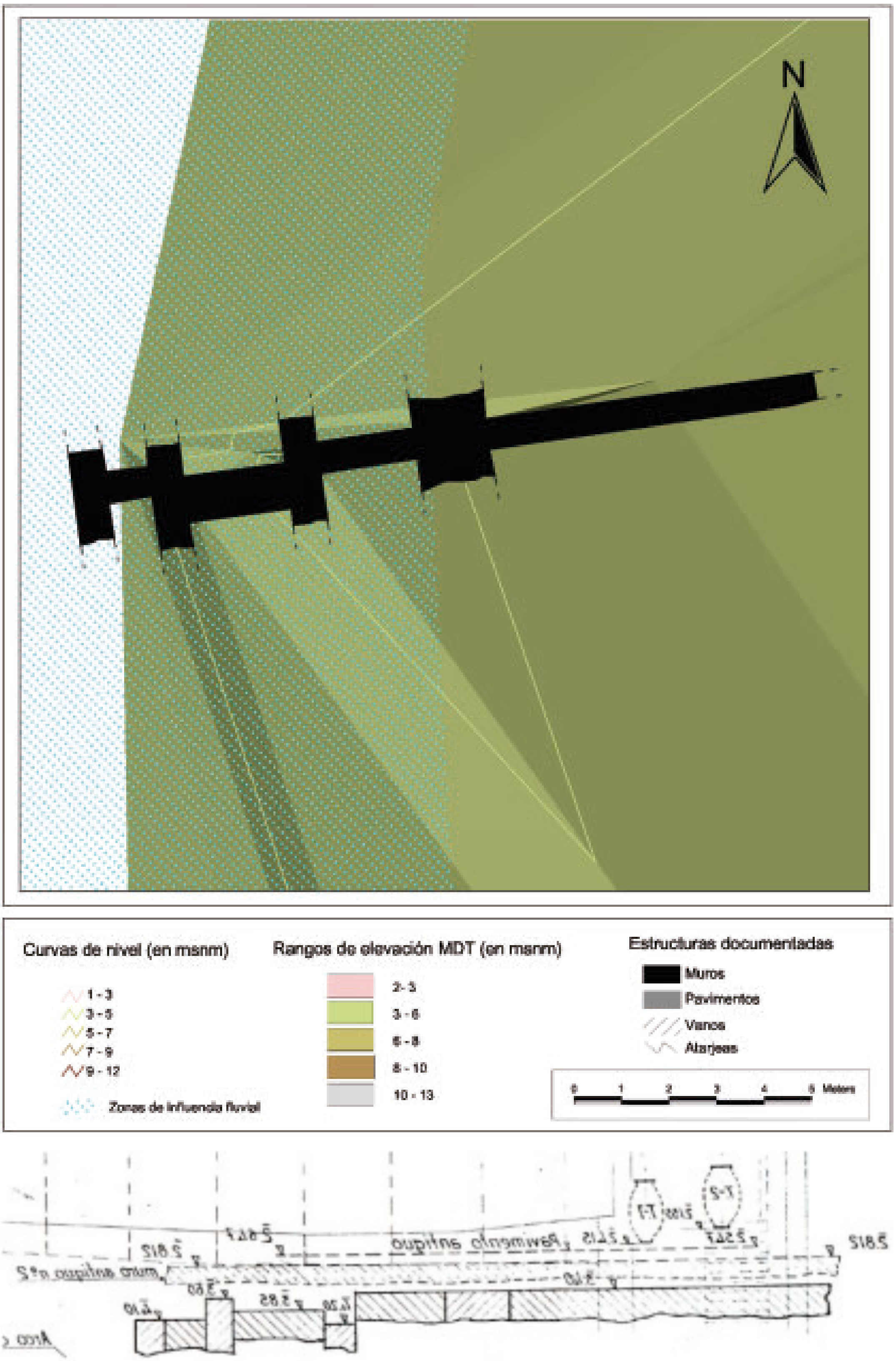


Figure 72: Top, reconstruction of the remains at Cine Imperial (after González Acuña, 2011: fig. 08.07) Bottom, site section of the archaeological remains found at Cine Imperial, the drawing has been reversed horizontally to match the orientation of the remains in the upper image (after González Acuña, 2010: 89).

However, the nature and arrangement of the remains could offer a different interpretation. The wall remains of the Cine Imperial site seem to be solely made of stone masonry. González Acuña's hypothesis that stone masonry was used to create a framework of compartments to be infilled with rubble (as with the quays found in Londinium, Oiasso, and Burdigala) has, to our knowledge, no archaeological example in the Roman world. Stone masonry walls were frequently used to create the waterfront of quays in Roman ports; the space between the back of this wall and the land was then filled with rubble or concrete (Blackman, 2008: 648-650).

Therefore, the four parallel masonry walls (north-south orientation) could also be interpreted as the remains of four different waterfronts of four consecutive quays. The idea that each of them was built at a different time is supported by their different thicknesses; this would also make sense if we take into account that the palaeo channel migrated toward the west (*vide infra*). However, the fact is that the space between the parallel walls is about 0.90, 2.10, and 2.00 m respectively from the outer to inner wall (Figure 72); these interspacings seem to be rather small to justify the successive construction of parallel quay fronts.

It is also possible that these masonry walls are the remains of harbour-associated warehouses. González Acuña's (2010: 89; 2011:417) description of the archaeological remains at the Cine Imperial site *"(...) the compartmentalised ashlar structure, sloped towards the ancient channel of the Baetis, (...)"*, as well as their apparent location in reach of the tidal range (Figure 72 top) would, hinder this hypothesis. However, if we look closely at the surviving site section of the archaeological remains found at Cine Imperial (Figure 72 bottom), the ashlar walls of the structure are not *sloped* but rather terraced towards the channel of the Baetis.

A building with consecutive rooms in which the spaces between its parallel walls are about 0.90, 2.10, 2.00 m, and with the last room measuring at least 7 m in length, all in a terraced configuration, is compatible with a warehouse on a riverbank. In fact, structures from the Roman Republic documented on the banks of the Tiber (Patella and Di Manzano, 2016), adjacent the Ponte Sublicio at Rome (Figure 73), resemble those recorded at the Cine Imperial site.

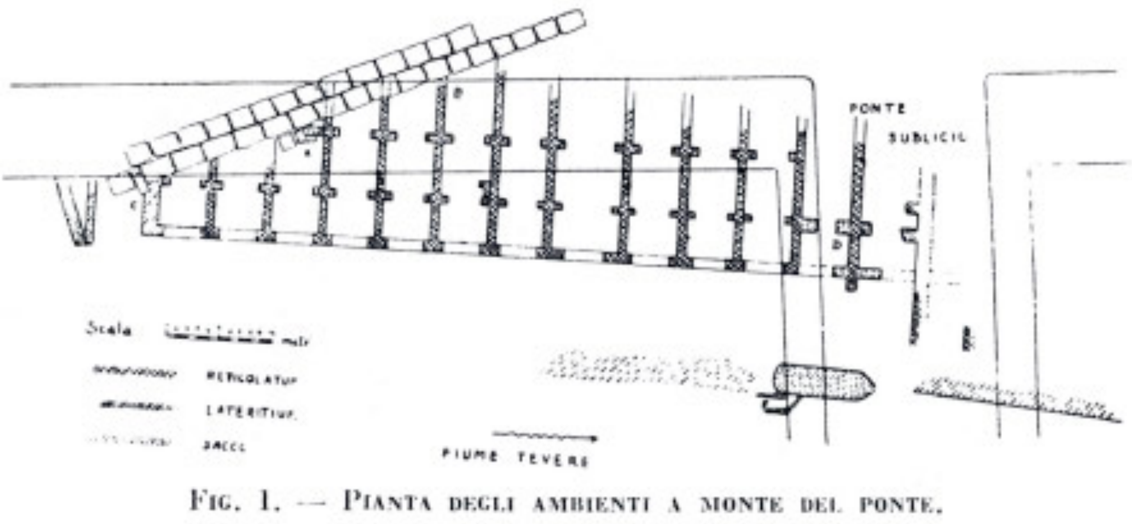


Figure 73: Site plan of the structures found nearby the Ponte Sublicio at Rome (after Patella and Di Manzano, 2016: fig. 3).

Finally, in the adjacent site at Calle Cuna 10 (Jiménez Sancho, 2014), long storage rooms, or naves, (in continuous use from the end of the 1st to the 4th or 5th century) were documented (*vide supra*). The long storage rooms documented at Calle Cuna 10 seem to strongly support the hypothesis that the structures at the Cine Imperial site were part of the same warehouses as those documented at Calle Cuna 10.

González Acuña has interpreted the tiled floor, located approximately 1 metre above the previous structures, as part of a late antique quay (González Acuña, 2010: 89); this large open area (i.e. 68 m^2) was built with the use of square tiles with 60 cm sides. The fact that quays need large open spaces to load and unload cargoes supports this hypothesis. Archaeological parallels for this type of open space are plenty, but of special significance is that of the port infrastructures in the Tiber riverbed at Rome (Mocchegiani 1982: 154).

In direct relevance to the remains of the Cine Imperial site, the structure made of *opus caementitium* faced with *opus quadratum* stone ashlars found at La Campana, could be the remains of a quay waterfront (*vide supra*). They have approximately the same N-S alignment and height (+2.5/3 m) as those remains found at Cine Imperial about 100 m to the south (see Figure 40). It is possible that the structures unearthed at these two sites were adjacent to the same stone quay waterfront that seems to have existed in the north of the city.

On another note, the overall dimensions (i.e. *circa* 75 cm) and type of wood (i.e. pine) of the Plaza Nueva wooden posts are fairly similar to the description given by Collantes de Terán Delorme (1977: 34) of the piles found at the Cine Imperial site. The Plaza Nueva and the Plaza de San Francisco squares are adjacent, so it is possible that the posts found at the former are similar piles to those that were found by Carriazo (1974-1975: 96). Both Carriazo and Collantes de Terán Delorme considered these piles as foundations for buildings or other structures, such as a quay. In either of the two hypotheses, the use of wooden piles was justified due to the unstable nature of the terrain (Vitruvius, *De arch.* 2.9.11, 5.12.6).

Indeed, Vitruvius described that most of the buildings of coastal Ravenna were supported on piles (*De arch.* 2.9.11). This supports the hypothesis of Carriazo and Collantes de Terán Delorme. However, Vitruvius also described that similar piles were used for the construction of harbour infrastructures (*De arch.* 5.12.6). Guerrero Misa (1984: 96) proposed that the piles were part of a large wooden wharf that existed on the east riverbed of the Baetis. This hypothesis was seconded by Ordóñez Agulla (2003: 67) and is supported by Vitruvius' description of the construction of harbours (*De arch.* 5.12.6).

Piling was also used for bridge construction. Caesar described how vertical or splayed supports were driven directly into the bed of the river without the construction of cofferdams (Caesar, *B Gall.* 4.17). Caesar used the term *sublicae* to name these piles, whereas Vitruvius used the term *palis*.

These piles could be interpreted as mooring-posts. However, the length of the posts of *circa* 75 cm seems to invalidate this hypothesis. It is then possible to suggest that due to their characteristics and the context in which they were found, they could be foundation piles. The question remains as to whether these piles were building foundations, or foundations for a stone quay. The white residue present on their upper butt ends could support the former hypothesis; this residue could be the remains of the mortar used in the construction of the structures built above them. This could be clarified by a chemical analysis of the white residue, which has not yet been conducted.

Figure 74: Wooden piles found in the Zanja de la Aveniza (left) *cf* one of the wooden post found at Plaza Nueva (scale 15cm) (Archivo Collantes de Terán Delorme and Author).

Taking into account the other nautical finds at Plaza Nueva (i.e. the wooden boat and iron anchor), they were most likely foundations of port infrastructures such as quays or esplanades. The closely spaced arrangement of the wooden piles found in the Zanja de la Avenida (Figure 74) and their location on the east bank of the Baetis River directly over the line of the waterfront is similar to other foundations for Roman harbours such as the one in Reims (Figure 75).

Figure 75: Two images of the same section of wooden piles used for the foundation of the Roman port of Reims (Inrap 2016).

However, it remains uncertain as to whether or not the eastern bank of the Baetis was composed of a large wooden wharf, as proposed by Guerrero Misa (1984: 96) and Ordóñez Agulla (2003: 66), of several wooden piers, or of a large quay waterfront (or series of quays) such as those at Londinium (Milne, 1993), Oiasso (Urteaga, 2003), Burdigala (Barraud, 2003) or Rome (Mocchegiani 1982).

The morphology of the meander at Hispalis could provide clues as to the type of harbour infrastructures of the ancient port. Any curved meander of a river channel has a concave and a convex side. The concave side creates a convex bank which is sloped in section and subjected to flooding and deposition. The convex side, on the other hand, creates a concave bank which is a vertical river cliff and is the product of the lateral erosion (Beaudoin, 1989: 15; Rieth, 1998: 20-23) (Figure 76).

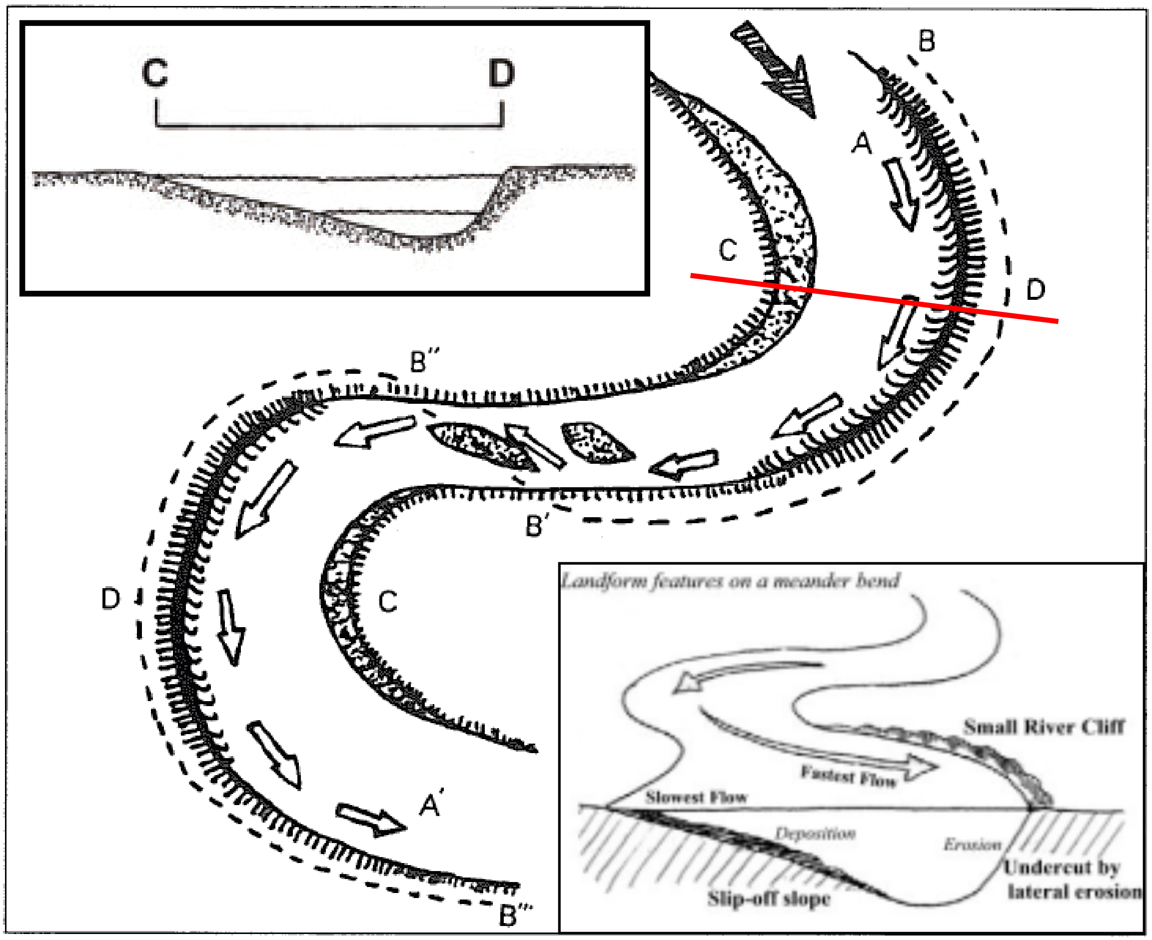


Figure 76: Morphology of the meanders of a river: A, navigable channel of the river; B, optimal area for towpath; C, sloped convex bank of the meander subject to flood; D, vertical undercut on the concave bank of the meander; red line, cross section (top left) of the river channel (after Beaudoin, 1989: 15 and Rieth, 1998: 21).

During the Late Republican period, we have seen that the curvaceous meander of the Baetis River created a convex bank in the city (*vide supra* Figure 28). That convex bank would have been sloped and subject to flooding, such as during the daily tides. This configuration creates a natural harbour and shipyard: it is ideal for berthing small flat bottom riverboats and for the construction and repair of ships. In this sloped natural harbour, wooden jetties are usually constructed to facilitate transhipment. In the 16th century Seville had a very large convex bank known as "el Arenal", where all these operations were carried out and it was represented in many illustrations of Seville at the time (see Chapter 5). It was on this convex bank of Hispalis were most likely the construction of war galleys, mentioned by Caesar in the 1st century BC (*Caesar, Bell. Civ.: 2.18*; *Bell. Alex.: 51, 56*), took place.

Towards the south, near the area of proposed warehouses, remains of what seem to be Roman quays were found at two locations. Roman concrete foundations were discovered at the Avenida de la Constitución by Carriazo (1974-1975: 93) and were interpreted as remains of a Roman quay by Ordóñez Agulla (1998: 157-158). About 100 m southwards, a structure made of masonry over a foundation of concrete was unearthed at Avenida de Roma and also interpreted as a quay (González Acuña, 2010: 90) (*vide supra*). The existence of masonry quays could be supported by the specific position of the remains with respect to the channel of the river. These two locations coincided with the convex side of the river meander and lay over its concave bank, located south of the city, which had a vertical undercut resulting from the lateral erosion of the water flow (*vide supra* Figure 29).

The concave bank is the ideal area for erecting a harbour with masonry and concrete quays since the natural flow of the river will keep the water adjacent to the quays free of silt. This reduces the need for maintenance of the channel (i.e. dredging) in the harbour in order to maintain enough depth for accommodating the draught of large merchantmen. The construction of quays in a concave bank, however, needs the use of piles for reinforcing the terrain prior to the construction of strong foundations of concrete as explained by Vitruvius (*De arch. 5.12.6*). A masonry wall would have been erected to create the waterfront of the quay (Blackman, 2008: 648-650). This robust construction is necessary to withstand the lateral erosion of the river flow. This harbour design, on the concave bank of the river, was employed at the Roman fluvial port of Naeva (Cantillana)(Ordóñez Agulla, 1993), where the archaeological remains of the concrete made quay were still visible in the mid 20th century (Figure 77).

Figure 77: 1950 photograph of the archaeological remains of the foundations of the Roman quay at Naeva and their position on the concave bank of the river (after Arias Solís and Pérez Camacho, 1990: 122).

All these elements, the concave bank, the wooden piles, the concrete foundations, and the masonry quays, were found between the Avenida de la Constitución and the Avenida de Roma (see Figure 40). It is possible, therefore, to suggest that all of this harbour area was equipped with a masonry waterfront with quays for merchantmen. The presence of Roman warehouses (i.e. *horrea*) in nearby locations would support this hypothesis.

Roman *horrea* have been located at Patio de Banderas, Calle San Fernando, Avenida de Roma, and Avenida de la Constitución excavations (*vide supra*). If we connect these locations by straight lines, we obtain a polygon with an area of 67,302 m^2 (Figure 78). However, all the archaeologically attested *horrea* were located, without exception, in the interior of larger building complexes. Therefore, it is possible that the original area would have been larger than that proposed. Nevertheless, warehouse space would have been less than the total area, in order to leave room for streets and for the thickness of the buildings' walls.

Figure 78: Locations where Roman warehouses have been excavated (yellow dots) and the area that results by connecting them (Author).

Consequently, and with the aim of offering an illustrative yet conservative value, it is possible to suggest that a 2/3 of the area could have existed as warehouse space, giving 44,868 m^2. The volume of the annual trade in olive oil could also aid us in calculating the necessary warehouse space in Hispalis. Chic García (2006) estimates that the annual production of olive oil in *Baetica* would have been at least 13,000 metric tons (Chic García, 2006: 282), which was stored and transported inside 185,715 Dressel 20 amphorae every year (*vide infra*). Dressel 20 amphorae had a maximum diameter of 56-65 cm (Berni Millet and García Vargas, 2012); thus it would have been possible to fit slightly fewer than approximately four Dressel 20 in one square metre. Consequently, the 185,715 Dressel 20 amphorae produced in a year, neatly arranged, would occupy an area of about 46,430 m^2. These two area estimates for Hispalis are similar to the warehouse space available at Ostia, which increased from 31,882 m^2 in the 2nd century, to 46,118 m^2 at the end of that century (Keay *et al.*, 2005: Table 9.1; Keay, 2016: 302).

At the north part of Hispalis, the archaeological remains found in excavations such as those at Cine Imperial, Calle Cuna, Mercado de la Encarnación and La Campana, seem to indicate the existence of another harbour district. We have seen that during the Republican period this area lay over a convex bank that created a natural sloped harbour, and jetties were probably used. During the Imperial Period, however, the meander straightened and the channel became deeper (*vide supra*). Then, the construction of a masonry waterfront would have made sense. It is plausible that the wall unearthed at La Campana is the archaeological remains of this waterfront (*vide supra*). The piles, and possible quay remains found at Cine Imperial further support this hypothesis.

Landing stages and warehouses have also been documented along the entire length of the east bank of the Roman riverfront between the south and north harbours. The distance between these is *circa* 1.5 km. This is comparable to the length of the riverfront at Ostia, although the fragmentary nature of the archaeological record does not allow us to obtain clear idea of the density of port infrastructure (Keay, 2016: 309).

All the archaeological evidence related to the harbour infrastructures of Hispalis presented and discussed in this Chapter has been unearthed on the east bank of the ancient *Baetis* River. As noted by Keay (2016: 309), nothing is known of possible harbour infrastructures on the west bank of the river. With regards to this area, Collantes de Terán Delorme (1977: 78-79) noted that several funerary epigraphs from the Roman period were discovered (at different times in history) in different places over a large area. Taking into account the position of the Roman city walls, he concluded that the west bank of the *Baetis* River was extramural and hypothesised that there was probably a road leading to the west (Collantes de Terán Delorme, 1977: fig. 6). The discoveries of the funerary epigraphs from the Roman period allowed him to propose that this road to the west would have had Roman cemeteries alongside, as was customary in the Roman period.

The hypothesis of Collantes de Terán Delorme on the existence of an extramural necropolis, could, potentially, be supported by an archaeological discovery made in the late 1960s. As J.M. Carriazo Arroquia reported (Newspaper ABC Sevilla 18-09-1969) during the construction of the retail store Galerías Preciados (currently El Corte Inglés) in 1969, a fragment of a Roman statue (of a toga attired male) and a fragment of a Roman funerary inscription (according to Carriazo, both from the early 2nd century AD) were found. This retail store was built on the exact location of the Hotel Madrid, which was demolished to build the retail store, located at the corner of the streets San Pablo and Méndez Núñez, adjacent to the Plaza de la Magdalena. Unfortunately, the fragments of the Roman statue and the Roman funerary inscription, described by Carriazo, which, potentially, could support the hypothesis of Collantes de Terán Delorme about the existence of a Roman necropolis, were not retrieved by an archaeologist, nor was the site (where the fragments were found) later inspected by archaeologists. Therefore, it is impossible for us to confirm or dismiss the existence of a Roman cemetery. However, three decades later, Mr Ramón Corzo Sánchez (1997: 198) reports another testimony about the same site. He reports that the Architect in charge of the construction project of the Galerías Preciados retail store building, remembers that during the construction works at the site *"a funerary monument with several funerary urns"* was unearthed (Corzo Sánchez, 1997: 198 footnote 10). This is another witness account that is impossible to verify now, but the second independent account for the same site with similar descriptions (i.e. funerary archaeological artefacts) and, consequently, I believe it ought to be mentioned. This site and its particular location will be further discussed in section 5.3.2 (*vide infra*).

Apart from the hypothetical existence of an extramural necropolis, it is probable that the west bank of the *Baetis* River was used as an auxiliary harbour to those facilities in the east bank. This is precisely what indeed happened in the 16th century on the east bank of the Guadalquivir River location of the Barrio de Triana (Bernal and Collantes de Terán Sánchez, 1988). Unfortunately, as we have seen very little is known about this area of Hispalis, and nothing is known about harbour infrastructures or facilities on the west bank of the *Baetis* River; therefore, proposing any particular hypothesis would be purely conjectural.

3.10.3 Traffic of the port of Hispalis and the economic value of its trade

We have seen that an idea of the capacity of the port of Hispalis by its wharf length, estimated in 1.5 km and comparable to the 1.2 km of Lepcis Magna (Wilson *et al.*, 2012: 382) and the one at Ostia, (Keay, 2016: 309). Additionally, the traffic density could also measure the capacity of a port.

39 to 72 flat-bottomed river barges, in combination of 12 to 25 large (400-tons) Roman freighters or, alternatively, 30 to 60 smaller *corbitae* (80-tons) probably undertook the transport and export the annual production of olive oils in Baetica. This might not seem to be a great number of vessels, but we need to add to this estimate numerous other ships in charge of importing and exporting other commodities locally and internationally. Additionally, if we consider that all the traffic related to olive oil had some restrictive seasonal factors (*vide supra*), and it was probably accomplished in a few months of the year, the logistical challenges of organising, coordinating, and managing the number of river boats and seaborne vessels harmoniously at the port of Hispalis was not an easy undertaking. It is

possible that the port of Hispalis did not have such intensive harbour traffic again until the Islamic Period (see Chapter 5) or perhaps even until the 16th century when Seville was the fulcrum point between the Old World and the New World (Chaunu, 1977).

Finally, we have seen that Baetica had an annual olive oil production of at least 7,000,000 litres (i.e. production from Baetica to Rome), archaeologically attested by the number of Dressel 20 amphorae at Monte Testaccio. When converted into weight, this represents 100,000 Dressel 20 amphorae or 10,000 tons of freight traffic. If we take into account other factors, as Chic García (2006: 282) has pointed out, the annual olive oil production could have reached 13,000 metric tons, or 185,715 Dressel 20 amphorae, representing 18,571 tons of freight traffic for olive oil production alone. Similar total annual volumes of freight traffic transhipped from the port of Seville (of any product) would not occur again until 16th century (Chaunu, 1977) when Seville was the economic capital of the world.

It is difficult to understand the economic value of olive oil during the Roman period, but we can get a general idea from the Diocletian's Edict on maximum prices of AD 301 (Graser, 1940). According to it, a *sextarius* of the cheapest olive oil was 12 *denarii*. A *sextarius* corresponds to approximately 546 ml (Smith and Anthon, 1851: 1030, Table VII), so two *sextarii* correspond to 1092 ml, roughly a litre, which would have cost 24 *denarii*. An unskilled labourer earned a maximum of 25 *denarii* a day (Groen-Vallinga and Tacoma, forthcoming). Therefore, in the Roman period, a litre of basic quality olive oil was worth roughly the daily wages of an unskilled labourer.

To put the value of the annual production of olive oil bound to Rome into perspective, the estimated 7,000,000 litres produced every year, at a market cost of 24 *denarii* per litre, would have had a market value of 168 million *denarii*. One *denarius* equals four *sestertii* (Rathbone, 2009: 301), so the annual production of olive oil from Baetica bound to Rome would have had a market value of 672 million *sestertii*. Duncan-Jones (1994: 45, table 3.7) estimated that the Empire's annual military budget in c. AD 215 was between 1,127 and 1,188 million *sestertii*. Therefore, the market value of the annual production of olive oil from Baetica bound to Rome alone roughly equalled half of the total cost of the entire Imperial Roman army in c. AD 215.

If we agree with the conclusions of Chic García (2006: 282) that, taking into account not only Rome but also the consumption of olive oil by the Roman army, estimates of the total annual olive oil production of Baetica could have reached 13,000 metric tons (i.e. 13,000,000 litres). This would have had a market value of 312 million *denarii*, or 1,248 million *sestertii*. Then, the market value of the total annual production of olive oil from Baetica would have been equal to the total costs of the entire Imperial Roman army in c. AD 215, representing approximately three-quarters of the Empire's annual budget (Duncan-Jones, 1994: 45).

These figures, as impressive as they might seem, are representative of the Baetica's annual olive oil production alone. But, as we have seen, Baetica had its fertile Baetis Valley rich in other foodstuffs (Ponsich, 1998) as well the Sierra Morena plentiful of metal ores (Domergue, 1990; 1998); these, certainly, would have created even greater wealth and profits for the contractors, landowners, merchants and shippers that controlled this trade from Baetica. The volume of trade in the Imperial Period as well as the economic value of the goods exported from Hispalis, suggests that this port was probably one of the greatest in importance in Hispania, and one of the most prominent and key regional commercial maritime hubs in the Western Mediterranean (Keay, 2016: 316).

Taking into consideration the annual market value of the olive oil production (*vide supra*), the local aristocratic families from Baetica that produced and distributed the oil must have been immensely wealthy. Some of these aristocratic elites were so rich that they were well off during the Late Antique period and until the 6th century (see Chapter 4). Some of these wealthy aristocratic families, such as the family of Emperor Hadrian the *Aelii* from Italica, were clearly involved in olive oil production as attested by *tituli picti*. The wealth of these families is indicated by many euergetistic undertakings attested by epigraphic documents found in Baetica. It has been suggested that the probable immense wealth of the *Aelii* family must have facilitated Hadrian to obtain the highest position in the administration of the Roman Empire (Chic García, 1992-1993: 18-19).

Chapter 4: Seville during the Late Antique period

Understanding Seville during Late Antiquity is difficult since very little evidence has been preserved. This chapter aims to summarise the scarce information that we know about the city of Seville, particularly for the 6th century, both historically and archaeologically, during this age of challenges and transformations. Direct archaeological evidence on the port comes only from the Plaza Nueva excavation, but its activity could be understood by looking at trade, historical accounts, and palaeo-sciences. What is interesting, however, is that Seville is at the centre of many key historical episodes of Late Antique Hispania, and its port seems to have been very active during this general era of decline.

4.1 Hispalis at the twilight of antiquity

As we have seen in Chapter 3, the Roman provincial metropolis of Hispalis was the main port of the Baetica region. The city was continuously called Hispalis through the convulsive epochs that followed the fall of the Western Roman Empire (i.e. Germanic invasions, Visigothic period, and Byzantine occupation) although the spelling of the name of the city evolved occasionally from Hispalis to Ispalis. Padilla Monje (1989) and Salvador Ventura (1990) are two excellent works to understand the different upheavals, transformations, and challenges occurred during the Late Antique period in Baetica.

In AD 409, different central European, Germanic peoples or "barbarians" entered Hispania through the Pyrenees. These invaders were made up of three distinct ethnic components: the Alans, the Suebi, and the Vandals, the latter of whom were subdivided into the Silings and the Hasdings. Both Suebi and Vandals were thought by the Romans to be Germanic peoples, originating in lands to the east of the Rhine (Collins, 2004: 11). In the Baetica region, the presence of these invaders was intermittent until the 6th century, although the 5th century was not free of traumatic event and conflicts.

After crossing the Pyrenees, Silings Vandals arrived in the Baetica region in AD 418, when they were defeated by Visigothic troops, who were fighting as *foederati* on behalf of the Roman Empire. The remnants of the Silings and the Alans appealed to Gunderic, King of the Hasdings Vandals, to accept them under his command. After a victory against a coalition of Romans, Suevi, and Visigoths in AD 422, the Hasdings Vandals troops of Gunderic were devoted to plundering different regions during the decade of the 420s. According to the chronicle of Hydatius, in AD 425, the Vandals pillaged the Balearic Islands, Hispania and Mauritania, sacking Carthago Spartaria (Cartagena) and Hispalis (Figure 79). In AD 428, Gunderic finally captured Hispalis, but after profaning the basilica of the city, he died “seized by a demon by the will of God” (Hydatius, 86 and 89, ed. Mommsen 1894).

Figure 79: Cities and rivers in Late Antique Hispania (after Collins, 2004: 39).

His half-brother Genseric succeeded him on the throne. In AD 429 the Vandals under Genseric crossed to Africa. Procopius of Caesarea asserts that the Vandals and Alans numbered 80,000 when they travelled to North Africa (Procopius *Wars*, 3.5.18-19). However, some historians debate the validity of Procopius' quote, and some authors estimate that the Vandals could have fielded an army of around 15,000–20,000 (Heather, 2005: 197-198). Regardless of the precise number, to transport an army across the straits of Gibraltar it is essential to have a large number of ships and experienced and qualified crews. Some authors have proposed that the Vandals built a fleet *ad hoc* for their journey to North Africa and that they sailed it across the straits (Morales Belda, 1969). However, this hypothesis seems not to be very well supported, since both shipbuilding and seamanship are highly specialised crafts that cannot be learned on the spot. Due to the large size of the Vandal army, it seems more plausible that the Vandals crossed to North Africa aboard an already existing fleet of ships departing from one of the major ports of Baetica, and the question of from which exacly will be discussed in Section 4.4 (*vide infra*).

In AD 441, the Suevic armies of King Rechila conquered Hispalis, capital of Baetica. With this victory the Suevi managed to, in theory, incorporate Baetica and Carthaginensis into their Kingdom. However, the Suevi presence in those territories seems to have been insignificant, and the Suevi control was limited to raids (Kulikowski, 2004: 180–181). During the 5th century, Rome was unable to exercise control over the entire Empire, and therefore, the Hispano-Roman aristocracy that owned the immensely wealth Baetica's *latifundia* controlled, de *facto*, the region and its capital Hispalis. During the 5th century, certain landed estates from Hispania were so large and wealthy that contemporary sources referred to then as "kingdoms" (Wolfram, 1988: 225). These large Roman landowners, who referred to themselves as senators, continued to exploit their states and to enjoy their riches under the Visigothic Kings (Thompson, 1969: 115-116).

During the end of the 5th century and the beginning of the 6th, the final occupation of the Visigoths in the Iberian Peninsula took place. Baetica, however, remained largely under the control of the Hispano-Roman local aristocracies until the decade of the 540s when the Visigothic kings began to start controlling it. The interest in Baetica appears linked to the expansionist policy of the Byzantine Emperor

Justinian´s *Renovatio Imperii*, who had conquered Vandal North Africa in the 530s (Figure 80). Baetica was a completely Romanised society which was fully integrated into the Roman Empire since its beginning. Consequently, their aristocracies were potentially keen to establish relations with the Imperials. In the 540s the Visigothic military interest and presence in Hispalis and Baetica was apparent. Visigothic King Theudis (reign 531-548) seems to have established his court at Hispalis. He was succeeded in the throne by his son Theudisclus, who after a brief reign was assassinated in his palace at Hispalis in AD 549 (Collantes de Terán Sánchez 1992: 29).

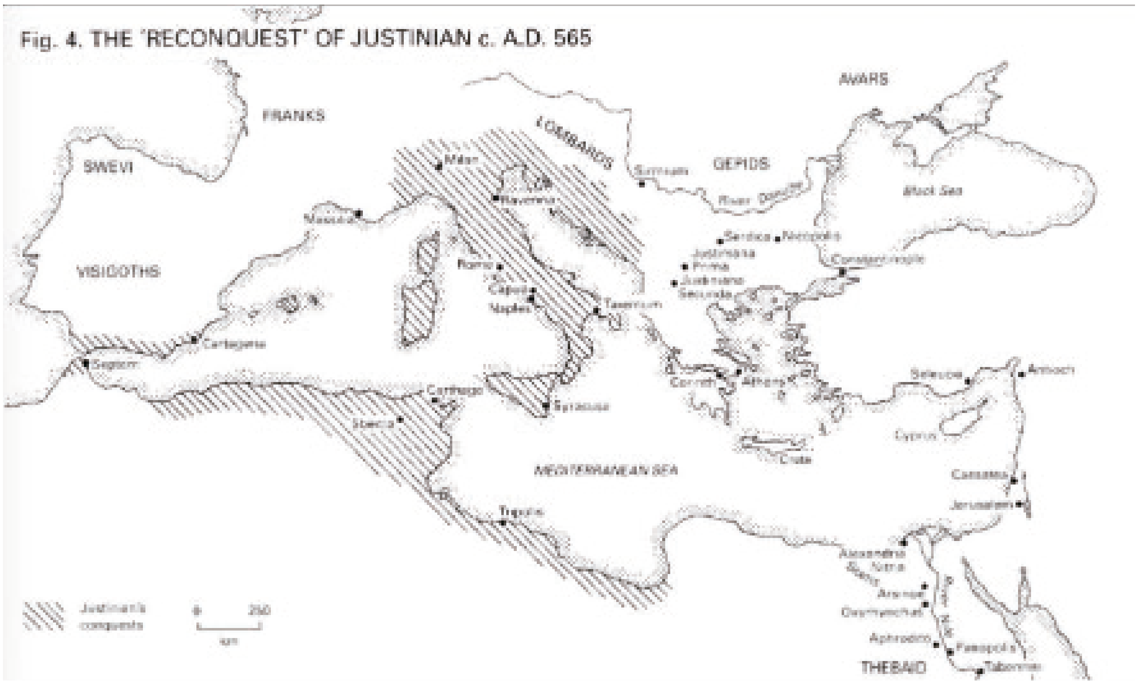


Figure 80: *Renovatio Imperii* of Justinian (after Cameron, 1993: fig. 4).

According to the chronicle of Isidore of Seville, in AD 552 Athanagild initiated a civil war in Hispalis against the Visigoth King Agila. Athanagild requested military support from Justinian (Isidore, *Hist. Goth.*, 46 and 47) and, shortly afterwards, the

Byzantine troops landed at key port-cities in southern Hispania taking control of them (Collins, 2004: 47-48). It is unclear if Hispalis was under the Byzantine rule, although, according to one historical chronicle (i.e. *Consularia Caesaraugustana*, marginal note in the text of John of Biclaro, ed. Cardele de Hartman and Collins, 2001: 61), Athanagild had to conquered it at the end of his reign. This also happened with other metropolises in Baetica, where the historical chronicles recorded that troops were sent to subdue different cities.

The Hispano-Roman population from Hispalis were Catholics. The Catholic Church led by the Bishops replaced the administrative vacuum left after the fall of the Western Roman Empire in Hispania. Consequently, the recognition of new authority by the Visigoth kings and their nobility who were Arian Christians was complicated, and led to some important conflicts, as became clear some decades later.

The Visigothic King Leovigild (reign AD 568 - 586) ruled the kingdom from his court at Toledo and chose to share control and to delegate some tasks of government to his two sons (García Moreno and Suárez Fernández, 2008). His eldest son Hermenegild, decided to marry Princess Ingund, the daughter of King Sigibert and a devout Catholic, an event that created profound criticism among Arian noblemen at the court of Toledo. The choice of monarch was primarily in the hands of the nobility of the court, who provided the immediate entourage of the king and whose own military following supplemented his. It was from their own number that the selection of future monarchs was most likely to be made. This may have disenfranchised those who were not close to the court circle (Collins, 2004: 46). In consequence, King Leovigild decided to mitigate the disapproval of his noblemen by sending Hermenegild, and his Catholic wife, to Hispalis to serve as the administrator of Baetica.

Once installed in Hispalis, Hermenegild converted to Catholicism, persuaded by his wife Ingund. The Catholic Bishop Leander of Seville was probably also instrumental in converting Hermenegild. In alliance with the local aristocracy (and probably incited by the Catholic Church), he rebelled against his father, proclaiming himself King in AD 582. This seditious act was a serious and direct threat to the Visigothic Kingdom of Toledo, as Hermenegild established relations with the enemies of his father: both the Byzantines and the Suevi Kingdom. King Leovigild first tried a peaceful settlement but, against the resistance of his son, resorted to arms (Gregory of Tours, *Hist.*, V.38, ed. Thorpe, 1974: 302).

In AD 582 Leovigild began an offensive to retake the territories that supported his rebel son. He first took Merida, and in AD 582 laid siege to Hispalis where his son Hermenegild lived. The Suevi King Miro led an army to support Hispalis, but Leovigild besieged him and forced him to swear loyalty. Shortly afterwards he conquered Osset (San Juan de Aznalfarache, across the Guadalquivir River, opposite to Hispalis) and Italica, thus closing in on Hispalis (Gregory of Tours, *Hist.*, VI.43, ed. Thorpe, 1974. 375). Leovigild eventually blocked the navigation on the river Guadalquivir, after which Hispalis began to suffer from starvation (Thompson, 1969: 72).

Hermenegild requested help from the Byzantines who occupied territories in the south east coast of Hispania (Vizcaíno Sánchez, 2009), which were known as *Provincia Spaniae* or *Spania* (Collins, 2000: 123)(Figure 81). Leovigild, however, bribed the Byzantines with thirty thousand pieces of gold, so when Hermengild faced his father for battle on the outskirts of Hispalis, the Byzantine troops deserted before the fight. Hermengild managed to escape but Leovigild took Seville in June or July of AD 583. For his role in the rebellion, Ingund and her child, as well as the Catholic Bishop Leander of Seville, were exiled to Byzantium. King Leovigild then conquered the remaining seditious cities and fortresses of Baetica, including Cordoba, where he captured his son in February of AD 584. Hermenegild had taken refuge in a church of the city and King Leovigild sent his other son Reccared to convince Hermenegild to surrender (Gregory of Tours, *Hist.*, V.38, ed. Thorpe, 1974. 301-303). Hermenegild was first exiled to Valencia and a year later was killed in Tarragona, probably by order of his father (Thompson, 1969: 72-73).

Figure 81: Territories occupied by Byzantine troops in the south east coast of Hispania, known as *Provincia Spaniae* (after Vizcaíno Sánchez, 2009: 48, fig. 2).

When King Leovigild died in AD 586, his younger son Reccared became the new King, acclaimed by the Visigothic noblemen without opposition. After the death of Leovigild, Bishop Leander was swift to return from Byzantium to the court of Toledo. In January AD 587, Reccared totally unexpectedly renounced Arianism for Roman Catholicism, the single great event of his reign and the turning point for Visigothic Hispania. Most Arian nobles and ecclesiastics, certainly those around the court at Toledo, followed the King's example. However, there were Arian uprisings by Arian Bishops and noblemen, which were swiftly crushed with deadly and merciless force (John of Biclaro, *Chronicle*, ed. Wolf, 1999: 63-64).

In May AD 589, Bishop Leander organised the Third Council of Toledo, but it was convened in the name of the King. The public confession of the King, read aloud by a notary, set the tone for the new Catholic kingdom. The emphatic clarity of its theological points and its quotations from the scripture reveals that it was ghost-written for the King. Bishop Leander also delivered a triumphant closing sermon, which his brother, Bishop Isidore of Seville, entitled *Homilia* de *triumpho ecclesiae ob conversionem Gothorum*, a homily upon the "triumph of the Church upon the conversion of the Goths". After the conversion of Reccared, Visigothic Hispania was religiously unified, and the religious differences between Visigoths and Hispano-Roman Catholics was eradicated (John of Biclaro, *Chronicle*, ed. Wolf, 1999: 64-65). After Reccared's reign, an elderly Bishop, Isidore of Seville organised and presided over the Fourth Council of Toledo in AD 633. On that occasion the Roman Catholic bishops took upon themselves the right of the noblemen to select a king from among the royal family, and the transfer of power was complete.

4.2 The archaeological evidence of Hispalis during Late Antiquity

During the Late Antique period, the urban reality of Hispalis changed from that of the Roman period. We have seen in Chapter 3 that, by the 3rd century, all previously occupied areas on the riverbank and outside the city walls were abandoned, particularly those on the south of the city which were replaced by cemeteries. The causes of the reduction in the inhabited area of the city, as we have seen, were related to a change in river dynamics (*vide supra*); however, another important factor was the loss of the economic importance of the port of Hispalis after the disintegration of the state system of oil purchases from Baetica during the second half of 3rd century (Remesal Rodríguez, 1998: 194). On the other hand, the northern intramural harbour district, located at the Plaza de la Encarnación, remained in use as a residential area until the 6th century (*vide infra*). Recent archaeological interventions in Seville show that there was an important regression in the population and use of urban areas during the Late Antique period. Several excavations have unearthed abandoned areas in ruins with no residential or public use within the city walls that evidences this (García Vargas, 2014: 185). For a detailed analysis of the urban transformation of Late Antique Ispalis, see González Acuña (2011: *passim*) and García Vargas (2014).

The changes in the topography of Hispalis were not only influenced by river dynamics and economic factors. As we are about to see in this Chapter (*vide infra*) the arrival of Christianity played an important role in the reorganization of the city. One of the most evident topographical transformations was the partial abandonment of classical civic spaces, the emergence of churches (some of which were remodelled classical temples), the Christianisation of cemeteries, and the probable creation of an episcopal area that replaced the Roman forum (García Vargas, 2014: 185). These changes were the result of a profound change in the habits of the society that created new and different uses of the urban space. In this period important ecclesiastical institutions, such as churches or places associated with martyrs, were interconnected by linear itineraries (Figure 82). These linear ecclesiastical related itineraries, which were sometimes used as processional circuits, became the new urban avenues or axes of transit in contrast to the previous use of the orthogonal urban grid of the city in the Roman period (García Vargas, 2014: 202).

Figure 82: Map of Late Antique Ispalis, *cf* with Figure 38 and Figure 39; intramural area of Imperial Hispalis (brown) concentration of necropoleis, cemeteries and "martyr" areas (red circles with crosses), probable episcopal area (red oval), and possible itinerary (dotted line), position of the *Baetis* River and Tagarete stream (blue). Archaeological excavations in Seville: asterisk, Plaza Nueva; 1, Mercado de la Encarnación; 2, Plaza de la Pescadería; 3, Patio de Banderas (Alcázar) (scale bar 150 m, after Tabales Rodríguez, 2015: 188).

4.2.1 The Mercado de la Encarnación and Plaza de la Pescadería excavations

During the last decade, the Mercado de la Encarnación excavation (Figure 83) was conducted in Seville, which unearthed abundant material culture that can help us understand the urban reality of Seville from the 3rd to the 6th century. The excavation revealed 7000 m^2 of urban dwellings and commercial areas located in the north area of Hispalis (Amores Carredano and González Acuña, 2006; González Acuña, 2011: 372-407).

Figure 83: Mercado de la Encarnación excavation (after González Acuña, 2011).

During the 3^{rd} century and the first half of the 4^{th} century AD, several houses and a *hospitia*, or guesthouse, occupied the excavated quarter. The arrangement of these buildings followed with the same preceding urban distribution of the Imperial period, albeit earlier constructions were commercial workshops. These late antique houses were conceived and constructed as residential units of varying size (Figure 84), ranging from 250 to 300 m^2 each. They were built around central courtyards of 30 to 80 m^2 and presented rooms which were often paved with mosaics (Amores Carredano and González Acuña, 2006: 197-204; González Acuña, 2011: 400).

Figure 84: Late antique quarter unearthed in the Mercado de la Encarnación excavation (after González Acuña, 2011).

From the second half of the 4th century AD a "concentration of ownership" process took place over time in the neighbourhood. Adjacent houses were combined into larger households. This resulted in a lower number of houses per block but they were of larger dimensions (from 500 m^2 to 1000 m^2) (González Acuña, 2011: 405; García Vargas, 2012c: 901). These wealthy houses were erected around several *atria* or patios, and some rooms were decorated with mosaics. Towards the beginning of the 5th century AD, only three houses and three other buildings occupied the entire *insula* of almost 3000 m^2 in extent (García Vargas, 2014: 185).

Most of these buildings were abandoned by the middle of the 5th century AD and became ruins. In the southern half of the *insula*, the ruins were buried by an enormous accumulation of ash derived from the activity of a glass workshop, which was located adjacent to the southwest building of the area. Conversely, two sumptuous residences remained in use for more than fifty years, between around AD 450 and AD 525 AD. Oddly, these luxurious homes were amid a ruinous urban landscape very different from the thriving district of the previous phase (García Vargas, 2014: 185).

Around AD 525-530, the entire "northern quarter", or at least the areas excavated by the archaeologists, seems to have been completely abandoned. The earliest evidence of reoccupation of the area occurred well into the Islamic period, in the 12th century AD when Islamic dwellings of a residential quarter were documented. It is surprising that an intramural area nearly adjacent to the city Roman Imperial forum, where during the Islamic period the *aljama* mosque (main mosque) was built, remained in a ruined state from the 6th to the 12th century for almost six hundred years (García Vargas, 2014: 186).

The excavators have named two of the late 5th or early 6th century AD residences as Sectile House and Sigma House. The latter seems to have been newly built in the 6th century. The luxurious Sigma House had a large atrium, several courtyards, and was associated with several adjacent workshops. However, its most important characteristic was a large room with a semi-circular end (Figure 85). This semi-circular end was first erroneously identified as the apse of a church (a preliminary identification which created immense expectation in Seville). However, the excavations revealed that the room was a dining room, or *triclinium,* built with semi-circular seats, or *stibadium,* with a circular or sigma shaped table used for dinning at banquets, or at *convivia* (Ordóñez Agulla and González Acuña, 2009).

Figure 85: Semi-circular dining room, or *triclinium* of Sigma House in the Mercado de la Encarnación excavation (Author).

It seems that the merchant owner of the Sigma House controlled several workshops located nearby the house. Among the imported goods that were found related to the Sigma House, one type stands out: liturgical altars. The remains of at least four altar tabletops, or *mensae,* were found (Figure 86); these were of two types, lobulated and circular, and all were made of white marble from the Greek island of Paros. These *mensae* could have been imported (Mango, 2009a) to satisfy demand from the Church or the wealthy Hispano Roman families who would have had fashionable dining rooms with *triclinia* and used related silverware plates of the period (Mango, 2009b). Additionally, in the surroundings of Sigma House, archaeologists have documented imports of wine amphorae from Gaza, Antioch or Cyprus, as well as *unguentaria* from Ephesus (García Vargas, 2014: 203).

Figure 86: Altar tabletops, or *mensae,* found associated with Sigma House in the Mercado de la Encarnación excavation (Author).

A dump associated with the house was also found; it contained large amounts of ash (Figure 87) from a nearby glass workshop dated to the mid 5th century AD (González Acuña, 2011: 471). The remains of two mortars, used to grind the raw glass, were found among the large quantities of ashes, glass slags, and discarded glass fragments (Figure 88). Chemical analysis of the glass has demonstrated that it contained *natron* from Alexandria in Egypt. The workshop seemed to have been importing raw glass in ingots from Alexandria; then the raw glass was ground, melted, blown, and shaped to create vivid glass vessels, glass ornaments, and *tessellae* for mosaics.

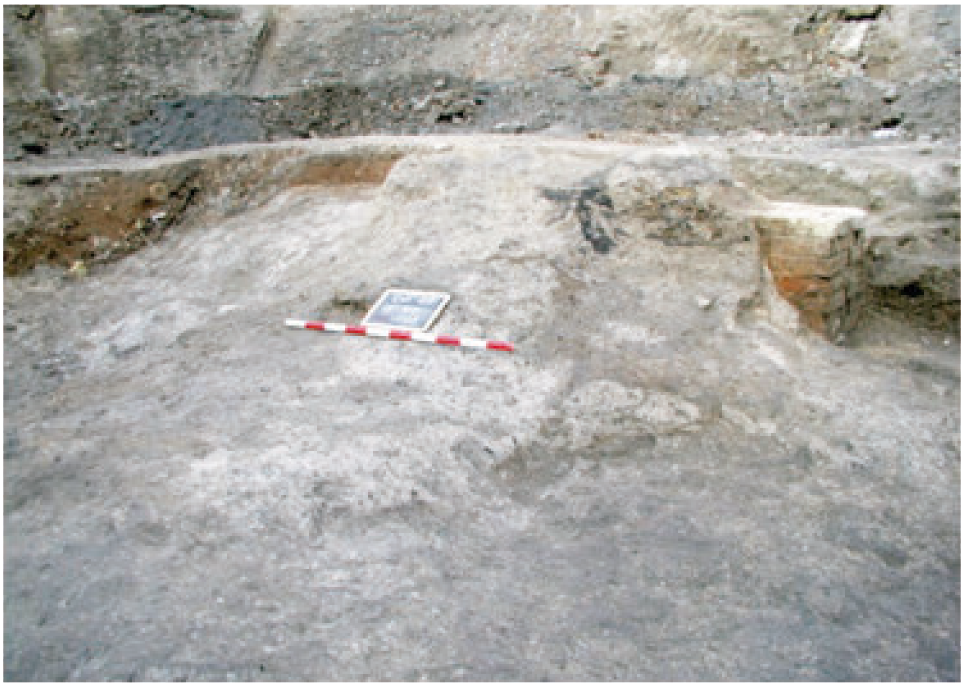


Figure 87: Large refuse dump of ashes from an important glass workshop next to the Mercado de la Encarnación excavation (after González Acuña, 2011).

Figure 88: Glass mortar and glass fragments from the glass workshop associated with Sigma House in the Mercado de la Encarnación excavation (Author).

Archaeology has documented an irregular distribution of these luxury objects, which were concentrated at a particular point in the urban space, surely close to the commercial area in which they were sold. These sumptuous products were imported for a secured market, albeit limited to aristocratic families and the Church, which would have been the only buyers of imported luxury goods. Local crafts also produced lavish jewellery, as attested by the 7th century treasure found in Torredonjimeno (Province of Jaen). This was composed of votive crowns and gold crosses (Figure 89), and made by filigree gold that had originally been offered to the Catholic Church by the Visigothic rulers in the 7th century. This was as a gesture of the orthodoxy of their faith and their submission to the ecclesiastical hierarchy. The treasure of Torredonjimeno was in origin a part of the votive offering of the Basilica of the Blessed Saint Justa and Saint Rufina, located in Hispalis (Perea, 2006; 2009).

Figure 89: Reconstructed votive crown from the treasure found in Torredonjimeno (Author).

The sumptuous Sigma House is interpreted as the residence of a *mercator* or merchant. This would explain the unusual mixture of an artisan and commercial workshops adjacent to a luxurious mansion. The arrangement seems to correspond or been related to port facilities. This interpretation resulted from the fact that the great harbour areas of the south flank of the city (Avenida de la Constitución and Avenida de Roma) had been abandoned, as we have seen (see Chapter 3), perhaps since the middle of the 2nd century AD. It is possible to argue that specialization in commercial activities would fit quite well with a port area officially controlled by the civic or religious administration of Hispalis.

In the Plaza de la Pescadería excavation, also close to the area of the old Roman Imperial forum now converted in an episcopal area (see Figure 82), a large public water cistern, or *castellum aquae*, for storage and redistribution of water was unearthed (García García, 2014: 172-173). It was built in the 2nd century AD but seems to have stopped working during Late Antiquity when it was reused as sub-living space. In the 5th century, it started to be used as a refuse dump and it was completely filled up by the mid 6th century AD, when it ceased to be used. This area of the city was not re-urbanised until the Almohad period in the mid 12th century (García Vargas, 2014: 205).

The ceramic evidence unearthed at both the Mercado de la Encarnación (Amores Carredano *et al.*, 2007) and the Plaza de la Pescadería (Maestre Borge *et al.*, 2010) provides us with information about imports during the late 5th and 6th centuries. Amphora sherds from western Mediterranean workshops from diverse places such as Tunisia, Ibiza, and Bruttium in the south of Italy were found among the ceramic evidence. Also, amphorae remains from distant places in the Eastern Mediterranean such as Cilicia, Ephesus, Sardis, Syria, and Gaza were unearthed (Figure 90). In addition to the amphorae material, other ceramic evidence was discovered including examples of tableware imported from Tunisia, the so called Late Roman C (LRC), and other places such as Phocaea, and Cyprus (García Vargas, 2012c: 909).

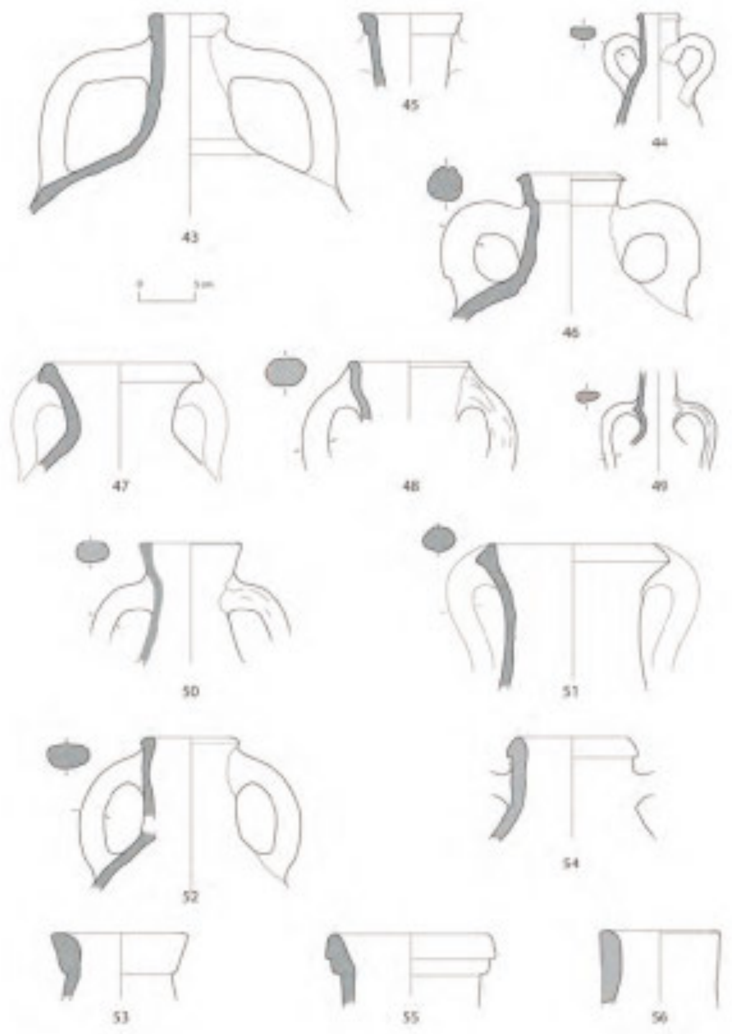


Figure 90: Late antique amphorae from Hispania, North Africa and the Levant found at the Mercado de la Encarnación excavation (after Amores Carredano *et al.*, 2007).

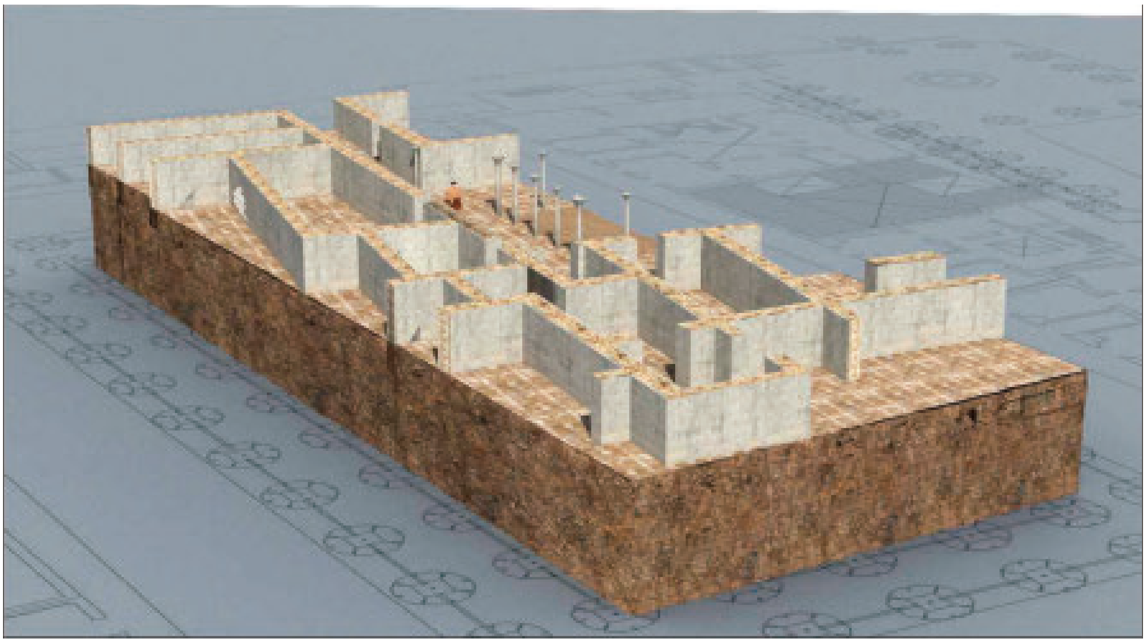
The marble *mensae* from Paros, the raw glass from Alexandria, and the ceramic material from North Africa and the Levant represent an important body of evidence that shows the range of the international commercial maritime routes to which Seville was connected, at least until the first half of the 6th century (Amores Carredano *et al.*, 2007: 133-146). All these imported materials arrived in Seville by sea, and its port had yet more evidence to offer of the connections of Hispalis with Mediterranean maritime trade routes during Late Antiquity.

4.2.2 The Patio de Banderas excavation

In Chapter 3 we have seen that in the excavations of the Patio de Banderas at the Alcázar of Seville, a large complex of two-naved buildings, built in *opus africanum*, were discovered whose function seems to have been as harbour facilities serving as large warehouses or *horrea* (Tabales Rodríguez, 2015: 83, 117-120). The area is abandoned throughout the 3rd, 4th and almost all of the 5th centuries, subjected to looting and reuse of materials until the construction of a new building complex at the end of the 5th century (Tabales Rodríguez, 2015: 187).

On the north side of the Patio de Baderas, an old excavation documented a series of Late Antique structures that included a basin coated with *opus signinum*. These were interpreted as being from a baptismal font from the baptistery of a Late Antique church (Bendala and Negueruela, 1980), although recent excavations, which have already reached the whole extent of the central area of the square, seem to question this hypothesis (Tabales Rodríguez, 2015).

In recent excavations of the Patio de Banderas, a large building has been documented, which maintains the alignment of previous constructions, erected towards the end of the 5th century. The building is paved with bricks and arranged around a large central courtyard with an *opus signinum* floor surrounded by reused marble columns. The floor of the patio is tilted towards its central part and it has a water conduit directly beneath it, which, *a priori*, seems to work as the *impluvium* of a water tank. The patio is surrounded by a large gallery that gives access to different rooms of ample dimensions (built with *pseudospicatum* walls) that were interconnected through doors (Figure 91).



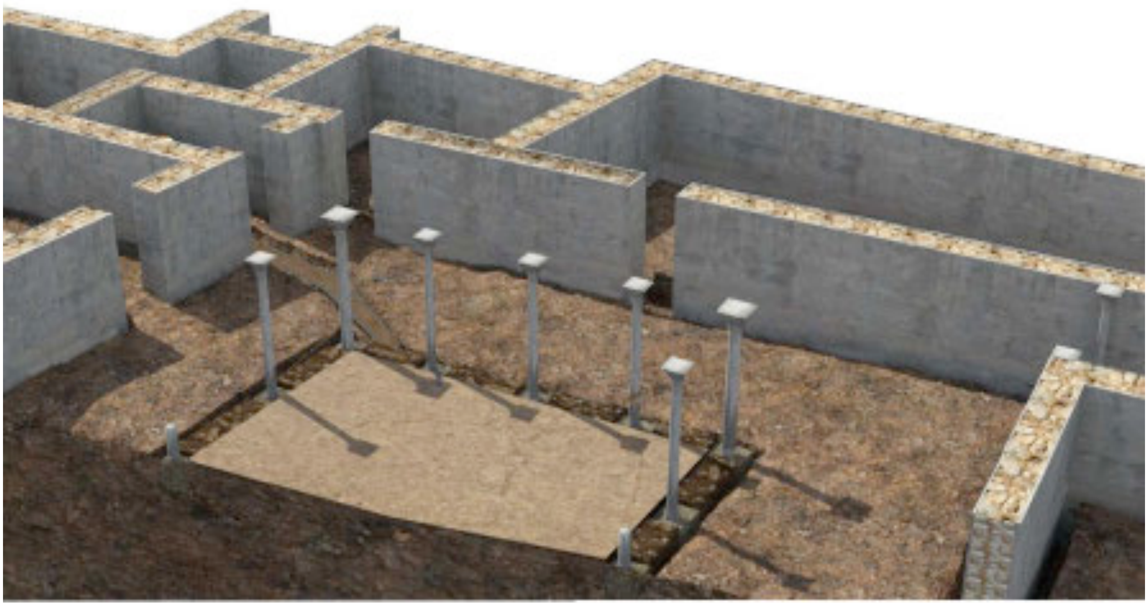


Figure 91: Reconstruction of the Late Antique building with a courtyard decorated with columns found at the Patio de Banderas excavation (after Tabales Rodríguez, 2015: 192-193).

In one of these rooms a well was discovered; it was connected to a water conduit underneath the courtyard, and it was finely built with ashlars and *tegulae*, some of which were decorated with the Christian symbol of the fish. To the north of the patio, outside of the building, there would have been either a street or open space. Here was located the entrance to the courtyard that had an arched gate with an access ramp (Tabales Rodríguez, 2015: 187-221).

Considering the layout of the structures and the heavy wear of the preserved pathways, the building has been interpreted as clearly functional in relation to the transit of beast of burden, carts or heavy transport such as wagons (hence the access ramp). Sánchez Velasco (2012: 523) has proposed that this building of large dimensions may be related to a possible monastic complex erected in the area, yet its precise function is still undetermined (Tabales Rodríguez, 2015: 187-221). The building lasted at least 200 years until the second third of the 6th century. It was destroyed to its foundations in order to erect a new building dated to the 7th century, which had been very badly preserved (Tabales Rodríguez, 2015: 221).

4.2.3 The cruciform anchor from the Plaza Nueva salvage excavation of 1981

We have seen that during the preliminary construction work of Seville's underground railway in 1981, abundant archaeological remains were found in a salvage excavation at Plaza Nueva. Two finds were the most significant, the remains of a wooden boat and an iron anchor (Figure 92), found in June 1981 at 15 metres from the surface (Fernández Gómez, 2007: 168). The *stratum,* in which the anchor remains was found also contained three marble column shafts.

Guerrero Misa, a Spanish archaeologist, studied and published a brief article about the anchor found at Plaza Nueva a few years after it was recovered (Guerrero Misa, 1984). On the basis of the typological characteristics of the anchor, such as its cruciform shape, Guerrero Misa identified it as belonging to the Byzantine tradition (Guerrero Misa, 1984: 95) (Figure 92).

Figure 92: Cruciform iron anchor found at Plaza Nueva (Author).

A series of historical events occurred in Seville during Late Antiquity, in which the city played a key role, which could support this hypothesis. In a series of subsequent military campaigns Justinian I (reign AD 527-565) restored direct Roman rule over Vandals' North Africa, Ostrogothic Italy, and an area of Visigothic Spain (Sarris, 2002: 46). In the early 550s, the southern and eastern regions of the

Iberian Peninsula, including Seville, were controlled by the Byzantine Empire and were known as *Provincia Spaniae* or *Spania* (Collins, 2000: 123). According to chronicles and historical accounts, it could be interpreted that Byzantine forces controlled Seville during three different periods: from 552 to 567, from 580 to 583, and in 610 (Vallejo Girvés, 1993: 123-124). However, the last occupation is unclear and debated by some scholars (Vallejo Girvés, 1993: 241-243; Guerrero Misa, 1984: 97).

Therefore, according to Guerrero Misa, on the basis of relating the anchor with the historical period in which Seville was under Byzantine rule, he suggested the following: that the anchor found at the Plaza Nueva belonged to a vessel which anchored in the ancient port of Hispalis and lost one of its anchors most likely during the second half of the sixth century AD (Guerrero Misa, 1984: 98).

4.2.3.1 Morphological characteristics of the Plaza Nueva anchor

The anchor was made using the forged-welded technique by arranging several iron pieces together to form a cruciform shape. The longitudinal axis of the two arms is perpendicular to the longitudinal axis of the shank, forming a cross. The measurements of the anchor are now 179.5 cm tall by 88 cm wide, yet it should be noted that the original dimensions of the anchor were larger.

The anchor is partially preserved and, before its discovery, had lost the aft part of the shank including the ring and the elliptical aperture for a moveable stock. The anchor had also lost the moveable stock, half of one of the arms and the projecting crown. Taking the missing parts into account, the reconstructed overall dimensions of the anchor would be *circa* 220 cm in length and *circa* 123 cm wide. The shank has a cylindrical section, being wider near the junction of the shank with the arms. The preserved arm is 61.5 cm long and is rectangular in section, excepting the fluke. The completely preserved arm, turned up at its end with an inclination of 45°, tapers down in thickness to a flat edge at the same time. As the arm turns up, it also narrows down to about three-quarters of its maximum width and then widens again to form the flat fluke as it turns up. The 17 cm long fluke is poorly developed and roughly trapezoidal in shape, being no wider than the main body of the arms.

The characteristics and dimensions of the anchor could provide information about the size and nature of the vessel that carried it and finally lost it in the ancient port of Seville. Ordónez Agulla had hypothesised about the possibility of the ship that carried the anchor being either a Byzantine rowing warship (i.e. Dromon) or a merchant vessel (Ordóñez Agulla, 2003: 67). Unfortunately, Ordónez Agulla could only support this hypothesis by the fact that these types of vessels were used by the Byzantine Empire in the sixth century A.D. Taking into account the dimensions of the anchor (i.e. *circa* 2 metres), it may be assumed that the vessel to which it once belonged must have been medium to large in size. However, it is difficult, if not impossible, to positively identify or describe the type of vessel.

The anchor found at Seville is similar to those found among the remains of the 7th century *Yassi Ada* shipwreck that sank off Turkish shores (Van Doorninck, 1982). Eleven anchors were found at this underwater site, and the Seville anchor closely parallels anchors number three and seven, since they all possess very similar overall dimensions and morphology (Figure 93) (Van Doorninck, 1982: 126). Anchors number three and seven were used as bower anchors (Van Doorninck, 1982: 137).

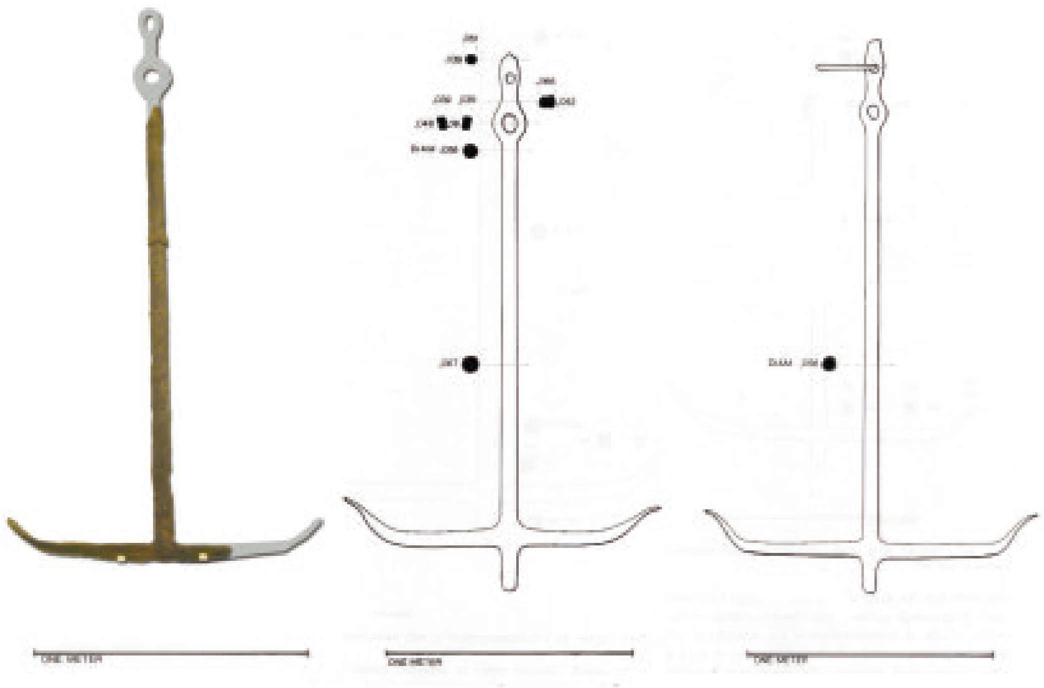


Figure 93: Comparison of anchors: Plaza Nueva (left) *Yassi Ada* #3 (centre) and *Yassi Ada* #7 (right) (scale bar 1 m) (after Van Doorninck, 1982).

J. Richard Steffy's reconstruction of the *Yassi Ada* shipwreck suggests that the ship had an overall length of 20 metres and a capacity of about 60 tons (Steffy, 1994: 80). Steffy's reconstruction could provide an idea of the average size of the vessel that lost an anchor in the ancient port of Hispalis. This is consistent with the detailed comparative study made by Votruba (2014: 146-147, 358, Graph 18), which concludes that anchors up to *circa* 300 cm in height and 100 cm in arm length may have been intended for ships of between 15 to 25 m long, and included those with a carrying capacity around 60 tons (Figure 94).

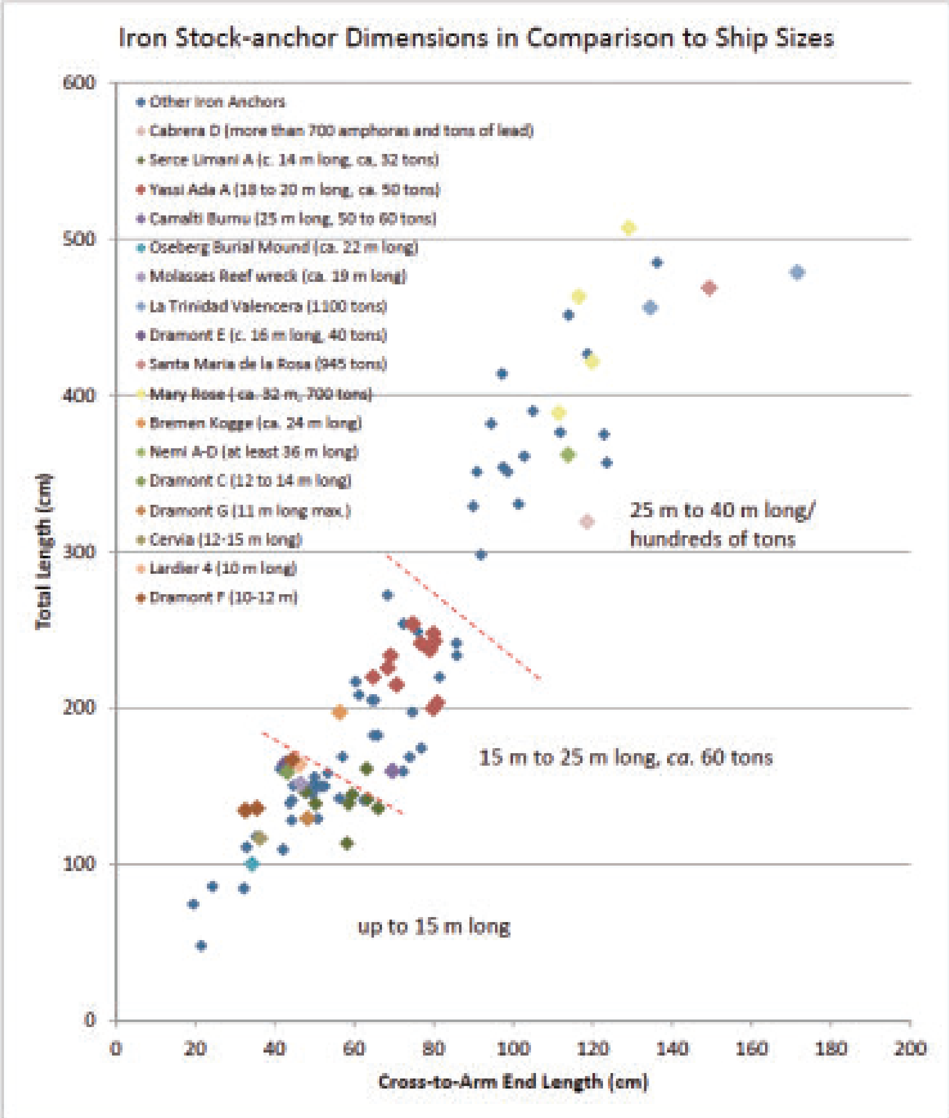


Figure 94: Distribution of well-preserved iron anchors based on length and volume (after Votruba, 2014: 358, Graph 18).

Perhaps, having no further evidence to identify and describe the vessel that lost one of its anchors in Hispalis, it seems reasonable to think that the vessel was probably around the size of the *Yassi Ada* shipwreck, if not larger. Yet, taking into account the fact that there is no other evidence except the anchor that remains, little more can be said about the vessel which carried it.

4.2.3.2 Preliminary conclusions regarding the Plaza Nueva anchor

The preliminary study reveals that the morphological characteristics of the Plaza Nueva anchor are similar to some of the anchors found in the *Yassi Ada* Shipwreck (7th century AD). Taking these similarities into account it has been previously proposed that the anchor found in Seville could be dated from the second half of the 6th century AD (Guerrero Misa, 1984: 92); this hypothesis also takes into consideration the historical period in which Seville could have been under the control of Byzantium. Although, this chronology is relatively plausible, the historical evidence used to support the precise chronology of this hypothesis (i.e. Hispalis historical events) is rather weak (Cabrera Tejedor, 2007).

The anchor was found in a stratum four metres below the boat's wooden remains (Fernández Gómez, 2007: 168). It is possible then to suggest that the anchor was deposited earlier in time, that the boat belongs to a later period, and that anchor and boat could each belong to different historical periods (Cabrera Tejedor, 2013: 522; 2014: 243). Pottery sherds from the Islamic period were found in the same stratum as that of the boat (Fernández Gómez, 2007: 168). It is possible, therefore, to suggest that the boat belongs to the Islamic period of Seville (i.e. AD 712 – 1248) when Ishbiliyya was under the control of different Islamic systems of government. A radiocarbon analysis of a wood sample from the boat demonstrated that this hypothesis was correct (see Chapter 5), and that the boat found at Plaza Nueva was built and used during the Caliphate of Cordoba (AD 929-1031).

Taking into consideration its morphological characteristics (i.e. cruciform shape), the anchor was probably made and used during Late Antiquity (Kapitän, 1984;

Eliyahu *et al.*, 2011). However, its precise chronology, provenance and cultural origin are difficult to establish. The hypotheses by Guerrero Misa who suggests a chronology of the second half of the 6th century, a provenance from the Eastern Mediterranean, and a byzantine cultural affiliation, are based largely on historical grounds. These hypotheses, although possible, seem not to be very firmly founded. In order to establish a chronology for the anchor, we need to take into consideration several details. Cruciform anchors were used from the second half of the 4th century until the 13th century (Kapitän, 1984: 42-43; Eliyahu *et al.*, 2011: 236-237). They were used in al-Andalus by Islamic ships as attested by the four anchors found in the Agay A shipwreck dated to the 10th century (Joncheray, 2007) (Figure 95). The boat from Plaza Nueva was lost in a later period after the anchor, thus the historical period of the boat represents a *terminus ante quem* for the chronology of the anchor. Thus, it seems that the anchor was made and used no later than the 10th century when, according to a radiocarbon analysis, the Plaza Nueva boat was built, used and lost (see Chapter 5).

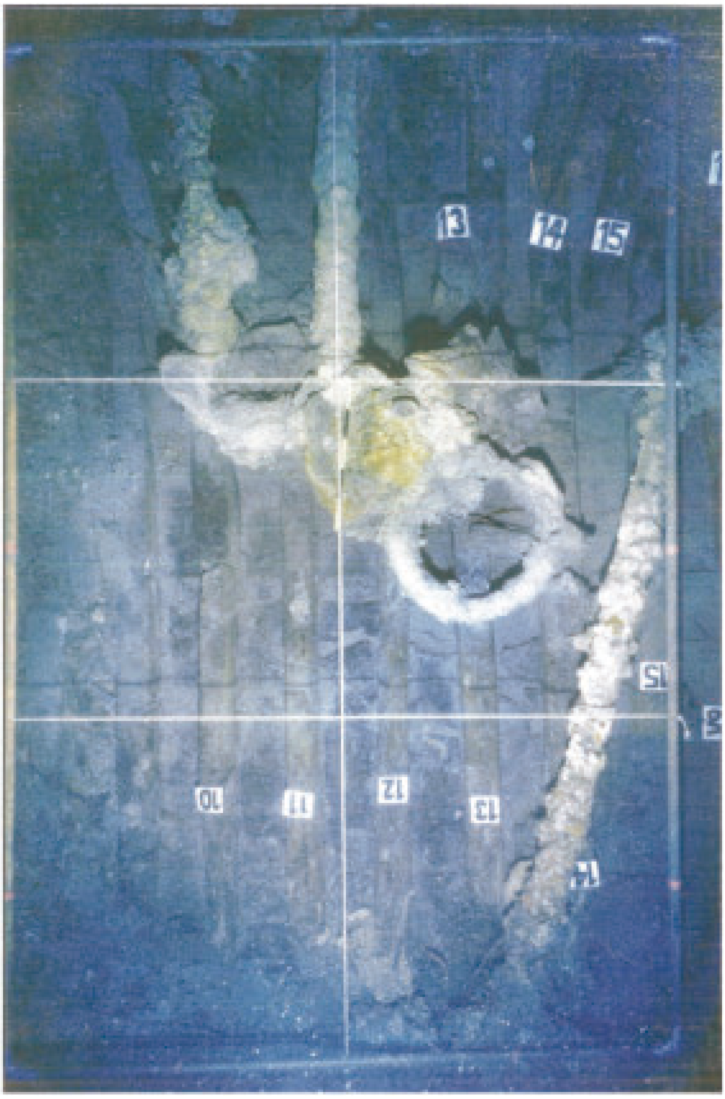


Figure 95: Cruciform anchors *in situ* from the 10th century Agay A shipwreck (after Joncheray, 2007: 229).

Consequently, and in the absence of a detailed study of the anchor and a subsequent comparative study, it can be suggested that the Plaza Nueva anchor probably belongs to a chronology between the 6th and 9th centuries (Cabrera Tejedor, 2013: 522; 2014: 244). The presence of this cruciform anchor in the ancient port of Seville is of importance since it represents the archaeological example of a cruciform anchor found the farthest west within the Mediterranean (Votruba, 2014: *passim*).

Although the anchor and boat may belong to different historical periods (i.e. Late Antiquity and Caliphate of Córdoba period), they were lost in the same area and found *in situ*. This reveals that this area was an anchorage of the ancient port of Seville for many centuries. Furthermore, to date, they represent the only archaeologically documented nautical finds from the ancient port. Due to the similarities of the Plaza Nueva anchor with those recovered from the seventh century *Yassi Ada* shipwreck, it can be suggested that this anchor, of *circa* 2 metres, must belong to a vessel around 20 metres in length if not larger in size. This suggests that in the historical period that the anchor was lost (i.e. estimated to be between the 6th and 9th centuries) the ancient riverbed of the Guadalquivir was navigable for seagoing ships.

This hypothesis could be further tested by the reconstruction of the stratigraphy of the Plaza Nueva excavation, although this was never documented. However, abundant ceramic materials were retrieved from the pit, and are kept at the Seville Archaeological Museum. Therefore, it is the intention of the present Thesis to study and classify the ceramic materials retrieved from the Plaza Nueva excavation (see Chapter 5). The study of the ceramic materials would help to establish a reconstructed stratigraphy, which could assists in defining a more precise chronology for the anchor.

4.3 The Baetis River during Late Antiquity

Based on archaeological data, historical chronicles, palaeo-geomorphological and palaeo-environmental studies, this section will discuss and propose possible climatic impacts on the history and development of the Baetis River during the Late Antique period.

4.3.1 Palaeo-hydromorphology of the Guadalquivir River in Seville during Late Antiquity

The phase from the Late Roman period to the Middle Ages in general terms could be described as a *development phase*. This was a period in which the hydro-morphological processes of the Guadalquivir River were active again and two different sub-phases are identifiable. From the 3rd century onwards an *alluvial phase* began, characterised by vertical and lateral aggradation processes that changed the morphology of the Baetis River. This Late Antique *alluvial phase* also lead to the lateral displacement of the river channel towards the west (Figure 96), yet only in the south half of the city (Borja Barrera, 2014: 291).

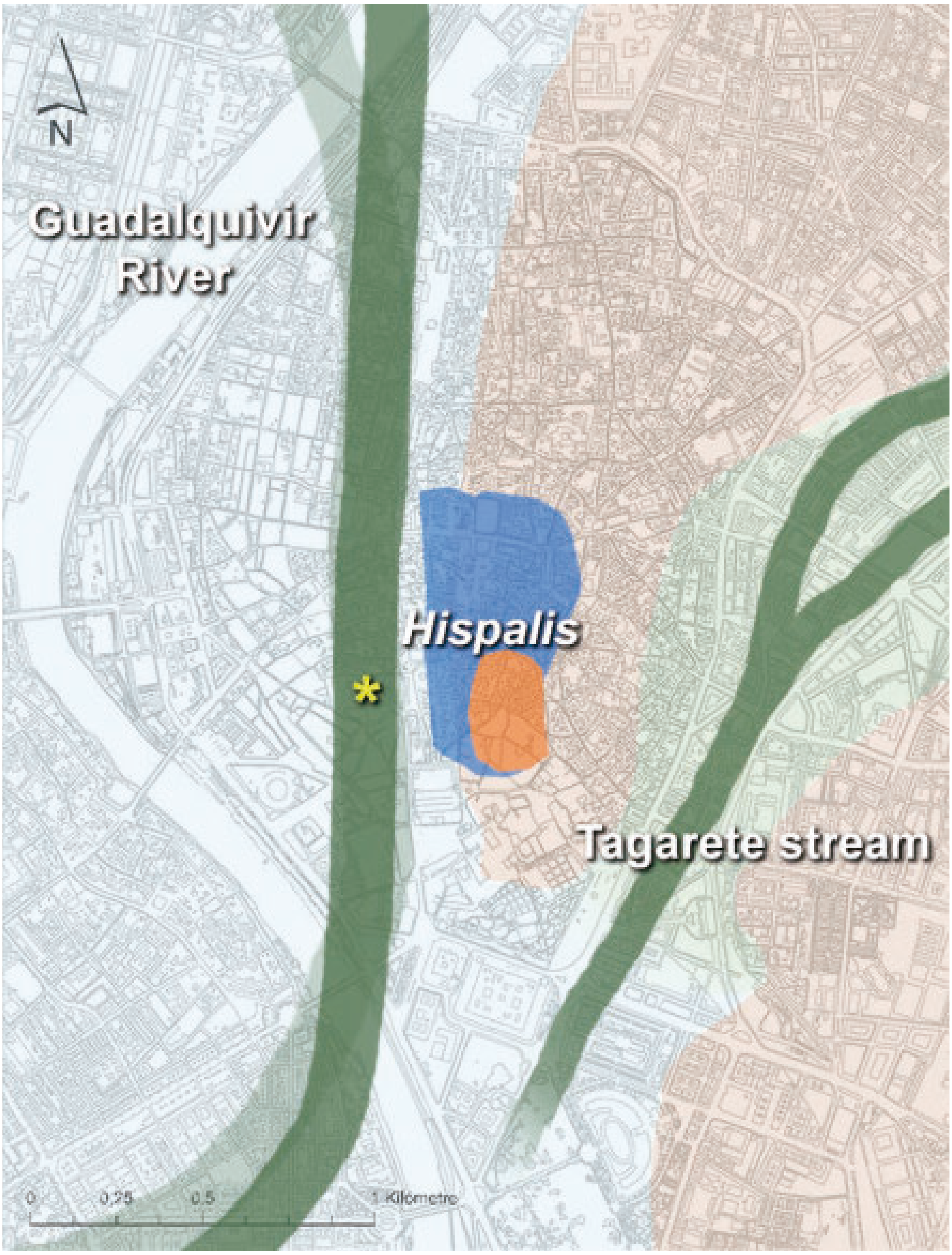


Figure 96: Approximate reconstruction of the hydromorphology of the Baetis River *circa* 3rd to 5th centuries AD; Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27). The asterisk marks the location of the Plaza Nueva. The faded areas along the river correspond to the positions of the meanders during the previous phase *circa* 1st to 2nd century AD. Note that the meander adjacent to the city has been displaced towards the west (scale bar 1 km, Author).

From around the 4rd until the 6th century an *alluvial phase* began, characterised by higher precipitation rates (i.e. rainfall) resulting in higher sediment being dragged by the river. This developed into aggradation processes, which increased the land elevation due to the deposition of alluvium from the river. This is attested in several archaeological excavations in the city of Seville in which horizontal strata of clay and fine silt completely cover Roman infrastructures such as port facilities and necropoli (Figure 97). Some of these aggradation processes seem to have been extremely violent floods, since they not only covered, but also destroyed, urban Roman infrastructures (Borja Barrera, 2014: 291-292). These floods are attributed to an increase in humidity, reflecting lower temperatures and higher precipitation (Figure 98).

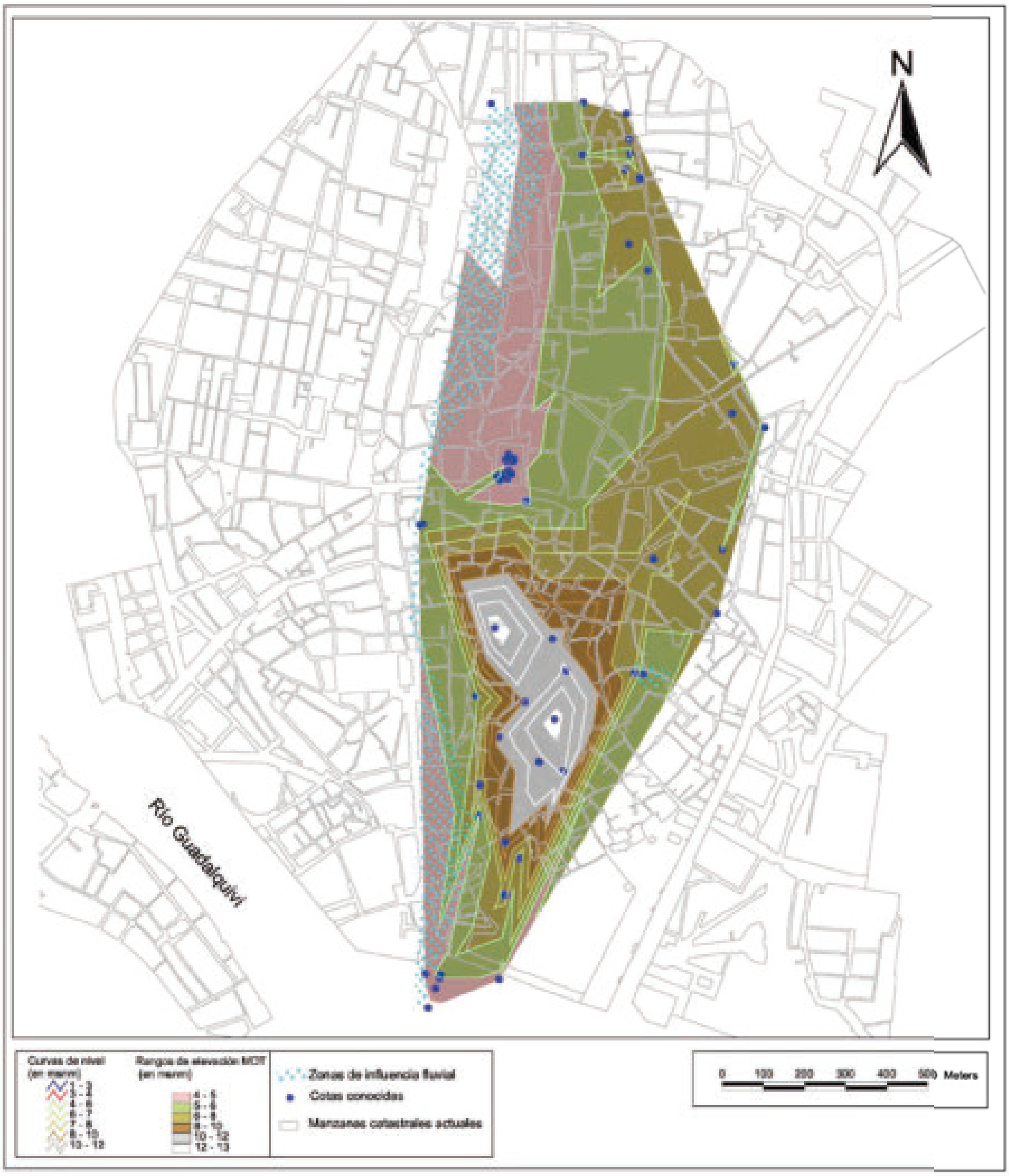


Figure 97: Areas of the city where the elevation of the land increased substantially during the 4th and the 5th centuries (pink) due to aggradation processes (after González Acuña, 2011: fig. 2.6).

This period of higher precipitation and floods was also recorded on the Rhône River (southern France), where from around AD 200 onwards substantial hydrological change occurred (Provansal *et al.*, 1999; Arcelin *et al.*, 1999: 125-126). During the 4th century, a series of floods resulted in the circus being abandoned as well as the Trinquetaille quarter at Roman city of Arelate (Loseby, 1996: 48). With regards to the same period of floods, Ammianus Marcellinus (14.10.2) recorded that the rivers of Gaul (i.e. France) were too heavily inundated by heavy rain in the spring of AD 354 for Constantius to ship grain from Aquitania to Germany.

Conversely, between the 6th and 8th centuries, there was a period characterised by a certain degree of stability in the Guadalquivir River in Seville. This *stable phase* was a direct consequence of a decrease in the mean sea level, along with lower average temperatures, as well as low average precipitation totals. All these factors resulted in a very stable riverbed (Borja Barrera, 2014: 293).

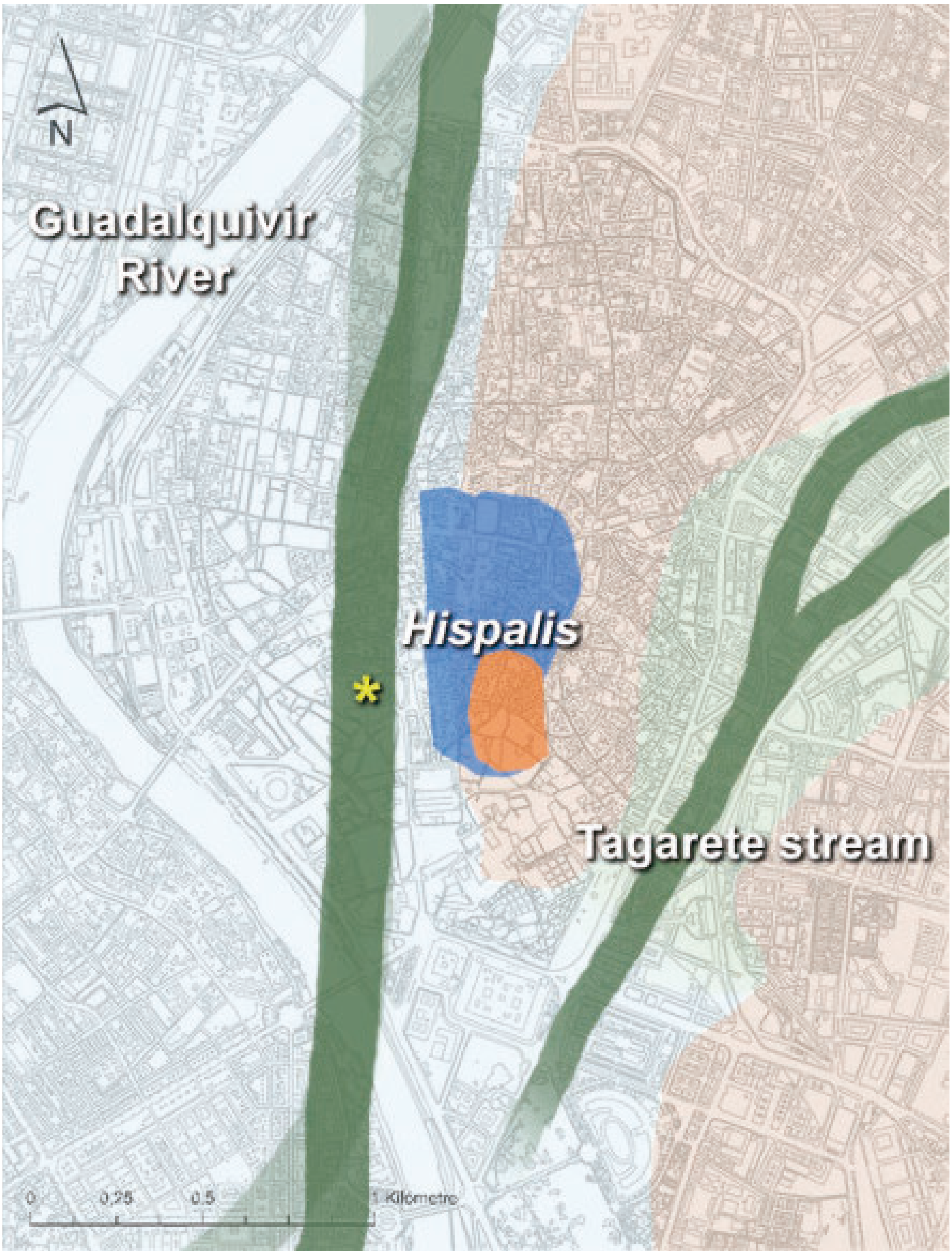


Figure 98: Approximate reconstruction of the hydromorphology of the Baetis River *circa* 6th to 8th centuries AD; Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27). The asterisk marks the location of the Plaza Nueva. The faded areas along the river correspond to the positions of the meanders during the previous phase *circa* 4th century AD. Note that the meanders north and south of the city have been displaced towards the east. The meander remained stable from the 6th to 8th centuries AD (scale bar 1 km, Author).

4.3.2 Palaeo-climatology of the southwest Iberian Peninsula during Late Antiquity

Different palaeo-environmental studies provide data supporting the palaeo-morphology hypothesis with regard to the Guadalquivir River in Seville during Late Antiquity.

Geologists that try to reconstruct the changes in climate through the history of the Earth (i.e. palaeo-climatologists) use and combine a variety of proxy records from several palaeoclimate archives (including tree rings, lake sediments, river sediments, marine cores and speleothems). Recent studies on climate reconstruction have demonstrated substantial climatic variation during the last two millennia and a correlation between these climatic events with historical periods (e.g. Büntgen *et al.* 2011; Luterbacher *et al.*, 2012; McCormick *et al.*, 2012).

In the last two millennia of the Holocene, studies in palaeoclimatology have identified four climatic periods characterised in terms of temperature and precipitation variability: from *circa* AD 0 to AD 500, the Roman Warm period (RWP); from *circa* AD 500 to AD 900, the Dark Ages (DA); from *circa* AD 900 to AD 1300, the Medieval Warm period (MWP); and from *circa* AD 1300 to AD 1850, the Little Ice Age (LIA) (Moreno *et* al 2012: 16). These climatic periods are widely accepted by the scientific community, however their proposed precise chronological boundaries or designation varies from study to study. Similarly, the temperature and precipitation variability during each period are heterogeneous and thus differ among geographical areas.

An academic paper by Moreno *et* al (2012: 29) has indicated that the results of their study on climate reconstruction (for the south Iberian Peninsula) are consistent with the southern-central European and Mediterranean records analysed by other studies such as Büntgen *et al.*, (2011). The study by Büntgen *et al.*, (2011) focused on the dendro-chronological records from oak samples in Central Europe, allowing for the reconstruction of local climate change (i.e. precipitation and temperature fluctuations) over the last 2500 years. Martin-Puertas *et al.*, (2010: 813) also suggested that the Late Holocene climate evolution in the south-western Mediterranean region correlates better with the western-central Europe and West tropical Africa than the data obtained in the eastern Mediterranean. These factors are the rationale for using the data obtained by Büntgen *et al.*, (2011: fig. 4) in different chapters of this Thesis (Figure 99).

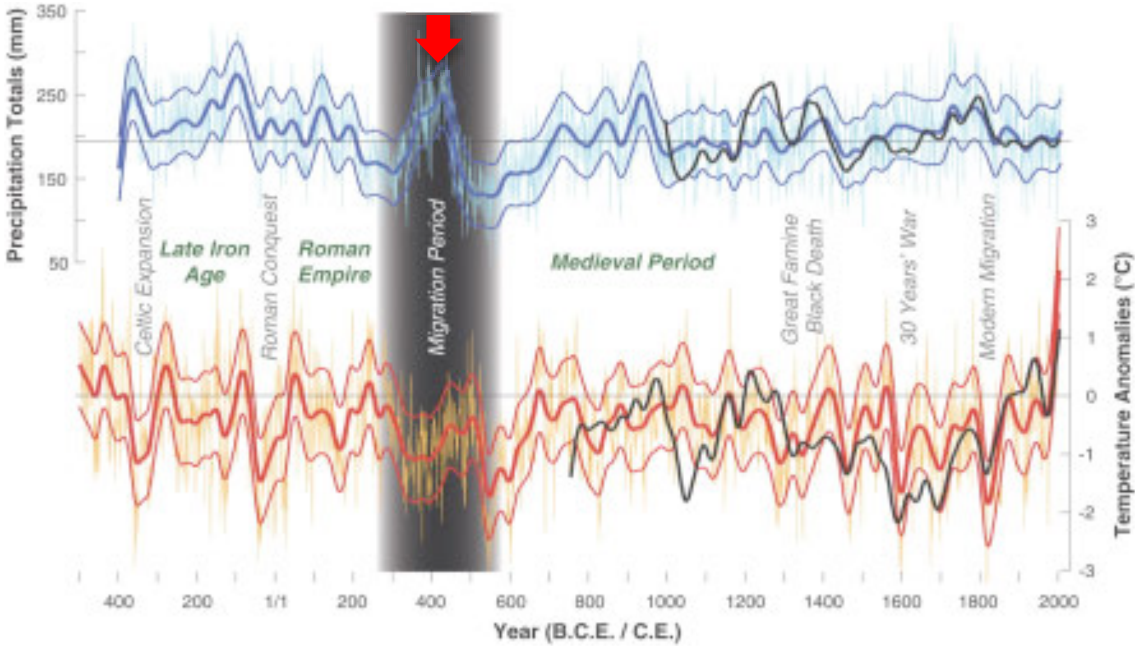


Figure 99: Reconstructed precipitation totals (top) and temperature anomalies (bottom). Bold lines are 60-year low-pass filters. Periods of demographic expansion, economic prosperity, and societal stability are noted, as are periods of political turmoil, cultural change, and population instability (after Büntgen *et al.*, 2011: fig. 4). The red arrow marks a significant increase in precipitation from *circa* AD 320 to AD 450.

Examination of the last 2000 years of climatic reconstruction shows that the first two and a half centuries AD were characterised by alternating cycles of warming and cooling weather. These years represent the optimum known as the Roman Warm period (Bianchi and McCave, 1999: 516; Greene, 1986: 83). However, from around the middle of the 3rd century AD, both precipitation levels and temperature dropped dramatically. The subsequent climatic period, from about AD 250 to AD 650, was characterised by cold and dry climatic conditions. The roughly last century and a half of this cold and dry period (i.e. from approximately AD 536 to AD 660) has recently been identified, by some palaeo-climatologists, as the Late Antique Little Ice Age (Büntgen *et al.*, 2016) because of the extremely low temperatures recorded that seem to have occurred after a series of volcanic eruptions and that coincided with a solar minimum.

Changes in temperature would have an impact on the total precipitation and, consequently, on the hydrology of rivers. The following general observations can be drawn from studies in palaeoclimatology. A small increase in temperature (i.e. +1° C) will cause the total annual precipitation to decrease, winter precipitation to increase, and summer precipitation to decrease. Due to increased evaporation and decreased precipitation, the overall discharge of a river will decrease by values ranging from 5% to 15%. Drier climates will also affect the morphology of rivers, generally causing them to become broader and shallower, creating meanders, which will increase the volume of water in the stream.

In contrast, a small decrease in mean temperature (i.e. -1° C) will result in an increase in annual precipitation, which will result in a larger riverine discharge and larger quantities of alluvium being carried. Precipitation variability extremes would be more balanced, although flash flood events would occur more often. Larger humid periods will affect the morphology of rivers as well; it could create braiding systems, where channels are obstructed and the flow is forced around sediment occupying multiple channels. Braiding systems could potentially make navigation more difficult (Franconi, 2013: 709).

Periods of relatively stable temperatures, such as the first two and a half centuries AD of the Roman Warm period, would have provided a fairly constant and predictable seasonality of high and low discharge in rivers. The cooling phase that began in the late 3rd century, combined with the increase in precipitation from around AD 320 to AD 450, produced frequent floods in rivers that would have resulted in increasingly braided and swift flowing channels. We have seen that the archaeological record and historical accounts pertaining to the Guadalquivir River in Seville and the Rhône River in Arles during the Roman period, have documented evidence of these hydrological changes and the destruction that they caused.

Additionally, recent studies of palaeofloods in the Iberian Peninsula during the Holocene (Benito *et al.*, 2015) support this hypothesis. This, and other analogous studies, show that an increasing fluvial activity and vertical alluviation rates occurred during the 5th and the 6th centuries AD which coincided with higher flood frequency (Benito *et al.*, 2015: fig. 3)(Figure 100).

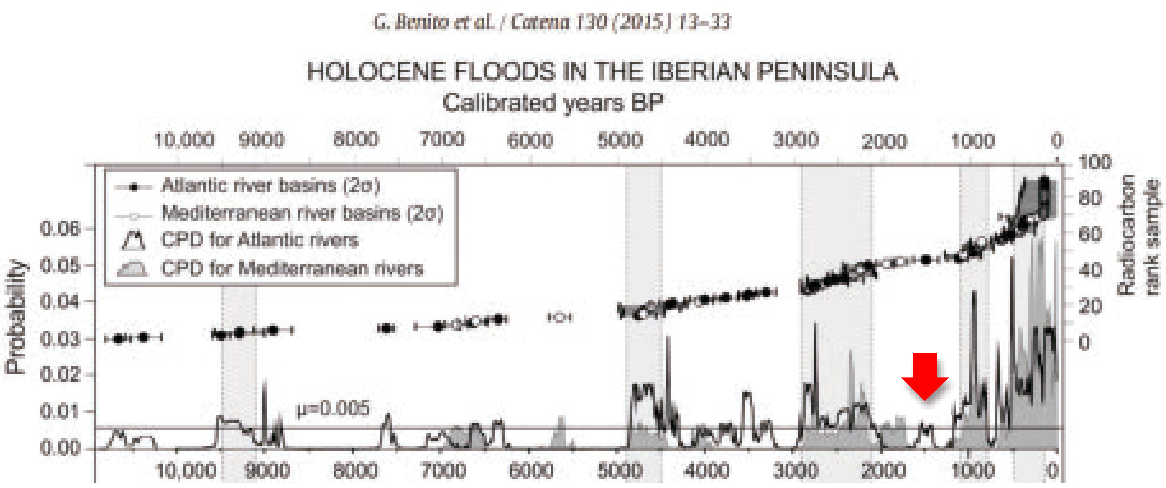


Figure 100: Cumulative probability density plots (CPD) of radiocarbon dates from floods and extreme fluvial event units of the Iberian Peninsula. The horizontal line indicates the mean probability above which a period of major flooding is inferred. Shaded vertical bars show periods of enhanced flood/fluvial activity above the mean and with at least three radiocarbon dates in 200 years. Black and white dots are radiocarbon aged samples (after Benito *et al.*, 2015: fig. 3). The red arrow marks the period around AD 400 - 600.

The anonymous chronicle of the *Lives of the Fathers of Mérida* recorded that one flood occurred at the end of this period of higher precipitation and higher flood frequency. The chronicle described how, during the first quarter of the 7th century AD, a great flood of the river Anas (i.e. Guadiana River) overflowed the channel of the river on both of its banks, destroying many buildings (Fear, 1997: 54-55; ed. Velázquez, 2008: 62).

4.3.3 The Baetis *conclusio* of King Leovigild in AD 583

The fluvial regime of the Lower Guadalquivir is defined as Oceanic-Mediterranean and is characterised by extreme irregularity and by a low mean discharge. The reduced volume of the Guadalquivir River's flow is in part explained by the limited size of its basin (i.e. 57,000 km^2) but the flow increases thanks to the input of several tributaries. The absolute mean discharge of the Guadalquivir River at Seville is about 185 m^3/sec, being one of the smallest of the Iberian Peninsula. In the summer, from early June until late September, the discharge of the river decreases significantly. On some extreme occasions the flow disappears completely, as occurred in October 1945 when there was no flow for eight consecutive days and a flow of less than 5 m^3/sec for three weeks (Ménanteau and Vanney, 1985: 119).

The recently identified Late Antique Little Ice Age that seems to have taken place from approximately AD 536 to AD 660 (Büntgen *et al.*, 2016) was characterised by extremely low temperatures and dry climatic conditions that coincided with a solar minimum. These climatic conditions resulted in one of the longest, coldest and driest periods recorded in the last three millennia.

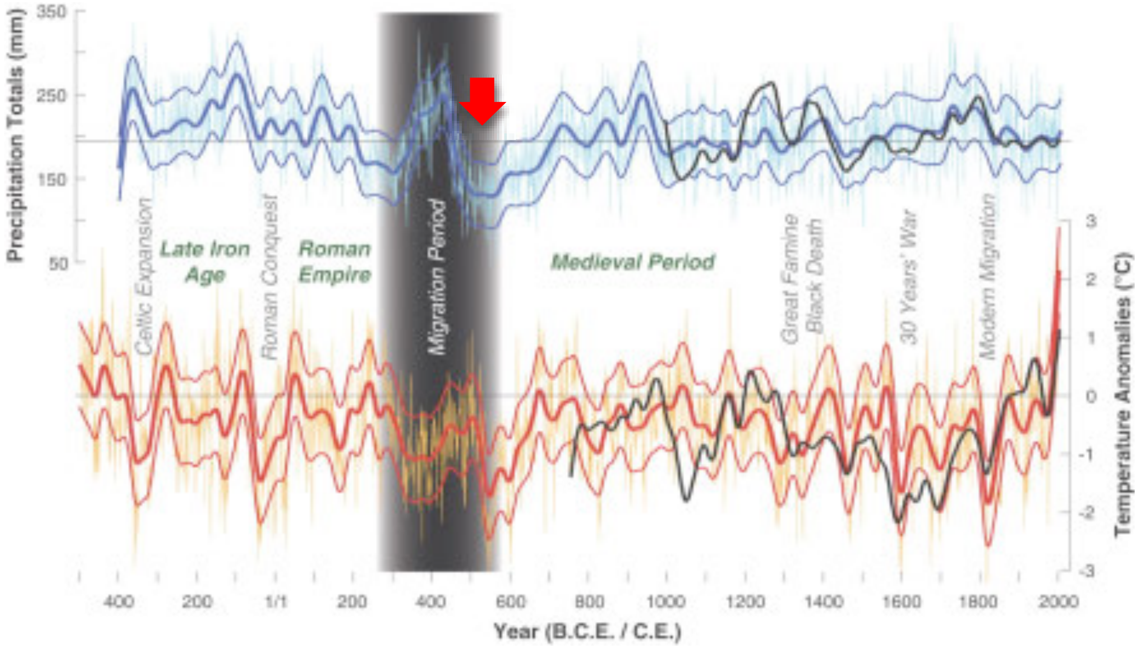


Figure 101: Reconstructed precipitation totals (top) and temperature anomalies (bottom). Bold lines are 60-year low-pass filters. Periods of demographic expansion, economic prosperity, and societal stability are noted, as are periods of political turmoil, cultural change, and population instability (after Büntgen *et al.*, 2011: fig. 4). The red arrow marks a significant decrease in precipitation from *circa* AD 500 to AD 590.

The cooling phase, combined with a severe decrease in precipitation from around AD 500 to AD 590 (Figure 101), probably resulted in the complete disappearance of the flow of the Guadalquivir River during the summer months, as occurred in Seville in October 1945 (*vide supra*). This anomalous extremely low flow during the last decades of the 6th century would explain a rather cryptic description of an event recorded in the chronicle of John of Biclaro. He described how Leovigild fought his son Hermenegild in Seville, by putting the city under siege, starving the population, and eventually blocking (or closing) the Baetis River (i.e. Guadalquivir River).

> *ANNO ERGO I MAVRICII IMPERATORIS, LIVVIGILDI*
> *REGIS XV ANNVS (AD 583)*
> *Liuuigildus rex civitatem hispalensem congregato exercitu*
> *obsidet et rebellem filium gravi obsidione concludit, in cuius solatio*

Miro Suevorum rex ad expugnandum Hispalim advenit ibique diem clausit extremum. cui Eburicus filius in provincia Gallaetiae in Regnum succedit. interea Liuuigildus rex supra dictam civitatem nunc fame, nunc ferro, nunc Baetis conclusione omnino conturbat.[45]

The palaeo-climate reconstruction of the period shows that there was roughly a century of severely dry conditions. This would have had an impact on the hydrology of the rivers and the water table. It is therefore plausible that the Baetis River had no flow during the summer months, especially during the last years of the drought period. This does not mean that the channel of the river was completely dry, since we have seen (Chapter 3) that Seville is within reach of the tides from the Atlantic Ocean; but the water in the channel of the river would have been largely composed of seawater that contains salt and thus is unfit for human consumption. In fact, the *Hisba* treatise written by Ibn ʿAbdūn at the beginning of the 12th century on the city of Seville clearly stated that water for consumption by the city should be taken upstream, beyond the reach of the tide (Ibn ʿAbdūn, ed. Levi-Provençal and García Gómez, 1981: 108-109).

It is possible thus to suggest that the severely dry conditions of the period resulted in the Baetis River having no, or very reduced, flow of fresh water coming from upstream, at least during the summer months. Consequently, this would have allowed Leovigild to literally and physically block or close the river upstream from Seville in AD 583 without requiring major engineering undertakings. Wells were

[45] IN THE FIRST YEAR OF THE EMPEROR MAURICE, WHICH WAS THE FIFTEENTH YEAR OF KING LEOVIGILD (AD 583) After assembling his army, King Leovigild surrounded the city of Seville and trapped his rebel son with a very tight siege. King Mira of the Suevi came to relieve Seville in support of Hermenegild and there he ended his days. His son Eboric succeeded him as king of the province of Galicia. Meanwhile King Leovigild afflicted the city first with hunger, then with the sword, and finally with a blockade of the Baetis river (John of Biclaro, *Chronicle*, ed. Wolf, 1999: 61).

also probably dry, since such an extended period of drought had most likely lowered the water table level. Consequently, the starvation mentioned by Chronicle of John of Biclaro probably refers to the lack of fresh water in the city resulting from the blockade of the river.

4.4 The port of Hispalis during Late Antiquity

During Late Antiquity the province of Baetica became independent from the Western Roman Empire structure. The local Hispano-Roman aristocracies in some measure welcomed this transformation. From that moment on, they took control of the province and continued to enjoy their immense wealth without having to share it with Rome. Throughout Late Antique period, Hispalis remained the principal commercial emporium of Baetica and the metropolis of the surrounding rural areas of the Lower Guadalquivir Valley. Unlike in the Tarraconensis province of Hispania that seems have undergone a crisis (perhaps resulting from the Frankish invasions), rural life in Baetica continued in a somewhat similar way to that in the Roman era (Carr, 2002: 81 and ff; García Vargas *et al.*, 2013), with its organization in *latifundia* owned by aristocratic Hispano-Roman families (*vide supra*). One of these wealthy landowners, Euphrasius, bred horses, which pastured on his vast estate. Around AD 400 the Roman statesman Symmachus requested his friend Euphrasius to send him racehorses for the games staged in Rome (Symmachus, *Epist.*, 4.58-63). During Late Antiquity these families controlled the territory through fortified manor houses. Some of these *latifundia* were so vast that they allowed their extremely wealthy owners to have a private army, recruited from the dependent peasantry, of 2000 men strong (Procopius, De *bello Gothico* I (V).12.50-54).

Epigraphic evidence from Hispalis attests to the existence of these aristocratic families in the 5th century in the case of the *clarissima femina Aurelia Proba* buried in Hispalis (*CILA* 2.1, 68), and in the 6th century by the *clarissimae feminae Cervella* and *Paula* (*CILA* 2.1, 143 and *CILA* 2.1, 150), buried in the necropolis of San Bernardo (Beltrán Fortes and Rodríguez Gutiérrez, 2014: 168-169). However, probably the aristocratic family that we know best is the extremely powerful family of Severianus, his sons, Bishop Leander and Bishop Isidore, as well as their sister Florentina. He and his family emigrated from Cartagena to Hispalis after the Byzantine invasion, where they became a prominent leading clan of the Hispano-Roman aristocracies of the city and the rest of Visigothic Spain (*vide infra*).

It has been proposed that during the 4th century, the provincial capitals and major cities saw their population grow to the detriment of small towns which were threatened by depopulation and lack of resources (Mazzarino, 1951), and this seems to have been the case in Baetica during the 4th and 5th centuries (Carr, 2002: 96, 183; García Vargas *et al.*, 2013: 376, 382). The adoption of Christianity as the official religion and the emergence of the Church contributed to this migration from rural areas towards urban cities (Padilla Monge, 1989). In the Late Antique period, the Church took over the redistributive function and protection of the lower classes from the Imperial Institutions. Cities with major Christian communities thus become a focus of attraction and a new framework for integration and promotion of aristocracies emerged (Brown, 2012). The changes occurred in rural Baetica at this time were not incompatible with the maintenance of a thriving urban life in certain capitals. However, from social change and the concentration of wealth and land ownership in fewer hands, new aristocratic elites emerged in the cities, the rural *honestiores* and *potentiores* (Ordóñez Agulla, 2002: 35).

In the work *Ordo urbinum nobilum*, the Gallo-Roman poet Ausonius (AD 310-393) described the most important cities of the Roman Empire, placing Hispalis as the most important in Hispania (*Urb*. 24.82):

> *Clara mihi post has memorabere, nomen Hiberum,*
> *Hispalis, aequoreus quam praeterlabitur amnis,*
> *summittit cui tota suos Hispania fasces.*
> *Corduba non, non arce potens ibi Tarraco certat*
> *quaeque sinu pelagi iactat se Bracara dives.*[46]

Some scholars have used Ausonius' description to suggest that during the 4th century perhaps Hispalis was the capital of the *Diocesis Hispaniarium* (Blanco Frejeiro, 1992: 62-63). The anonymous Islamic chronicle known as *Akhbar Majmu'a* (ed. Lafuente y Alcántara, 1867) described the grandeur of Hispalis at the time of the Umayyad conquest in AD 712 and supports Ausonius' description: *"Then Musa went to Seville, (…). Before the invasion of the Goths had been the capital of the kingdom, but after their victory, the court was moved to Toledo (…)*". However, the poetical nature of the *Ordo urbinum nobilum*, as well as different transcriptions of the surviving text, led other scholars (Arce Martínez, 2002) to question the veracity of Ausonius' description, arguing that Emerita Augusta was indeed the

[46] After these thou shalt be told, beloved Hispalis, name Iberian, by whom glides a river like the sea, to whom all Spain subjects her magistrates. Not Cordova, not Tarragona with its strong citadel contends with you, nor wealthy Braga, lying proudly in her bay beside the sea. (Ausonius, transl. by Evelyn-White, 1919: 277).

capital. Whether or not Hispalis was the capital is certainly debatable, but what seems unquestionable is that Seville had a huge geopolitical weight during Late Antiquity.

Recently, in April 2016, 600 kg of coins from Emperor Maximian (AD 286-305) and Emperor Constantine (AD 306-337) were discovered in Tomares, a suburb of Seville. The bronze coins were found in 19 purposely made small *amphorae*. It is estimated that there are at least 50,000 newly minted coins, but they were never in circulation, and some of which seem to have been silver-plated. The preliminary hypothesis of the archaeologists is that this vast coin hoard had the original function as being for payment of taxes or army wages (El País, 29th April 2016). This unparalleled hoard attests to the importance of Hispalis during the 4th century and, perhaps, potentially supports the words of Ausonius.

During Late Antiquity, centralised management deteriorated and, as a result, some reduction in trade and economic activities followed. This led to a shift of trade and economic hubs towards major cities in the interior of Hispania. In this new scenario, production of foodstuffs became more important than their distribution. However, although a decrease in the volume of maritime commerce is evident compared to that of the first two centuries AD (Lewis, 1978: 482-487; Reynolds, 2010), production of surplus for export remained unchanged in Baetica until the Byzantine conquest of territories in the southeast peninsula in the mid 6th century. During the 4th century, eastern areas of Hispania and Baetica remained prosperous enough to produce considerable surpluses which could be exported by sea (*Codex Theodosianus*, VIII and XXIX, Pharr *et al.*, 1952). Evidence of this surplus production as well as its export as far as the Levant in the Eastern Mediterranean is attested archeologically. The production of amphorae for the transportation of olive oil in *figlinae* of Baetica is confirmed archeologically through the 4th, 5th and the 6th centuries (Berni Millet, 2008). Olive oil amphorae, Dressel 23 or Keay 13 from Baetica, reached Anatolia and Judea in the 5th century (Bernal Casasola, 2001: 954-955, 948). Consequently, the port of Hispalis continued to be the principal maritime emporium of Baetica, and the city occupied an important place among the great peninsular *metropoleis*.

A period of instability and political turmoil began when the Alans, Suebi, and Vandals entered Hispania in AD 409. From AD 425 Seville, located in an area of high strategic value, began to experience the raids of the Vandals, a product of the weakening of the Roman Imperial presence in Hispania. The last report regarding Roman military presence in Baetica is from AD 438 (Hydat 114; Isid. *Hist. Vand.* 85).

Nevertheless, a number of sources attest how the port of Hispalis, throughout Late Antiquity, maintained its importance and its connection with the Mediterranean maritime networks, both with nearby areas, such as North Africa, as well as with the Levant in the far east (Amores Carredano *et al.*, 2007: 133-146). It is also very likely that the Vandals, under the leadership of Genseric, crossed to North Africa aboard a fleet from one of the major ports of Baetica.

Due to the large size of the Vandal army, it seems plausible that the Vandals crossed to North Africa aboard an already existing fleet of ships rather that building one *ex novo*. It is clear that they departed from one of the major ports of Baetica but he historical sources did not tell us which. The port of Gades, due to its excellent natural harbours (Bernal Casasola, 2008; 2010) and being the closest to the coast of North Africa, would have been the most convenient and obvious port of origin for the crossing of the Vandal army. However, the 4th century AD historian Avienus, informs us how Gades had lost all its previous grandiosity, was abandoned and in ruins (*Ora maritima*, vv. 267-274).

> *(...) Gadir hic est oppidum,*
> *nam Punicorum lingua cons(a)eptum locum,*
> *Gadir vocabat. ipsa Tartessus prius*
> *cognomina(ta) est. multa et opulens civitas*
> *aevo vetusto, nunc egena, nunc brevis,*
> *nunc destituta, nunc ruinarum ag(g)er est.*
> *nos hic locorum, praeter Herculanea(m)*
> *solemnitatem vidimus miri nihil. (...)*[47]

It seems probable, consequently, that the Vandals crossed to Africa aboard a fleet from Hispalis (Ordóñez Agulla, 2002: 36), which took the army to the shores of North Africa. This hypothesis, if proven to be correct, would mean that Hispalis had the capacity to mobilize a substantial fleet in the 5th century able to transport an army of around 15,000–20,000 (Heather, 2005: 197-198).

The presence of communities of foreign merchants in Hispalis can be traced in Late Antiquity (García Moreno, 1972: 137). A community of Greek merchants existing from at least the 2nd century AD is attested by epigraphy. From the end of the 4th century or the beginning the 5th, a Greek merchant originally born in Tarsus,

[47] (...) Here is the town Gadir, for it means in the language of the Carthaginians "fenced-in place." It was formerly called Tartessus. In ancient times, it was a large and wealthy state, now it is poor, now it is small, now it is abandoned, now a heap of ruins. Here we saw nothing remarkable beyond the yearly rites of Hercules. (...) (Avienus transl. by Murphy, 1977: 19).

Aurelio Eliodoro, died in Tarragona while he was possibly traveling there, since he permanently resided in Hispalis (Vives, 1969: 196). From the late 3rd century AD, public celebrations of religious cults of Syrian origin were practiced in Seville (Cumont, 1927). The existence of eastern cults is demonstrated by the episode of the martyrdom of Saint Justa and Saint Rufina. Justa was born in AD 268, and Rufina in AD 270, both of a poor but pious Christian family of potters. During a pagan festival they refused to sell their ware for use in these celebrations. In anger, locals broke all of the dishes and pots in their workshop. Justa and Rufina retaliated by smashing up an image of Venus. The prefect of Hispalis, Diogenianus, ordered them to be imprisoned. Failing to convince them to renounce their faith, they were tortured, imprisioned, starved, thrown to the lions in the amphitheatre and, finally, beheaded thus becoming Christian maritrs (Flórez, 1752: 309-315).

The port of Hispalis maintained its function as the main commercial maritime hub for the south of Hispania through which imports, exports, and foreign relations proceeded to Baetica. The port was one of the major access points to the peninsula for the prominent eastern traders, or *transmarini negotiatores*, mentioned in Visigothic law (D'Ors, 1958: 467-483). The existence of an active colony of eastern merchants is significant evidence of the continuation of commercial bases that had made their fortunes in Hispalis during previous times. Despite the great transformations occurring during Late Antiquity, Hispalis seems to have maintained its strength as a maritime emporium (Ordóñez Agulla, 2002: 36). The anonymous chronicle of the *Lives of the Fathers of Mérida* described how during Late Antiquity, each year when the sailing season was opened, foreign merchants were welcomed in a ceremonial reception hosted by the Bishop of Merida in the atrium of the Archbishop's palace (Fear, 1997: 61-62; Velázquez, 2008: 73). It is therefore plausible that foreign merchants were received in Hispalis in a similar manner to that in Mérida (García Vargas, 2014: 203).

During this period an important Jewish colony existed in Hispalis, and some of their members were merchants (García Moreno, 1972: 146). The Jewish community, in spite a long period of persecution and abuse inflicted by the Visigothic rulers with the main purpose of converting them to Christianity (García Iglesias, 1978: 83-199; García Moreno, 1993: 137-177; Thompson, 1969: 315-317), remained in the city until the Islamic period, when it had a prominent position in the urban administration (see Chapter 5).

The maritime connection of Hispalis with the central and eastern Mediterranean is also confirmed by the exchange of correspondence which occurred between Pope Simplicius and Pope Felix III with Bishop Zenon of Hispalis during the end of the 5th century. The voyage of Bishop Leander of Seville to Constantinople in AD 582, in search of military help from the Emperor Tiberius II Constantine to support Hermenegild against King Leovigild (Thompson, 1969: 21, 66; Isidore, *De Vir Illustr* 60, pl 83. 1104), and the ample correspondence that resulted from his friendship with the future Pope Gregory (Gregory I, I Dial. Iii. 31) also attest to continuation of the maritime routes. The attendance of a Monophysite bishop from Syria at the Second Council of Seville in AD 619, attests to his journey by sea from the Eastern Mediterranean (Vives *et al.*, 1963: 171).

Throughout the period of the Byzantine presence in Spain, research on archaeological (Gutiérrez Lloret, 1998), epigraphic (García Moreno, 1972) and textual (D'Ors, 1958) evidence has demonstrated that commercial contacts between Spania, Visigothic Spain, and the eastern empire continued uninterrupted. The cruciform anchor found at Plaza Nueva in Seville provides physical evidence that seagoing ships anchored at the port of Hispalis during at least the 6th century and/or up to the 9th century (*vide supra*).

During the 6th and the early 7th centuries the geopolitical importance of Hispalis increased substantially due to two different factors. Hispalis became the royal Visigothic capital at various times, and had an active and prominent role in the strategies of various Visigothic kings. The conquest of Vandal North Africa by Justinian in the 530s and the loss of *Septem* in AD 534 (*vide infra*) forced the Visigothic monarchy to try to control Baetica with the goal of monitoring the Strait of Gibraltar. In the 6th century, during the realms of Theudis, Theudisclus, Athanagild, and Hermengild, Hispalis became *sede regiae* of the kingdom (Ordóñez Agulla, 2002: 36). Another indication of the importance of the city in the context of Visigothic Spain is the fact that Hispalis was one of the permanent mints (Figure 102) for Visigothic royal coinage (Pliego Vázquez, 2009: 79-90, 117-118).

Figure 102: Gold tremissis coin from King Reccared minted in Hispalis. The legend reads "+*RECCAREDVS RE(x)*" (left) "+*PIVS ISPALI*" (right)(after Pliego, 2009: 106E).

Besides gold tremisses minted by the Visigothic Kings, from the late 5th century through all of the 6th, small bronze coins bearing the SPL monogram, meaning Ispali, a late antique adaptation of the classical name of the city, were minted (Figure 103) and are archaeologically found in Seville and its hinterland (Fernández Flores *et al.*, 2013: 297). These were certainly used for the smaller payments related to the port's commercial activity, or with the daily purchases in other markets equally controlled by the civic or Church authorities (García Vargas, 2014: 205).

Figure 103: Late antique bronze coin with the inscription *(i)SP(ali)* (after García Vargas, 2014: 205, fig. 15).

Despite the arrival of Visigothic nobility, the society in Hispalis remained similar to that in the Roman period. The arrival of Gothic elements at the metropolis would have been minimal, in all likelihood confined to monarchs, some noblemen with military contingents and members of the administration. The importance of the city and its port was reinforced when the Byzantines invaded territories on the southern coasts of the peninsula, creating the Byzantine province of *Spania* (*vide infra*).

Additional geopolitical importance came from the fact that Hispalis was transformed into a cultural and religious centre with powerful active Catholic bishops. The growing role of the Hispano-Roman urban nobility from the 5th century was directly related with controlling the bishoprics of important cities such as Hispalis.

In the case of Hispalis, the brothers Bishop St Leander and Bishop St Isidore of Seville became the centre of intellectual and ecclesiastical life not only in Baetica but in all of Visigothic Spain. Bishop Leander of Seville presided in AD 589 over the council in which King Reccared and all his Arian Visigoths subjects adopted the Catholic faith. In Hispalis he created a teaching centre and an important library, in which his brother Isidore would be educated to become Bishop of Seville as was his brother before him. Isidore was one of the most important figures at that time. In the IV Council of Toledo he is the inspirer of the principles on which the Visigothic state rested until its disappearance. His many writings include Etymologies, a compendium of knowledge of his time, which, through multiple copies, was an essential work of reference and study for academic education until the Middle Ages. Isidore was canonised a saint by the Roman Catholic Church in 1598 by Pope Clement VIII, and declared a Doctor of the Church in 1722 by Pope Innocent XIII (Fontaine, 2000: *passim*). In the intellectual environment created by Leander and Isidore, some outstanding ecclesiastics were educated, who over the next century, worked in different episcopal headquarters of Hispania. The active role that the Bishops from Hispalis played in the Councils of Toledo reflects the importance of the old Hispano-Roman aristocracy of the Lower Guadalquivir.

The intense maritime commerce, the mint of bronze coinage related to market and the commercial port activities, probably under the direct supervision of the church, and the prominent position of its bishops, leads one to wonder if the Church of Hispalis had a similar role to that of its contemporary the Church of Alexandria. The eastern Mediterranean maritime emporium of Alexandria, under the Patriarchate of St John the Almsgiver (*circa* AD 552 - AD 606/616), *de facto* successfully ruled the city beyond ecclesiastical affairs. This influence included an army of administrators and bureaucrats, the court of justice, and the banking system for the business community, as well as a fleet of commercial cargo vessels, which traded with Western Europe (Mango, 1980: 36-39). Except direct control from the Empire, all the different elements that constituted the Patriarchate of Alexandria, including the threat from an unorthodox sect, in the case of Hispania the Visigothic Arian Christians, seem to have existed in 6th century Hispalis, including extremely prominent church figures that were later canonised by the Church.

4.5 Discussion: was Seville controlled by Byzantium?

There is a historical debate regarding who controlled the city of Seville during the military invasion of Hispania by the imperial troops of Justinian in AD 552 (Thompson, 1969: 320-323; Vallejo Girvés, 1993: 123-124; 2012: 147-158; García Moreno and Suárez Fernández, 2008: 33-34; Collins, 2004: 46-49). This section will summarise some historical events, which inform us about the military intervention. Second, it will cover some of the literary evidence which is used by some historians to argue that Seville was never part of the Byzantine territories, while others maintain that perhaps Seville was in control of the imperial troops deployed in Hispania.

The purpose of this section is to bring a new and different point of view to the discussion, suggesting that recent archaeological excavations in Seville could provide us with new information and insights about this historical episode. This archaeological information might help us to better understand the urban reality of Seville at the time, and hence take a stance in the debate regarding who controlled Seville.

Different contemporary chroniclers such as Gregory of Tours, John of Biclaro, and Isidore of Seville, among others, tell us, through their literary work, how an internal dispute between two Visigothic kings, Agila and Athanagild, was the event that caused the deployment of imperial troops in Hispania. However, it could be argued that in the overall scheme of Justinian´s *Renovatio Imperii* (Sarris, 2002: 46), Hispania had always been included as one of the territories that rightfully needed to be recovered to again be part of the Roman Empire. If that was the case, and Justinian had always wanted to recover Hispania, or at least parts of it, the dispute between Agila and Athanagild was a perfect pretext for the Emperor to fulfil his plans (Thompson, 1969: 323-324).

Before addressing Agila and his civil war with Athanagild, it is necessary to briefly discuss the predecessors of Agila on the throne and the important military events which occurred during the first half of the 6th century. Theudis and Theudisclus (Figure 104) preceded Agila as King of the Visigoths. Both these Visigothic kings were the first to pay special interest to the Baetica region, which comprised the southern territory and coast of the Iberian Peninsula.

Theudis (reign AD 531 -548) was an important monarch of the Visigothic kings since he repelled an invasion of the Franks, fought against the empire in North Africa, and issued a new set of laws (Thompson, 1969: 13-16; Collins, 2004: 42-46).

His interest in the Baetica region seemed to begin after the successful conquests by the *milites* of Justinian over Vandal North Africa, in the 530s, and the on-going war in Ostrogothic Italy, during the 540s. If the control of North Africa by Imperial forces was a potential threat, when in AD 534 the armies of Justinian conquered *Septem* in Tingitania (modern day Ceuta) from the Visigoths, the threat became real (Isidore of Seville, *Historia Gothorum* 42, ed. Wolf, 1999: 81-82). Therefore, Theudis focused his attention on the Baetica region, as it was an important part of Hispania and a highly strategic area to control the Imperial forces in North Africa.

Figure 104: 18th century artistic portraits of King Theudis and King Theudisclus (after J. Ibarra, 1782).

On one hand, the strategic importance of the Baetica region derived from the fact that several important cities were located there, the most important being

Corduba, Hispalis, Astigi, and Malaca; furthermore, some of these cities were key ports such as Hispalis, Malaca, and Gades. Ports were of utmost importance since they were essential as bridgeheads for the completion of a military conquest and for controlling maritime routes, as was later demonstrated.

On the other hand, the importance of Baetica had been attested since Roman Imperial times. Baetica was a vast foodstuff production region with important mines (see Chapter 3) and the home of several major commercial hubs in Hispania. Due to this economic importance, powerful Hispano-Roman aristocratic elites had controlled the area since the 1st century AD. The importance and power of these families was demonstrated during the 5th century when this area was able to withstand the invasion of the different Germanic peoples, being little affected by their raids, and virtually gaining independence (*vide supra*).

Procopius tells us how Theudis, aware of the importance of the Hispano-Roman elites who controlled key territories in Hispania and their wealth, married a rich, Hispano-Roman aristocrat who owned such a large estate that Theudis was able to raise a private army of 2000 men strong (Procopius, *De bello Gothico* I (V).12.50-54). In AD 547 Theudis unsuccessfully attempted to reconquer Septem from the Byzantines (Wolfram, 1988: 311). The next year, in AD 548, he was assassinated in his palace, which some scholars place in Seville (e.g. Thorpe, 1974: 187, footnote 30).

In AD 548 Theudis was succeeded by Theudisclus, who after a very brief reign was murdered during a banquet in Seville in AD 549. According to Isidore of Seville, this was because of his seduction of the wives of several magnates (Isidore, *Hist. Goth.* 44). However such supposed motivation is not uncommon in accounts of palace coups in Antiquity (Collins, 2004: 46).

After Theudisclus's assassination, Agila (reign AD 549-555) began his reign as King of the Visigoths (Thompson, 1969: 16-19). It seems Agila lacked the support of some Hispano-Roman families from Baetica, since Cordoba rebelled, and he was forced to attack. His attempt to suppress the rebellion was disastrously unsuccessful. In AD 550 he was defeated, many of his troops were killed, including his son, and he lost the royal treasure. In his attack on Cordoba he profaned the sanctuary of St. Acislus. According to Isidore of Seville, this profanation caused great discomfort among the Catholic Hispano-Roman population and was the reason why God punished him with the outcome of the battle and the losses he sustained (Isidore, *Hist. Goth.* 45). After his defeat in Cordoba, Agila retreated to Merida, the capital of Lusitania.

Isidore of Seville recorded that after this humiliating defeat, Athanagild rebelled against Agila (Figure 105), initiating a civil war. According to the chronicle of Isidore of Seville, Athanagild had set his stronghold in Seville, and in AD 552 Agila sent an army towards the city to fight the usurper. Athanagild, with his military might, won his first victory against Agila (Isidore, *Hist. Goth.*, 46):

> *46 Ipse victus, ac miserabili metu fugatus, Emeritam se recepit. Adversus quem interjecto aliquanti temporis spatio, Athanagildus tyrannidem regnandi cupiditate arripiens, dum exercitum ejus contra se Hispali missum virtute militari prostrasset, videntes Gothi proprio se everti excidio, et magis*

> *metuentes ne Hispaniam milites Romani auxilii occasione invaderent, Agilanem Emeritae interficiunt, et Athanagildi sese regimini tradiderunt.*[48]

Figure 105: 18th century artistic portraits of King Aguila and King Athanaguild (after J. Ibarra, 1782).

According to Isidore, Athanagild requested the help of Justinian to fight against King Agila (Isidore, *Hist. Goth.*, 47):

> *Aera DXCII, anno imper. Justiniani XXIX, occiso Agilane, Athanagildus regnum quod invaserat tenuit ann. XIV. Hic cum jamdudum sumpta*

[48] 46. Vanquished, Agila fled in wretchedness and fear, reaching Mérida. After a period of time, Athanagild launched a rebellion against him in his desire to assume power. With his military might, Athanagild laid low the army that Agila sent to meet him at Seville. The Goths, seeing that they were destroying themselves and fearing that the imperial army might invade Spain on the pretext of providing assistance, killed Agila in Mérida and handed themselves over to the rule of Athanagild (ed. Wolf, 1999: 82-83).

tyrannide, Agilanem regno privare conaretur, militum sibi auxilia ab imperatore Justiniano poposcerat, quos postea submovere a finibus regni molitus non potuit. Adversus quos hucusque conflictum est. Frequentibus antea praeliis caesi, nunc vero multis casibus fracti atque finiti. Decessit autem Athanagildus Toleti propria morte, vacante regno mensibus V.[49]

Although Isidore wrote his chronicle about half a century after the events, historians generally accept his description. However, as Roger Collins (2004: 48) has pointed out, Jordanes, a contemporary author of the events of the time, reported in his *Getica* that an Imperial expedition was on its way to assist Agila against Athanagild even as he wrote (Jordanes, *Getica* 303 (or LVIII), ed. Mommsen, 1882: 135–136):

> *Post quem Theudegisclus, regnum adeptus, non diu regnans defecit, occisus a suis. Cui succedens, hactenus Agil continet regnum. Contra quem Athanagildus insurgens Romani regni concitat vires, ubi et Liberius Patricius cum exercitu destinatur.*[50]

Collins (2004: 48) suggests that Isidore might have erroneously attributed the appeal for Imperial help to Athanagild rather than Agila. The latter case seems more probable taking into account other Imperial interventions in the West in these decades, which were all ostensibly in support of legitimate monarchs who had been overthrown or challenged. It has been generally accepted that Jordanes finished his short book in AD 550 or 551. Consequently, the appeal for military

[49] In the era 592 (554), in the twenty-ninth year of the emperor Justinian, after Agila had been killed, Athanagild held the kingship which he had seized for fourteen years. When he launched the rebellion in his attempt to deprive Agila of power, he requested military assistance from the emperor Justinian. Afterwards, he was unable, despite his efforts, to remove these soldiers from the boundaries of his kingdom. Up until the present day the Goths have struggled against them. But worn down by frequent fighting, they have now been broken and defeated, suffering many losses.
Athanagild died a natural death in Toledo and the kingship remained vacant for five months (ed. Wolf, 1999: 83).

[50] After him Theudisclus obtained the kingdom and, but ruling for a short time, met his death at the hands of his own followers. He was succeeded by Agila, who holds the kingdom to the present day. Rising up against him, Athanagild is now provoking the might of the Roman Empire. So the Patrician Liberius is on the way with an army to oppose him (translation by author).

support had to be received in Constantinople in AD 550 or 551. Collins proposes that it is actually more plausible that Agila's succession was challenged from the start by Athanagild and that the legitimate Visigothic king (i.e. Agila) must have made his request to Justinian by AD 550 if not earlier, as Jordanes's text states (Collins, 2004: 48).

Gregory of Tours in his *History of the Franks*, did not refer to any invitation from Athanagild to the Byzantine troops of Justinian, but did record how he defeated the Imperial troops on a number of occasions (Gregory of Tours, *Hist.* IV 8):

> *Regnante vero Agilane apud Hispaniam, cum populum gravissimo dominationis suae iugo adterriret, exercitus imperatoris Hispanias est ingressus et civitates aliquas pervasit. Interfecto autem Agilane, Athanagildus regnum eius accepit. Qui multa bella contra ipsum exercitum postea egit et eos plerumque devicit, civitatisque, quas male pervaserant, ex parte auferens* de *potestate eorum.*[51]

Regardless of who requested the military support of the Imperial troops, they landed in Hispania no later than June or July AD 552, although it is unclear where exactly they arrived (Thompson, 1969: 17, 323). What it is clear, however, is the fact that Justinian made a master move by occupying important parts of Hispania without having to launch a full campaign, since he only fought half of the Visigothic armies. This resulted in an occupation of Hispania by the Imperial troops of several territories that composed the *Provincia Spaniae* or *Spania*, and would last 75 years in the case of the peninsula and a few centuries in the case of Ceuta and the

[51] Agila now reigned in Spain and oppressed the people beneath the heavy yoke of his tyranny. An army sent by the Emperor Justinian marched into Spain and captured several cities. Agila was assassinated and Athanagild took over the kingship. Athanagild subsequently fought several battles against the Emperor's troops and beat them on a number of occasions. He managed to free from their occupation some of the cities which they have wrongfully captured (ed. Thorpe, 1974: 121).

Balearic Islands[52]. The key to this ingenious move was the domestic conflict between two Visigothic kings (Thompson, 1969: 323-324).

Isidore attributed the victory of Athanagild over Agila in AD 552 to his military talents (i.e. *virtute militari*). Neither Isidore nor Gregory of Tours mentioned that Athanagild was victorious because of the support of the Imperial troops. Despite this, modern historians widely accept that Athanagild won the battle of Seville in AD 552 thanks to the aid of the Imperial troops.

Thompson (1969: 323-329) discussed the possibility that Justinian instigated the revolt, but concluded that it was unlikely taking into account, among other factors, that at the time, AD 552, the empire was involved in several military confrontations, such as the war in Italy against the Ostrogoths (Moorhead, 1994: 72-88, 101-109). Nonetheless, the request from the Visigoths in Hispania for help was an opportunity for Justinian that he used. Because of the on-going military campaigns, only a small army of a few thousand men, no more than 5,000, was probably sent to Hispania (Treadgold, 1995: 74).

What seems plausible is that an agreement was signed in which the Empire would gain the possession of territories in Hispania as compensation for the military help provided. This is inferred from a request that King Reccared (reign AD 586-601) made to Pope Gregory I in AD 599 for him to obtain a copy of the treaty that the Visigoths signed with the Emperor Justinian. Only the reply from Pope Gregory to

[52] The best recent general work about the *Provincia Spaniae* are those of Vallejo Girvés, 1993 and 2012; Presedo Velo, 2003; and Vizcaíno Sánchez, 2009.

King Reccared has survived, relating that the Pope was unable to obtain a copy, because Justinianic archives had been destroyed in a fire. Unfortunately, there is no mention in the letter of who signed the agreement with Justinian or when it was signed (Gregory I, *Registrum Epistolarum* IX, no. 229, ed. Hartmann, 1893: vol. II, 225–226). The existence of this letter seems to prove the existence of a treaty, but the lack of details does not allow us to know which Visigothic King signed it. The absence of facts, however, does not prevent some authors from attributing the agreement signed with Justinian to Athangild (e.g. Thompson, 1969: 331-332; Vallejo Girvés, 1996; 2012: 158-163).

The Visigothic civil war lasted three years and then took a dramatic turn when the noblemen loyal to Agila killed their own king and decided to support Athanagild, their former enemy. Thus the civil war ended in AD 555 when Agila was assassinated. Isidore explained that this Visigothic reunification, between former opposite factions, resulted when the Visigoths finally realised that they were destroying themselves to the advantage of the Byzantines, already present in Hispania (Isidore, *Hist. Goth.*, 46). Thompson also proposed that the Visigothic change in attitude towards the Byzantines was possibly a consequence of the decision by Justinian to send reinforcements to Hispania, since his military campaign in Ostrogothic Italy ended in victory. The arrival of reinforcements seems to have led to the violent occupation of Cartago Spartaria (i.e. Cartagena) (Thompson, 1969: 323-329). In AD 555 Athanagild, as undisputed King of the Visigoths, began fighting the Imperial troops with the goal of repulsing them from Hispania.

On one hand, both Isidore of Seville and Gregory of Tours mention in their chronicles how, during his reign, Athanagild successfully took back several territories from the Byzantines (Isidore, *Hist. Goth.*, 47; Gregory of Tours, *Hist.* IV 8). Unfortunately, the chronicles do not detail any particular location or dates. The lack of specific mention of cities is the argument that some scholars use to claim that Seville was never under Imperial military control. On the other hand, there is much less known historical account, only a brief fragmentary chronicle dated to AD 568 that also relates the wars of Athanagild: the *Consularia Caesaraugustana*, which appears as a marginal note in the text of John of Biclaro (ed. Cardele de Hartman and Collins, 2001: 61), Iohannes 6a (AD 567-568):

> *Hic Athanagildus Hispalim ciuitatem Hispaniae*
> *prouinciae Baeticae sitam bello impetitam suam fecit,*
> *Cordubam uero frequenti incursione admodum laesit.*[53]

Athanagild died in Toledo of natural causes in AD 568, the first Gothic king to do so since AD 484 (Collins, 2004: 49). Thus the chronicle relates to us how Athanagild conquered Seville in the last years of his reign and life. However, and unfortunately, the source does not mention when Seville was lost or with whom Athanagild had to fight to recover it. Some scholars have used this source to suggest that Seville was lost against the Imperial forces in AD 552, or soon after (Stroheker, 1965: 136, 213). Neither Isidorus of Seville nor Gregory of Tours mention this military campaign in their chronicles. This adds to the controversy.

There are two options for who could have defended Hispalis against Athanagild in AD 567: first, Byzantine Imperial forces; second, local Hispano-Roman aristocratic

[53] Here Athanagild by military assault made his the city of Hispalis located in the Baetica province of Hispania, but Corduba he only somewhat damaged with frequent attack (translation by author).

elites (Salvador Ventura, 2006: 15). The former hypothesis assumes that the occupation of Hispalis by the Byzantines occurred after the initial landing of AD 552, and was contrary to the stipulations of the treaty, thus Gregory of Tours referred to the occupation of these cities as their having been wrongfully captured (Gregory of Tours, *Hist.*, IV, 8). The latter hypothesis argues that local Hispano-Roman aristocratic families, after initially hosting the rebellion of Athanagild against Agila in AD 552, later on decided to rebel against Athangild. Cordoba maintained a rebellion against Visigothic rule from its initial uprising against Agila in AD 550 until King Leovigild finally subjugated the city in AD 572 (Thompson, 1969: 322-323), slaughtering those hostile (John of Biclaro, *Chronicle*, ed. Wolf, 1999: 55).

Based on the existing literary evidence, and the lack of detail contained in it, it is possible to postulate diametrically opposed arguments, leaving the historical question open to debate. The sequence of events is unclear and many questions remain unanswered such as: why did the Imperial forces land in Hispania? Which Visigothic leader requested military support from the Byzantines and signed a treaty with Justinian? Which Visigothic faction betrayed their fellow noblemen? What reasons had they? Who betrayed the other faction first? What was the role of the Hispano-Roman aristocracies? We have seen that two main hypotheses have attempted to answer these questions, yet these theories fail to address all the posed historical questions and to reconcile all the historical sources. In the light of the present information, it is possible to propose a theory that supports the hypothesis that local Hispano-Roman aristocratic families controlled Seville (Salvador Ventura, 2006: 15), and to elaborate this proposition further.

The study of a late antique commercial quarter in Seville, unearthed in the recent archaeological excavation of Mercado de la Encarnación, suggests that it was abandoned around AD 525-530 (García Vargas, 2014: 191). The abandonment of this commercial sector roughly coincides with the start of the reign of Theudis (reign AD 531-548) who, as we have seen, focused his interest on Baetica as a result of the Justinianic military campaign in Vandal North Africa (*vide supra*). Is this just a coincidence? In the light of the scarce information that we have, it is impossible to know. However, according to contemporary historical chronicles, Theudis married an extremely wealthy Hispano-Roman lady from an aristocratic family (Procopius, *De bello Gothico* I (V).12.50-54). Was this marriage some sort of political agreement between the local Hispano-Roman aristocratic elites and the Visigothic King? We should also remember that, in later years, both Theudis and his successor Theudiclus seem to have been murdered in Hispalis.

The revolt of Cordoba against King Agila, soon after the assassination of Theudisclus, indicates that local Hispano-Roman aristocracies in that city did not like the Visigothic royal authority. Isidore of Seville declares how upsetting was the desecration of the sanctuary of St. Acilso by Agila. Perhaps in addition to the economical and political factors for the rebellion, religion could have also influenced the uprising, since the Hispano-Roman population were Catholics and the Visigoth nobility Arian Christians. It has been proposed that during Late Antiquity, religious identity was often more strongly felt than regional identity, and Justinian during his empire enforced religious unity (Mango, 1980: 30, 88-89). It is possible that Seville did as Cordoba did, and also revolted against Agila. Also, as

Collins (2004: 48) has proposed, perhaps Athanagild opposed Agila's accession to the throne from the beginning with the support of the local aristocracy of Hispalis, and perhaps of Cordoba as well. In this hypothetical scenario, it is not only Cordoba that rebels against Agila but a large part, if not all, of the Baetica region.

The rebellion of Baetica would represent a serious threat for the recently elected King Agila and his supporting Visigoths. This would justify why around AD 550, Agila requested military assistance from Justinian (Jordanes, *Getica* 303, or LVIII) in order to defeat the usurper Athanagild, despite knowing the dangers of this request. Perhaps Agila signed a treaty with Justinian giving him some territories in exchange for military support. Then, in AD 552, Agila takes the initiative and commands an army with the goal of conquering Hispalis and defeating Athanagild. Agila was confident in his victory thanks to the support of the Byzantine troops that had just landed in Baetica. On the day of the battle, the Byzantines betrayed Agila and did not intervene in the fight. As James Wood (2010: 295) has suggested, Justinian was opportunistically taking advantage of Visigothic disunity in Hispania (as he had done first in Vandal Africa and later in Ostrogothic Italy) and the opportunistic 'wait and see' option seems to have been the most beneficial stance. It is even possible that the Byzantines received a bribe from Athanagild for not interventing in the battle, as indeed happened in a similar Visigothic dispute between Leoviglid and his son Hermengild in AD 583 (Gregory of Tours, *Hist.*, V.38, ed. Thorpe, 1974. 301-303). In this hypothetical scenario, it is even possible to suggest that the money for the bribe, ironically, came from the royal treasure that Agila lost trying to supress the rebellion in Cordoba. I admit that this hypothesis is conjectural albeit perfectly possible, since it would match the Byzantines' strategies and objectives.

The seemingly quiet civil war (i.e. there is no recorded developments in the chronicles) that occurred between AD 552 and 555 would have been the result of the humiliating defeat of Agila, and his disgrace because of requesting help from Justinian. On the other hand, the local Hispano-Roman aristocracies achieved their goal of maintaining control of their *latifundia* with a Visigothic ruler of their choosing. However, they were not entirely happy about having the Byzantines installed in the coastal territories. It is plausible, as Thompson (1969: 326) suggested, that in AD 555, after the end of the war in Ostrogothic Italy, Justinian sent reinforcements to Spain and took Cartagena by force. Hence Gregory of Tours referred to the occupation of these cities as wrongfully captured (Gregory of Tours, *Hist.*, IV, 8). The move of the Byzantines threatened the independence of the Hispano-Roman aristocracies, forcing them to react. The disgraced King Agila was blamed for inviting the Byzantines to enter Hispania and, consequently, assassinated by his own men. Then, the militarily talented Athanagild was chosen as the new King of all the Visigoths (Isidore, *Hist. Goth.*, 46).

Years later, in AD 567, Athanagild had to conquer Hispalis and unsuccessfully attacked Cordoba (Iohannes 6a; John of Biclaro ed. Cardele de Hartman and Collins, 2001: 61). At that point he probably would have realised that what the Hispano-Roman aristocracies from Baetica wanted was economical and political control. Consequently, the Hispano-Roman aristocracies never wanted either Visigothic royal authority or Byzantine domination. In the pursue of their goals, they used King Athangild first against Agila and later against the Byzantines.

Although this theory is just hypothetical, it is firmly based on, and reconciles, all the existing historical evidence despite its deficiencies. Regarding the plausibility of this theory, it should be mentioned that a similar incident took place a few years later in AD 579, as we have seen at the beginning of this Chapter. This event involved, yet again, the participation of Imperial forces in a Visigothic domestic dispute, this time between King Leovigild and his rebel son Hermenegild (*vide supra*). On the Imperial side the Emperor was Tiberius II Constantine. This episode had the same elements and main players as the previous one: Imperial troops sent to support one side of the Visigothic opponents; then the Byzantines did what suited them best and did not intervene (in return for a substantial bribe), power, politics, religious doctrine, and local Hispano-Roman aristocratic elites. This event, probably not a coincidence, also took place in Seville (*vide supra*).

Additionally, the interest of the Hispano-Roman aristocratic elites in maintaining sole control of their wealthy estates, was clearly attested during the Islamic period. The Islamic chronicle known as *Akhbar Majmu'a* described the grandeur of Hispalis at the time of the Umayyad conquest in AD 712: *"Then Musa went to Seville, which was the largest and most important cities of Spain, very remarkable for its buildings and monuments. Before the invasion of the Goths it had been the capital of the kingdom, but after their victory, the court was moved to Toledo, though, in Seville remained the Roman nobility, the jurists and scholars in sacred and profane sciences"* (Lafuente y Alcántara, 1867). The passage of the *Akhbar Majmu'a* is a clear testimony of the existence, in the final moments of the Visigoth monarchy, of a powerful Hispano-Roman aristocracy in Hispalis, descendants of the old Roman senatorial nobility from Baetica (Bosch, 1984: 299). In AD 713, the residents of Ispalis rebelled against the Umayyad invaders (being the first uprising which occurred in Hispania after the invasion) forcing General Musa to send his son Abd al-Aziz to suppress the revolt. Similarly, during the Emirate period (AD 716-912) there were several uprisings in Ishbiliyya (Islamic Seville), which were led by local elites. Local elites would keep pushing for the control of their wealth during the Caliphate of Cordoba and would finally create an independent kingdom during the *taifa* period of Seville (AD 1023 – 1091) (see Chapter 5).

So, why then were the chronicles so cryptic regarding the events? As Thompson (1969: 76-78) explained and argued, rightfully in my opinion, the historical accounts are ambiguous because after the establishment of the Catholic state in Hispania, it was thought unwise to associate Catholicism with the revolt; to which I will add that, equally, it would have also been unwise to associate the Hispano-Roman aristocracies from Baetica and Hispalis with a rebellion that had caused much devastation. When Isidore wrote his *History of the Goths* he and his family were a prominent leading clan of these Hispano-Roman aristocracies from Baetica, so it is plausible that, for obvious reasons, he decided to take small liberties by being a bit vague regarding precise details of the events.

Returning to the title of this section, which was a question: Was Seville controlled by Byzantium? Based on the literary and archaeological evidence that we have to date, the answer is that there is no way of knowing with certainty. I would argue that the Hispano-Roman aristocracies that had controlled Hispalis since the 1st century AD, always pursued economic and political independent control of Baetica's wealth and commercial trade as a maritime emporium of the Western Mediterranean (Figure 106).

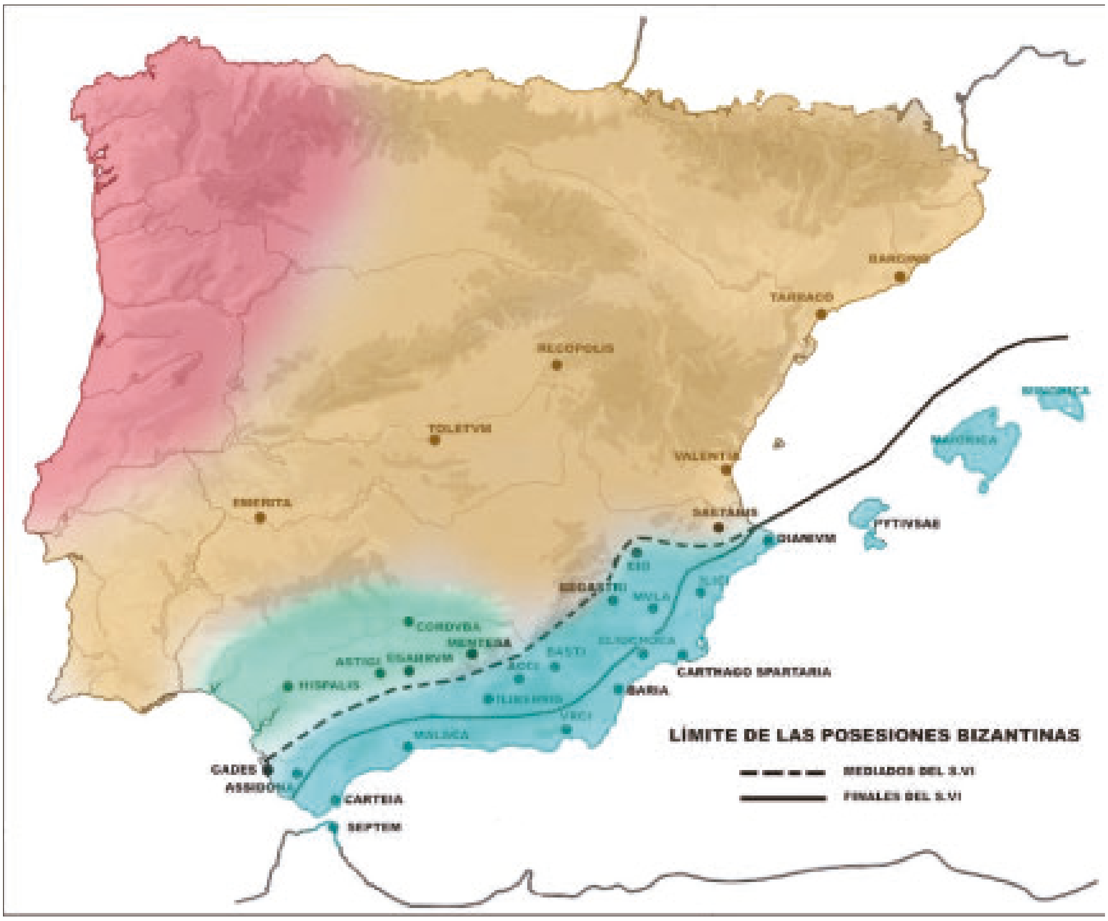


Figure 106: Proposed controlled areas of Hispania *circa* AD 560. Suevi Kingdom (red), Visigothic Kingdom, (orange), independent cities of Baetica (green), *Provincia Spaniae* (blue)(Author, after Vizcaíno Sánchez, 2009: 48, fig. 2).

Additionally, it seems that Justinian was never interested in conquering the entire Hispania, and that he just sought to control those coastal territories that later formed *Spania* (Wood, 2010: 318-319; Vizcaíno Sánchez, 2009: 809-817). In my view, Justinian was only interested in maintaining and strengthening his

Mediterranean thalassocracy in the Western Mediterranean. That is why he never tried to conquer inland territories in Hispania. He seems to have strengthened his thalassocracy taking control of the Western Mediterranean network of maritime routes (Arnaud, 2005: 149-171) by controlling key areas along the maritime routes such as the Strait of Gibraltar and the Balearic Islands.

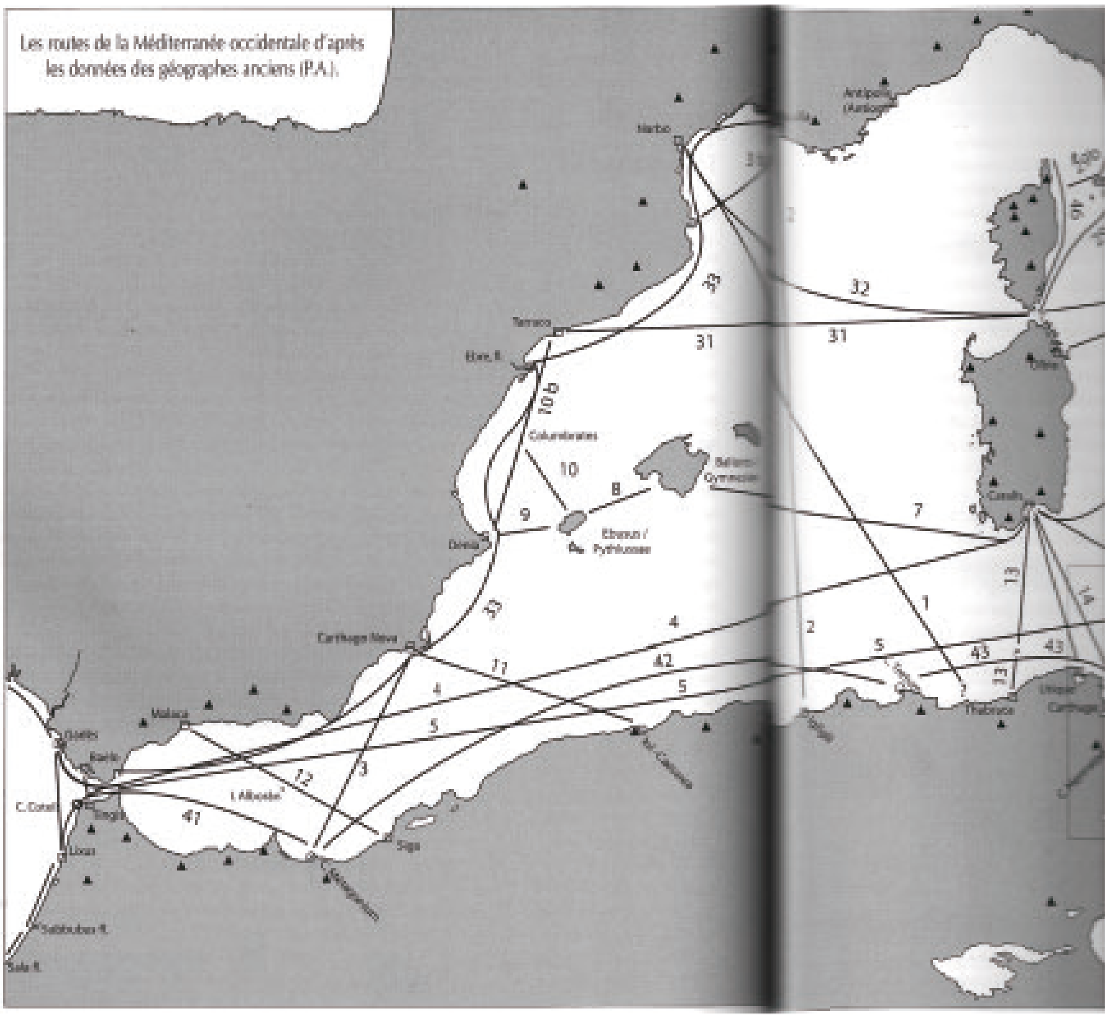


Figure 107: Western Mediterranean network of maritime routes in antiquity (after Arnaud, 2005: 154-155)

He seems to have accomplished that objective by first conquering strategic coastal locations (i.e. natural ports) along those routes, and then fortifying them with naval military bases in places such as Septem, Carteia, Malaca, Carthago Spartaria, Dianium, and the Balearic Islands (*cf.* Figure 106 and Figure 107).

Seville might, or might not, have been controlled by Byzantium, but according to recent archaeological studies it seems that, in the late 5th and first half of the 6th centuries, its commercial connections with the Eastern Mediterranean were extensive, profuse, and prosperous (García Vargas, 2012c). Perhaps Seville was never under the military control of the Imperial forces, but it seems unquestionable that the city, and its local Hispano-Roman aristocratic elites, were under the commercial, political, religious, and cultural influence of Byzantium (Presedo Velo, 2003: 95-163). Two clear examples of this Byzantine influence are the legend used on Visigothic coinage and the system of dating their reigns on inscriptions (Thompson, 1969: 68-69).

To conclude, the point I want to stress is that the posed historical question, as valid as it is, perhaps distracts us from an important fact: which is that Seville during the 6th century played an essential role in Visigothic politics, as well as in the military confrontation between Byzantium and Visigothic Spain. This probably happened because Seville, during the 5th and the 6th centuries, seems to have been a vibrant, wealthy, internationally connected city controlled by local Hispano-Roman aristocratic elites and the Church (Ordóñez Agulla, 2002; García Vargas, 2014). There are other examples of cities, such as Marseille, with maritime emporia in the Western Mediterranean that also thrived during Late Antiquity (Loseby, 1992). This image that derives from the study of the historical record and recent archaeological excavations is far from the image of a lesser, decadent late antique city, a small shadow of its glorious Imperial Roman past. It seems that Hispalis, although it underwent transformations through Late Antiquity, was widely connected with the emerging East (Frankopan, 2015) and did not experience the demise that other cities of the Western Mediterranean suffered (Ward-Perkins, 2005). The so called “Dark-Ages” seem not to have occurred in Hispalis at least until the 620s when the Visigoths finished conquering the last Byzantine territories of the Iberian Peninsula. At that time Visigothic Spain seems to have ceased to be part of the wider Mediterranean maritime network.

Chapter 5: Seville after the Umayyad conquest in AD 712

As for Late Antiquity, little is known of the first centuries of the Islamic occupation of Seville. One of the reasons for this is that the study of al-Andalus in general, and in the field of medieval archaeology, has been neglected for many years in Spain, but this is changing rapidly. Knowledge of the Islamic period is essential for the study of the ancient port of Seville because it is during these centuries that it ceased to exist, and the process of how exactly that happened has been unknown until now. An understanding of the river dynamics is essential to decipher this process. Only through a combination of archaeological data (from Plaza Nueva), historical accounts, and palaeo-sciences can this be achieved, as this Chapter demonstrates. Finally, the relocation of the port and the construction of shipsheds during the Islamic period of Seville will be briefly examined.

5.1 Ishbiliyya: a new beginning (historical background)

In AD 712, the Umayyad's Empire occupied Hispalis which then remained controlled by different Islamic monarchies in subsequent centuries until AD 1248. During the Islamic period, the city was renamed as Ishbiliya, the denomination from which its current name Sevilla (i.e. Seville) derives.

On April 30, 711, during the caliphate of the Caliph Al-Walid I (reign AD 705 – AD 715) of the Umayyad Empire, the Berber commander Tariq ibn-Ziyad led a small force that landed at Gibraltar, seemingly to intervene in a Visigothic civil war. After a decisive victory over Visigoth King Roderic at the Battle of Guadalete on July 711, Tariq initiated the conquest of Hispania. A year later, in 712, the Arab governor Musa ibn Nusayr of Ifriqiya joined him. In a seven-year Jihad, the Arab and Berber armies brought most of the Visigothic Kingdom under Muslim control (Levi-Provençal and García Gómez, 1950: 10-19).

The Islamic chronicles report two different versions of the conquest of Ispalis (i.e. Visigoth Seville). In one description, Tariq conquered Ispalis soon after the Battle of Guadalete in August 711. The second account, which is more plausible, attests that Musa took over the city in the summer of 712. This chronicle reported that the local population resisted the initial conquest, which obliged Musa to besiege the city for several months, after which the residents finally surrendered although some decided to flee. According to the chronicle of Ahmad ibn Muhammad al-Rāzī, Musa left a small garrison in the citadel of the city and gathered around it the Jewish community, who took over the administration on behalf of Musa. As occurred in other cities, the Jews welcomed the invaders, having been subjected to persecution and abuse from the Visigothic rulers for centuries (Thompson, 1969: 315-317). Soon afterwards, in the summer of 713, there was an uprising by the residents of Ispalis (the first that had occurred in Hispania after the invasion) and Musa sent his son Abd al-Aziz to suppress the revolt. The Caliph summoned Musa to Damascus and before his departure he left his son al-Aziz as governor or emir of Al-Andalus (i.e. Islamic Iberia) with its capital in Ishbiliyya (i.e. Islamic Seville). Al-Aziz married a local Christian princess and soon afterwards, in 716, he was murdered following orders from the new Caliph of Damascus Sulayman bin Abd al-Malik (reign AD 715 – AD 717). A new emir, al-Hurr, arrived in AD 717 and transferred the capital of Al-Andalus to Cordoba (Levi-Provençal and García Gómez, 1950: 15-21).

During the Emirate period (AD 716-912) there were endless tribal and ethnic confrontations and uprisings in Al-Andalus against the Umayyad emirs of Cordoba; these were also common in Ishbiliyya, which were led by local elites. However the most important event of this period in Seville was a Viking attack that occurred in AD 844. The attack lasted several days and the raiders were finally repulsed after the Emir of Cordoba, Abd al-Rahman II (reign AD 822 - 852), sent in an army to repel the Vikings. After the riders were expelled, the Emir ordered the erection of a city wall in Ishbiliyya, the construction of a fleet, and the building of shipsheds to house it (Ibn al-Qūṭiyya, ed. Rivera, 1926: 53).

When Abd-ar-Rahman III began his reign in AD 912, he initiated a process of political and ethnic reunification of Al-Andalus, and in AD 913 he subdued Ishbiliyya, and its hostile local aristocracy, by force. During the Caliphate of Cordoba (AD 929-1031), Ishbiliyya seems to have had peace and stability overall. It became the second most important city of Al-Andalus, after Cordoba, and it maintained the Atlantic fleet of the Caliphate, becoming an important economic and maritime centre (Bosch Vilá, 1984: 71-84).

The Caliphate disintegrated during a civil war or *Fitna* (1009-1031) between the descendants of the last caliph, Hisham II, and the successors of his hayib (court official), Al-Mansur. At the end of the Caliphate in the 1020s, Ishbiliyya regained political influence. The local aristocracy of Ishbiliyya, chiefly the Abbad household, played an important role during the *Fitna*. In 1031, after years of infighting, the caliphate fractured into a number of independent Muslim *taifa* (kingdoms) (Bosch Vilá, 1984: 84-92).

During the *taifa* period of Seville (AD 1023 – 1091) the city was governed by three kings of the Abbadid dynasty: Abu al-Qasim (AD 1023-1042), Abbad II al-Mutadid (AD 1042-1069) and Muhammad al-Mutamid (AD 1069-1091). The Abbad household, or Beni-Abbad, was an Arab family who had settled in Ishbiliyya in the first days of the conquest. Although they had not previously played a major role in history, they were a wealthy family of noble pedigree, hailing from the historical kings of Al-Hira in south-central Iraq. During the second half of the 10th century, the father of the Abbad dynasty, Ismail, held some important public positions of trust close to the caliphs, such as head of the personal guard of Al-Hakam II and Hisham II, Iman of the Great mosque of Cordoba, and *qadi* (i.e. the judge of the city) of Ishbiliyya. In AD 1023, amid the political crisis of the fitna, his son Abu al-Qasim Muhammad ibn Abbad replaced him as *qadi* of Ishbiliyya (Bosch Vilá, 1984: 92-99; Collantes de Terán Sánchez, 1992: 35-36).

As *qadi*, Al-Qasim had the confidence of the residents inherited from the prestige of his father. Nevertheless, he gained further trust by playing a major role in the successful resistance to the Berber soldiers of fortune who had grasped at the fragments of the Caliphate during the fitna. After the Berbers were forced out, and since the Caliphate had disintegrated, he was proclaimed King of the *taifa* of Ishbiliyya by a near unanimous voice of the people and the aristocracy. From AD 1023, he ruled with the advice of a council formed of local noblemen but he dismissed the council in AD 1027. Al-Qasim, through war, diplomacy, and even trickery, formed a coalition of several *taifa* kingdoms. He had made his family the recognised leaders of the Al-Andalus Muslims against the neo-Berber element arrayed under the *taifa* King of Granada. The Abbadid dynasty developed a policy of military expansion essential to maintain power, both in relation to their subjects and to the other *taifa* kingdoms. A consequence of this policy was that, at moments of maximum expansion, the *taifa* Kingdom of Ishbiliyya was the largest of Al-Andalus (Bosch Vilá, 1984: 92-106).

Al-Mutadid, the son and successor of Al-Qasim, devoted his reign mainly to extending his power at the expense of his smaller neighbours, and in conflicts with his chief rival the King of Granada. Despite the prominence of the *taifa* Kingdom of Ishbiliyya, the continuous wars weakened the Muslim Kingdom, to the great advantage of the rising power of the Christian kings of León and Castile. In AD 1063 Fernando "El Magno" of León (reign AD 1056 – 1065) marched to the gates of Ishbiliyya, besieging the city and forcing al-Mutadid to pay tribute as well as to surrender the remains of St. Isidore. This fealty continued for the remaining two years of the reign of Fernando (Bosch Vilá, 1984: 106-118).

Al-Mutamid witnessed the end for the Abbadid dynasty, as during the years of his reign the *taifa* Kingdom of Ishbiliyya became increasingly weaker due to a number of events. The Christians succeeded in reconquering Aragon and Valencia, and finally King Alfonso VI of León and Castile conquered the *taifa* kingdom of Toledo in AD 1085. This forced Al-Mutamid to request support from his former enemies the Berbers, calling on Yusuf ibn Tashfin, the Berber Almoravid ruler. He had already foreseen the high probability that the Almoravids might overthrow him in the future. However, he preferred to ally with a Muslim adversary than to submit to a Christian Kingdom. With the assistance of the Amoravids, they defeated

Alfonso VII in AD 1086. Despite this victory, decades of war caused heavy taxation for the population of Ishbiliyya, especially for the aristocracy, necessary to pay tribute to the Christians and the wages of the Amoravid mercenary armies. Over taxation fostered tension with the city residents and animosity grew against the *taifa* king. Six years later in AD 1091, exactly as Al-Mutamid had foreseen, Yusuf ibn Tashfin sieged Ishbiliyya, and with the help of Almoravid sympathizers assaulted the city. Al-Mutamid was forced to capitulate. The *taifa* Kingdom of Ishbiliyya came to an end and the deposed Al-Mutamid was exiled to Morocco (Bosch Vilá, 1984: 118-133).

For nearly a century and a half, Al-Andalus was integrated into much larger political centres of power from North Africa: first into the Almoravid Empire and subsequently into the Almohad Empire. During the years of North African domination, Ishbiliyya played a prominent role in the political arena. In both periods, the rulers sent to the city by the caliphs were almost without exception family members, quite often brothers and princes, some of who later became caliphs themselves (Collantes de Terán Sánchez, 1992: 36-37).

The Almoravid rule in Ishbiliyya lasted 56 years, from AD 1091 until AD 1147 when Almohad troops took control of the city. During the Almoravid period, Ishbiliyya was the capital of the west of Al-Andalus, the governor-general ruled Muslim Iberia from the city, and armies from North Africa used the city as a landing and operational base. The Almoravid period in Ishbiliyya was relatively peaceful and new city walls on the west side of the city (i.e. east bank of the Guadalquivir) were built (Bosch Vilá, 1984: 136-145).

The Almohad Empire took over the Almoravid rulers, and established the capital of Al-Andalus in Ishbiliyya for 82 years from AD 1147 until AD 1229. The Almohad period was the most significant economically and culturally for the city, due to the many important urban undertakings that took place. The most important were: the completion of the city walls, originally initiated by the Almoravids; the construction of a pontoon bridge connecting Ishbiliyya to Triana, on the western bank of the Guadalquivir River; the building of an *aljama* or Great Mosque along with its minaret, later transformed into the bell tower of the Cathedral (currently known as the Giralda); the construction of the Almohad palace, and of the al-Buhayra palace; the repair of the old Roman aqueduct; and finally the construction of a 12-sided military watchtower situated on the east bank of the Guadalquivir, the Torre del Oro (Torres Balbás, 1934; Bosch Vilá, 1984: 145-184; Valor Piechotta, 2008).

Both Almoravid and Almohad Empires in Ishbiliyya were military dominions, and their authority was effective through armies of soldiers and officials. The ruling members of these empires were countryside Berbers from North Africa and therefore had a very different culture from that of the cosmopolitan well-educated citizens of Ishbiliyya. Sometimes it was difficult to communicate, because the Berber ruling classes did not speak Arabic since they only knew the Berber language. Therefore, although at first the invaders had some support from sectors of the population, the subsequent political evolution and ethnic tension, and their administrative corruption, ruined the initial popular backing. In these conflicting situations, the local aristocracies re-emerged into the political foreground. In AD

1145 the noblemen of Ishbiliyya recognised the Almohad Caliph and, conversely, in AD 1229 decided to separate from his obedience, and they then ruled Ishbiliyya autonomously. They kept, however, seeking military support and alliances abroad for the wars against the Christian kingdoms (Collantes de Terán Sánchez, 1992: 36-37).

The defeat of the Almohads at Las Navas de Tolosa (AD 1212), along with the internal political crisis of the Almohad Empire, allowed Castile and León troops to increasingly penetrate Al-Andalus until they reached Ishbiliyya and its surroundings. This forced the local authorities to establish tributary alliances with Christians. But after the fall of Cordoba (AD 1236) and Jaen (AD 1246), the fate of Ishbiliyya was cast. Although military aid was sought in all the courts of North Africa, the little support sent was unsuccessful. The Castilian troops began the siege of the city in AD 1247, after controlling the surrounding countryside, the nearby mountains, and the west bank of the Guadalquivir River. The siege was combined with raids on smaller populations that offered resistance, leaving the besieged with little chance of survival. Resistance became impossible after the destruction of the pontoon bridge, impeding the communication with the west bank of the Guadalquivir. In this situation, the local authorities negotiated their surrender with King Ferdinand III, "El Santo", of Castile (AD 1201-1252). The monarch spared the lives of the residents on the condition that all the inhabitants should be exiled from Ishbiliyya leaving the city behind untouched and taking from their homes only what they managed to carry on their hands. It is estimated that the city of Ishbiliyya at the time had from 65,000 to 95,000 residents (Bosch Vilá, 1984: 341; 1992: 128) being not only the second largest in the Iberian Peninsula (after Cordoba) but among the most populated cities in Europe. The capitulation was signed on November 23, AD 1248, and King Ferdinand III, who was leading the Castilians troops, entered an intact and uninhabited city (Collantes de Terán Sánchez, 1992: 37-38).

5.2 The archaeological findings from the Islamic period at Plaza Nueva

5.2.1 Demolition of the Great House of San Francisco: an Islamic necropolis

In 1258, ten years after the Christian conquest of Seville in AD 1248, the monastery of the Great House of San Francisco acquired by royal decree the location now occupied by the Plaza Nueva. Construction of the monastery probably did not start until the end of the 13th century and continued in subsequent phases until centuries later. This Franciscan monastery occupied an area larger than that of the cathedral (Figure 108), was destroyed by fire in 1810 and later demolished between 1840 and 1851 (see Chapter 3.8.1).

In 1851, during the demolition of the ruins of the monastery of the Great House of San Francisco, a graveyard from the Islamic period of Seville was found directly beneath the convent grounds; an epitaph was recovered (Figure 109) with an inscription dated in the year of the Hegira of 412/AD 1022 (Lévi-Provençal, 1931: 43-46). This epigraphic document appears to prove the existence of a graveyard located at Plaza Nueva, in existence from at least the first quarter of the 11th century.

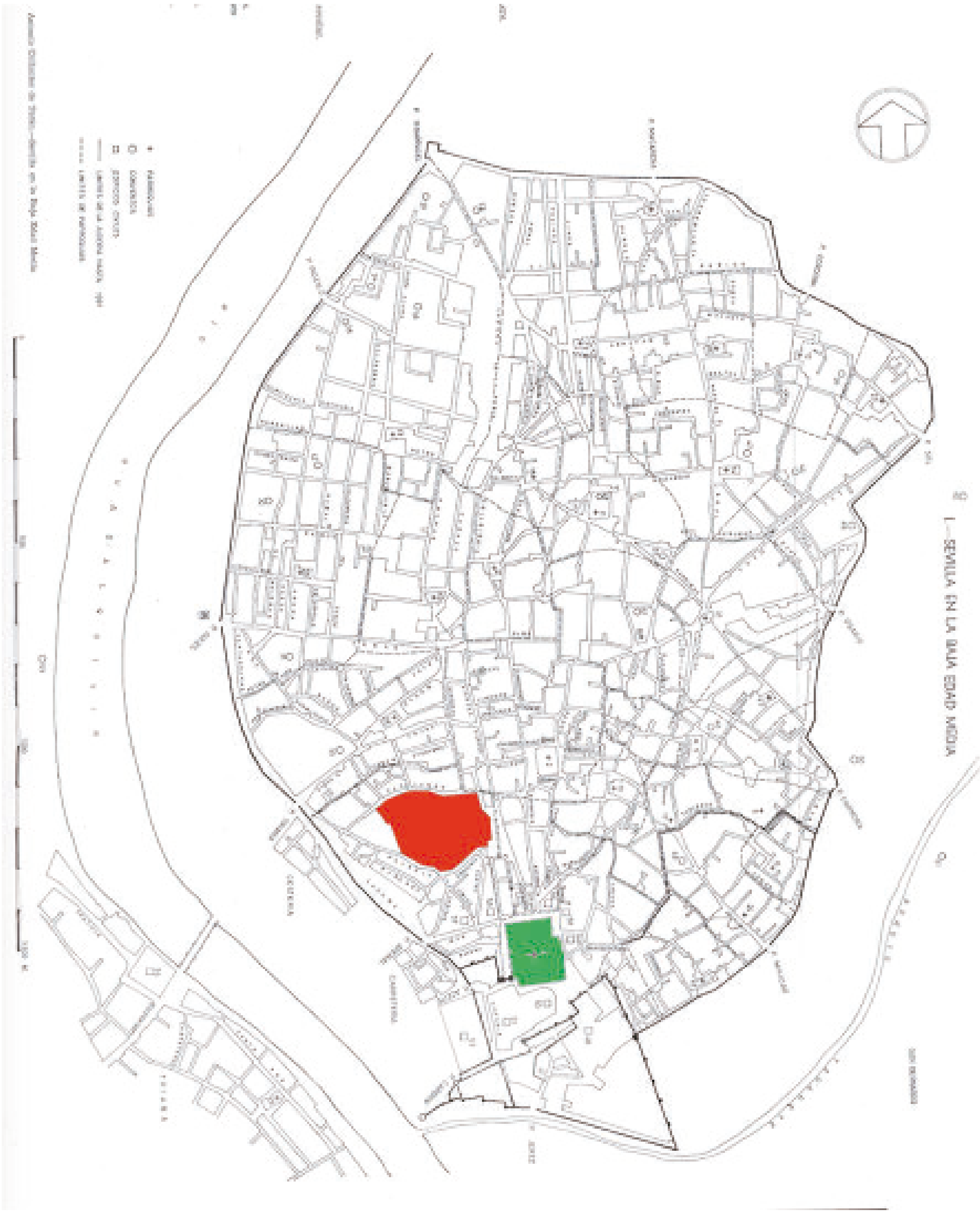


Figure 108: Map depicting the layout of Seville in the 15th century: location and extent of the monastery of Great House of San Francisco (red) *cf* Cathedral (green) (after Collantes de Terán Sánchez, 1977: Plano I).

Graveyards were called in Arabic *maqbara*, or in the plural *maqābir*. To build a graveyard was regarded as a pious act, with the same consideration as erecting a mosque, excavating a well for public use, or repairing a bridge; those individuals who built them would have rewards in their after life. The *qadi* (i.e. the judge of the city) and the *al-muhtasib* (i.e. chief public servant) were in charge of keeping, maintaining and, in case of need, building new graveyards for the city (Torres Balbás, 1957: 144).

....(1) .... الملك العامرىّ .... (2)لا إله إلاّ الله [وحده لا] شريك له
وأنّ محمّدا عبده ورسوله وأنّ الجنّة حقّ (3)والنار حقّ وأنّ السّاعة آتية لا ريب فيها وأنّ
الله يبعث من فى القبور (4)قُتل الفتى الكبير شفيع يوم اطريانـة بشاطئ الوادى بقريب
(5)القرية المذكورة على طاعة أمير المؤمنين المأمون القاسم (6)وفقّه الله وذالك يوم الجمعـة
لاثنين (sic) عشرة ليلة بقيت من ذى القعدة سنة (7)أثنتى عشرة وأربع مائة غفر الله ذنبه ورحم
عبد(sic) ؟له دين فى منزعه وقدم فى دنياه؟

...... (en témoignant qu'il n'est) d'autre divinité qu'Allāh, seul, qui n'a pas d'associé et que Muḥammad est Son envoyé, que le paradis est vérité, l'enfer vérité, "et que l'Heure suprême viendra, sans nul doute à son sujet, et qu'Allāh ressuscitera ceux qui sont dans les tombeaux(²)!" — A été tué le "grand-officier" *(al-fata ᵓl-kabīr)* Šafīᶜ, le jour (= au combat) de Triana, au bord du fleuve, près du bourg ci-dessus mentionné, dans l'obédience de l'émir des croyants al-Maᵓmūn al-Ḳasim — qu'Allāh l'assiste! — et cela le jour du vendredi, douze nuits restant de du ᵓl-ḳaᶜda, année 412 (24 février 1022). Qu'Allāh pardonne ses péchés et fasse miséricorde à un esclave (?) qui avait de la religion dans sa manière d'être et une haute situation dans sa vie d'ici-bas(?)!

Figure 109: Epitaph plaque found in 1851 of al-fata Safi: year 412 AH (i.e. AD 1022) attesting the existence of an Islamic necropolis at the beginning of the 11th century (top). Transcription and French translation by Lévi-Provençal (1931: 43-46).

Following the Roman tradition, Islamic graveyards were located outside the city walls on the sides of the roads that led to the main gates of cities. In contrast, in contemporary medieval Christian towns the deceased were buried inside the city walls in graveyards next to churches (Torres Balbás, 1957: 145).

Taking into account the date of the epitaph (i.e. H 412/AD 1022) and the location of the graveyard in the Plaza Nueva square, Valencia Rodríguez (1988: 598) proposed that the graveyard was probably built before the Almoravid period of Seville (i.e. AD 1091 – AD 1147) and was outside the city walls which protected the city during the Umayyad period of Seville (i.e. AD 756 – AD 1023). Oliva Alonso (2007, 193) suggested that this graveyard was known by the name of *Bab Abí Qulays* or *Al-Attarin*, and that, following the tradition in Islamic cities, was probably located in front of one of the western gates of the ancient city walls.

Valor Piechotta (1989: 331) and Oliva Alonso (2007, 193) hypothesised that the Islamic necropolis found at Plaza Nueva could be the graveyard described by Ibn ʿAbdūn, author of a *Hisba* treatise on the city of Seville written at the beginning of the 12th century. Ibn ʿAbdūn described the existence of a potters' district with a mosque, next to which Ibn Sihab constructed a graveyard (probably at some point during the beginning of the 11th century), which was used during the "year of the great famine" (Ibn ʿAbdūn, ed. García Gómez and Lévi-Provençal, 1981: 95). Valencia Rodríguez believes that AD 1056 was the "year of the great famine" and he found the first mention of a funeral at this graveyard in AD 1029 in a chronicle by Ibn Baskuwal; three more funerals are described in this textual source in AD

1075, AD 1140, AD 1195 (Valencia Rodríguez, 1988: 577-600). Both the epigraphic evidence and the literary sources attest that this graveyard was used continuously for about two centuries from AD 1022 to AD 1195.

This hypothesis seems to be confirmed by archaeological works conducted in 2008 at the nearby (i.e. 200 m away from Plaza Nueva) intersection of the Avenida de la Constitución and Calle Alemanes (Hunt, 2008). In this public work, several dozens of graves, which probably belonged to the same graveyard at Plaza Nueva, were found, with a chronology from the 11th century to the first half of the 13th century (Hunt, 2008: 173; Jiménez Maqueda and Pérez Quesada, 2012: 310). Consequently, this graveyard seems to have been used for two and a half centuries and hence its extent was probably considerable.

It is provable, therefore, that this *maqbara* or graveyard, along with the nearby mosque in the potters' neighbourhood, was in use until the conquest of Seville in 1248 by the Christian troops of King Fernando III of Castile (1201-1252). García Sanjuán (1999: 223) explains that during the Reconquista, once Christian troops took over a particular Islamic city of al-Andalus, the norm was to convert its mosques into Christian churches, as occurred in Toledo where the *aljama* (i.e. great mosque) was converted into a cathedral (Jiménez de Rada, ed. Fernández Valverde, 1987: 249-250). Later on, King Alfonso X of Castile (1221–1284) created the *Siete Patidas* statutory code, establishing, among many other laws, that "all conquered mosques were the property of the King, whom could bestow them to whomever he wishes" (Partida VII, title XXV, law I) (Carpenter, 1986: 241-243).

This is precisely what materialised after the conquest of Seville by King Ferdinand III, "El Santo", of Castile (1201-1252) the Saint. His son and successor, King Alfonso X, "El Sabio", of Castile, as new owner of the city mosques, decided in 1252 to bestow them to the Church, with the exception of three that were turned into synagogues (González Jiménez, 1991: 6-8). The Almohad *aljama* (i.e. great mosque) of Seville, after a process of purification and transformation according to ecclesiastical protocols, was converted into the Cathedral of Santa María (Valor Piechotta and Montes Romero-Camacho, 1997).

The large necropolis located in the area of Plaza Nueva was consider a *waqf* or mortmain property, which under Islamic law was an inalienable religious endowment typically donated in the form of a building or a plot of land. García San Juan (1999) suggested that, in the same manner as the mosques, all the *waqf* of Seville became the property of the King Alfonso X of Castile. It is possible to suggest, therefore, that the mosque in the potters' neighbourhood, along with the large necropolis of Plaza Nueva, were donated by King Alfonso X of Castile to the Church in 1252. We can further suggest that the King donated the mosque and graveyard to the Franciscan Order, of which his father, King Ferdinand III of Castile, was an important and extremely devoted member of the Third Order of Saint Francis. Sixteen years later, in 1268, after a process of purification and transformation according to ecclesiastical protocols, the monastery of the Great House of San Francisco was created. The large size of the necropolis at Plaza Nueva would explain the large extent of the monastery of the Great House of San Francisco.

The existence from at least the year AD 1022 of a necropolis in the Plaza Nueva area is of special importance for the present Thesis. As we have seen, according to Valencia Rodríguez (1988: 598) the location of this graveyard seems to have been outside the city walls from the Umayyad period of Seville (i.e. AD 756 – AD 1023). The city walls were in part similar to those in the Roman Imperial period and thus Oliva Alonso (2007, 193) proposed that the graveyard was located in front of one of the western gates of the ancient city walls. We have seen (see Chapter 3) that the Baetis River ran directly over the area of the Plaza Nueva, located parallel to, and close by, the western façade of the Roman Imperial city walls. The creation of a large graveyard, or necropolis, in this area previously occupied in the Roman era by the Baetis River, indicates that at that time the river no longer ran through it. Consequently, the presence from, at least, the year AD 1022 of a necropolis in the Plaza Nueva area provides us with a *terminus ante quem* for the existence and navigability of the ancient riverbed of the Guadalquivir River.

5.2.2 The 1981 salvage excavation at Plaza Nueva: the medieval ceramic assemblage

A substantial part of the work for the present Thesis was focused on the documentation, study, and analysis of the Plaza Nueva archaeological materials found in Seville in 1981, never studied until now (see Introduction). During the preliminary construction work of the underground railway system for Seville in 1981, abundant archaeological remains were found in Plaza Nueva. The remains ranged from the Iberian to Islamic periods. Among all the archaeological materials unearthed in the tunnel pit of Plaza Nueva (Fernández Gómez, 2007), the remains of a wooden boat were found in a stratum that had abundant pottery sherds from the Islamic period (Guerrero Misa, 1984: 95). Despite the mention of the Islamic pottery, Guerrero Misa (1984: 95) reported that only the wooden boat, the iron anchor (see Chapter 4), and some amphora sherds (see Chapter 3) were salvaged from the Plaza Nueva site (*vide supra*).

However, my inspection of the archaeological materials from Plaza Nueva at the Archaeological Museum of Seville revealed that large numbers of ceramic sherds, mostly from the Islamic period, were also recovered from the site; yet these were neither reported to have been found nor studied and/or information on them published. In fact, 50 boxes with the label "Plaza Nueva 1981" (Figure 110) were "rediscovered" within the Museum collection[54]. Inspection of these 50 boxes revealed that more than 1000 ceramic sherds, mostly from the Islamic period, were recovered from the site. They are currently kept in the museum and had also never been studied.

[54] I thank Mr Manuel Camacho who informed me of the existence of these boxes.

Figure 110: The 50 boxes containing ceramic remains from Plaza Nueva "rediscovered" in the basement of the Museum (Author).

Practically the entire +1000 ceramic sherds kept within the collection are diagnostic sherds. It is almost certain, therefore, that more ceramic sherds were found at the excavation pit but not retrieved. Mr Fernando Fernández (personal comment) confirmed that the ceramic sherds recovered were hand picked from the sand and from debris that was extracted from the pit by the crane excavator used in the works. Thus the ceramic materials kept at the Museum are a selection of what was found, rather than a complete assemblage.

Upon examination of the boxes, it was observed that they contained plastic bags full of ceramic sherds and that the bags contained paper labels. The handwritten labels indicated a date, the depth of the pit, a level number, and a specific sequence of numbers. It seemed that the ceramics were arranged and classified depending on the date, the depth from which they were extracted, which was used to assign a specific archaeological level, and a correlative number.

It was also observed that the sherds contained in the bags and boxes had pencil numbers written on their surface (some sort of early classification) and reference numbers made with black ink. The reference numbers gave different information: “PN81”, which stands for “Plaza Nueva 1981”; so it seemed that the ceramic remains underwent a classification after being extracted. Mr Fernando Fernández (personal comment) believes that Mr Antonio de la Hoz Gándara (at the time an history undergraduate at the University of Seville) might have made the initial classification. Unfortunately, the boxes and bags were in disarray: the Museum had no previous knowledge of the existence of these ceramics and had no documentation or classification thereof. Consequently, I had to document all the ceramics contained in the bags and boxes, and then reorder and classify them.

As part of the present Thesis, the +1000 ceramic sherds were documented with digital photography, identified, and classified according to their respective nature and chronologies. In total, a minimum of 908 ceramic diagnostic pieces were identified. There are 111 pieces of Roman chronology from the 1st to 5th centuries; 20 pieces of Islamic chronology from the 10th to 11th centuries; 601 pieces of Islamic chronology (Almohad period) from the 12th to 13th centuries; 93 pieces of Islamic chronology (late Almohad period) from the first half of the 13th century; 57 pieces of Christian late medieval chronology from the 14th to 16th centuries; and 26 pieces of modern chronology from the 17th to 19th centuries. These numbers are summarised in Figure 111.

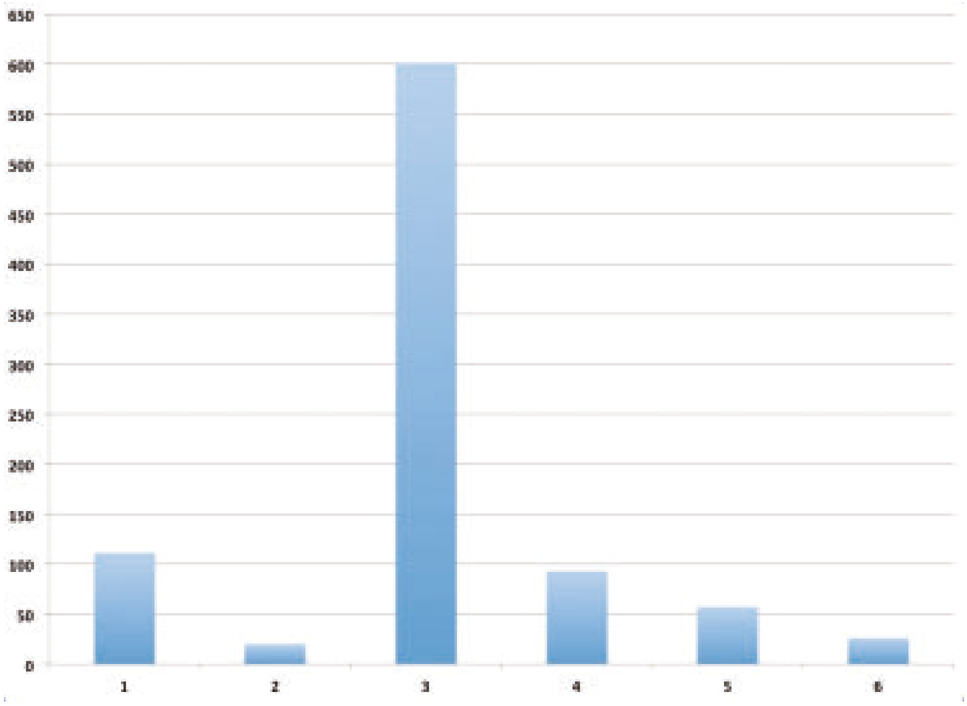


Figure 111: Ceramics from Plaza Nueva arranged by chronology: 1, Roman 1st to 5th c.; 2, Islamic 10th to 11th c.; 3, Islamic 12th to 13th c.; 4, Islamic 13th c.; 5, Christian 14th to 16th c.; 6, modern 17th to 19th c.

Representative samples of the Islamic ceramics were selected, drawn, and arranged in eight plates (Figure 112 to Figure 119), representative of different historical periods and typologies (Table 3)[55]. Given the nature of the collection (i.e. selection of diagnostic pieces) and given that we do not have stratigraphic references, we had to make the identification of the ceramics by means of comparative analysis. This was achieved by comparing well-dated parallels, as well as considering the ceramic assemblages of archaeological interventions undertaken in nearby areas. The Islamic materials recovered from Plaza Nueva are very similar to those unearthed at a commercial excavation at Calle Pedro Parias 4 (currently Calle Madrid 4). The ceramic materials from Pedro Parias 4 have a clear

[55] Classification of the Islamic/medieval ceramic sherds, as well as documentation of a selection of the material by means of archaeological drawings, was conducted with the aid and supervision of Ms Pilar Lafuente from the University of Seville.

stratigraphy and were used to identify the materials from Plaza Nueva. What follows is a description of the Islamic ceramics from Plaza Nueva organised by chronology and typologies (Table 3).

FIGURE #	BOX #s	EXCAVATION REF. #	PENCIL #	DESCRIPTION	CLASSIFICATION	CHRONOLOGY
112, no. 1	12			Ataifor (large dish)	Pre-Almohad ceramics	10th –11th centuries
112, no. 2	35			Candil (oil lamp)	Pre-Almohad ceramics	10th –11th centuries
112, no. 3	13			Cazuela (casserole)	Pre-Almohad ceramics	10th –11th centuries
112, no. 4	12			Closed form with handles	Pre-Almohad ceramics	11th century
112, no. 5	4			Jarrita (small jar)	Pre-Almohad ceramics	11th century
112, no. 6	6			Redoma (bottle)	Pre-Almohad ceramics	10th –11th centuries
112, no. 7	13			Redoma (bottle)	Pre-Almohad ceramics	11th century
112, no. 8	13			Redoma (bottle)	Pre-Almohad ceramics	11th century
112, no. 9	13			Arcaduz (jar on water well)	Pre-Almohad ceramics	10th –11th centuries
112, no. 10	6			Arcaduz (jar on waterwheel)	Pre-Almohad ceramics	10th –11th centuries
113, no. 1	1	PN/81/4/439		Olla (pot)	Almohad ceramics / Cooking ware	12th –13th centuries
113, no. 2, 113, no. 3	1, 43	PN/81/4/457 PN/81/3/169		Cazuela de costilla (rib casserole)	Almohad ceramics / Cooking ware	12th –13th centuries
113, no. 4, 113, no. 5, 113, no. 6	16, 16, 34	PN/81/3/226 PN/81/3/232 PN/81/3/279		Cazuela (hemispherical casserole)	Almohad ceramics / Cooking ware	12th –13th centuries
114, no. 2, 114, no. 3, 114, no. 4	26, 50, 48	PN/81/2/641 PN/81/_/113		Jug	Almohad ceramics / Storage and transportation ware	12th –13th centuries
114, no. 1	14	PN/81/4/640		Orza (jar for storage food)	Almohad ceramics / Storage and transportation ware	12th –13th centuries
116, no. 6	8	PN/81/2/142		Cantimplora (canteen)	Almohad ceramics / Storage and transportation ware	12th –13th centuries
115, no. 6, 115, no. 7, 115, no. 8, 115, no. 9, 115, no. 10	1, 1, 2, 1, 1	PN/81/4/431 PN/81/4/433 PN/81/3/263 PN/81/4/461 PN/81/4/459		Ataifor (large dish)	Almohad ceramics / Table ware	12th –13th centuries
115, no. 4, 115, no. 5	16, 16	PN/81/3/227 PN/81/3/229		Jofaina (dish)	Almohad ceramics / Table ware	12th –13th centuries
115, no. 1, 115, no. 2, 115, no. 3	29, 1, 8	 PN/81/4/447 PN/81/2/53	27	Cuenco (small bowl)	Almohad ceramics / Table ware	12th –13th centuries 13th century 12th –13th centuries
116, no. 3	1	PN/81/4/427		Jarra (jar)	Almohad ceramics / Table ware	12th –13th centuries
116, no. 1, 116, no. 2, 116, no. 4	29, 35, 8	 PN/81/2/141	39	Jarro (jar)	Almohad ceramics / Table ware	12th –13th centuries 12th –13th centuries 13th century
116, no. 5, 116, no. 7, 116, no. 8	35, 28, 28	 PN/81/2/82 PN/81/2/83		Redoma	Almohad ceramics / Table ware	12th –13th centuries
117, no. 1, 117, no. 2, 117, no. 3	41, 41, 1	PN/81/2/43 PN/81/2/40 PN/81/4/429		Candil de pie alto (tall stand oil lamp)	Almohad ceramics / Ware for lighting	12th –13th centuries 13th century 13th century
117, no. 6	1	PN/81/4/426		Candil de pellizco (oil lamp)	Almohad ceramics / Ware for lighting	12th –13th centuries

FIGURE #	BOX #s	EXCAVATION REF. #	PENCIL #	DESCRIPTION	CLASSIFICATION	CHRONOLOGY
117, no. 4, 117, no. 5	35, 41	PN/81/2/47		Candil de cazoleta (oil lamp)	Almohad ceramics / Ware for lighting	13th century 13th century
117, no. 2, 117, no. 3	5, 5	PN/81/4/523 PN/81/4/524		Anafes (small portable stove)	Almohad ceramics / Fire containers	13th century 12th –13th centuries
117, no. 1	5	PN/81/4/525		Brasero (brazier)	Almohad ceramics / Fire containers	12th –13th centuries
118, no. 6, 91, no. 7	34, 16	PN/81/3/414 PN/81/3/343-345		Lebrillo (basin) Bacin (chamber pot) Barreño (basin)	Almohad ceramics / Other domestic ware	12th –13th centuries
118, no. 1, 118, no. 2	2, 2	PN/81/3/381		Tapadera (small lid)	Almohad ceramics / Complementary ware	12th –13th centuries
118, no. 4	1	PN/81/4/465		Tapadera (lid for bowls)	Almohad ceramics / Complementary ware	12th –13th centuries
118, no. 3	35			Tapadera (conical lid)	Almohad ceramics / Complementary ware	13th century
118, no. 5	35			Arcaduz (jar on waterwheel)	Almohad ceramics / Productive use ware	12th –13th centuries
N/A		PN/81/4/522		Brocales de pozo (well linings)	Almohad ceramics / Large pieces	12th –13th centuries

Table 3: Islamic ceramics from Plaza Nueva organised in chronological order and different typologies.

From the pre-Almohad chronology (i.e. 10th and 11th centuries) few and very fragmented ceramic materials have been documented (Figure 112). Among them the following vessel forms have been identified:

a) 'Ataifor' (large dish used for presenting food): a polychrome glazed sherd (brown and green decoration, known as 'verde and manganeso') with wave motifs along the edge and a hemispherical shape, and a Caliphal chronology (10th or early 11th century) (Figure 112, no. 1).

b) 'Cazuela' (casserole) or 'Fuente' (platter or large flat dish): this multifunctional vessel has an open shape, flat base and a slightly thickened edge. Its fabric has coarse inclusions and traces of having been burned. On its inner surface it has a waterproofing burnish. It could be dated to between the 10th and 11th centuries, although it is possible to find the same type in a later period (Figure 112, no. 3).

c) Closed form with handles, undetermined function: this piece has a red fabric with coarse inclusions, and it has a white painted decoration. Judging by its technical characteristics and its decoration, it must be dated to the 11th century (Figure 112, no. 4).

d) 'Jarrita' (small jars, designed to hold liquids, with handles): it has a buff fabric with fine and medium size inclusions. It has a flat base, inverted truncated cone body, developed neck, and two handles. It is dated in the 11th century (Figure 112, no. 5).

e) 'Redoma' (bottle, small closed form): a neck of a 'redoma' with red-firing clay and medium and some coarse inclusions has been recovered (Figure 112, no. 6). Moreover several fragments from various 'redomas', made of very refined buff or buff-orange fabric, with honey-greenish glaze covering one or both sides were found. They can have traces of manganese, usually poorly defined, and can be dated between the 10th and 11th centuries (Figure 112, nos. 7 and 8).

f) 'Candil' (oil lamp): this is an almost complete piece, made of light buff fabric with fine inclusions. It has a flat base, closed oil compartment, short neck and a spindle-shaped spout, with a handle on the opposite side to the spout. Its chronology is of 10th-11th century, although it is possible to find the same type in later periods (Figure 112, no. 2).

g) 'Arcaduz' (bucket or jar on waterwheel): this is a type with a thickened base and a conical body in its bottom. It has a buff fabric, with fine and medium-sized inclusions. According to Sonia Gutiérrez Lloret (1996: 122) they have an early chronology of 10th to 11th century (Figure 112, nos. 9 and 10).

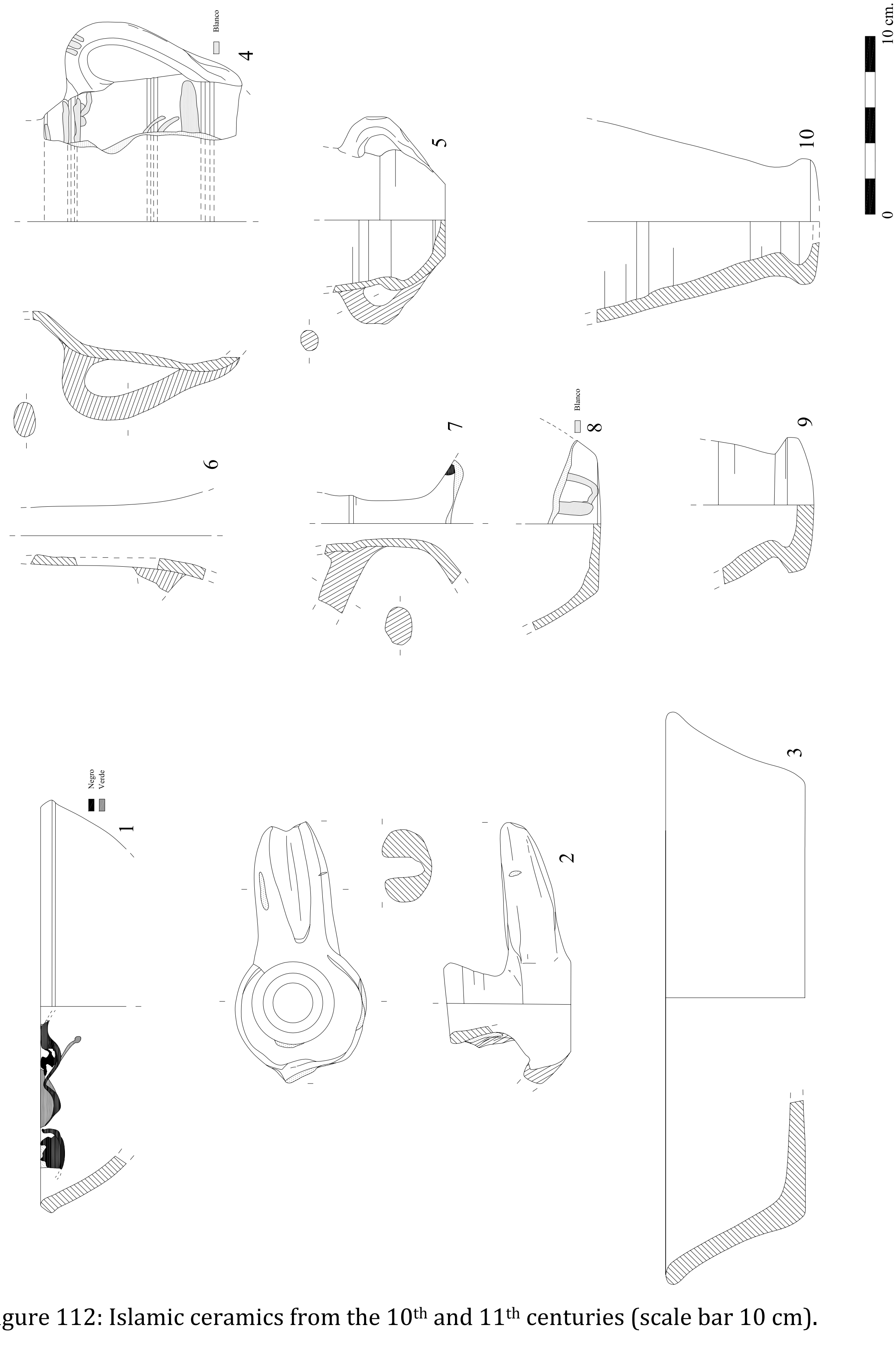


Figure 112: Islamic ceramics from the 10th and 11th centuries (scale bar 10 cm).

As we have seen the majority of the pieces from the ceramic assemblage belongs to the Almohad period, which reached its end in the middle of the 13th century, when King Fernando III of Castille conquered Seville in AD 1248 (*vide supra*).

From the considerably large Almohad ceramic assemblage, 20 different typologies have been identified and have been arranged according to the original function of the objects, divided into the following categories:

1. Cooking ware
2. Storage and transportation ceramics
3. Tableware
4. Fire containers
5. Domestic ware
6. Complementary ware
7. Productive use ceramics (agricultural or craft use)
8. Large pieces

1. Cooking ware

The cooking repertoire consists mainly of 'ollas' (pots) and 'cazuelas' (casseroles). The most significant type of pot has a convex base, globular body with grooves, short cylindrical neck with a flat edge, and two handles. Two characteristic types represent the casserole group: casseroles with ribs, and the hemispherical casseroles (Figure 113).

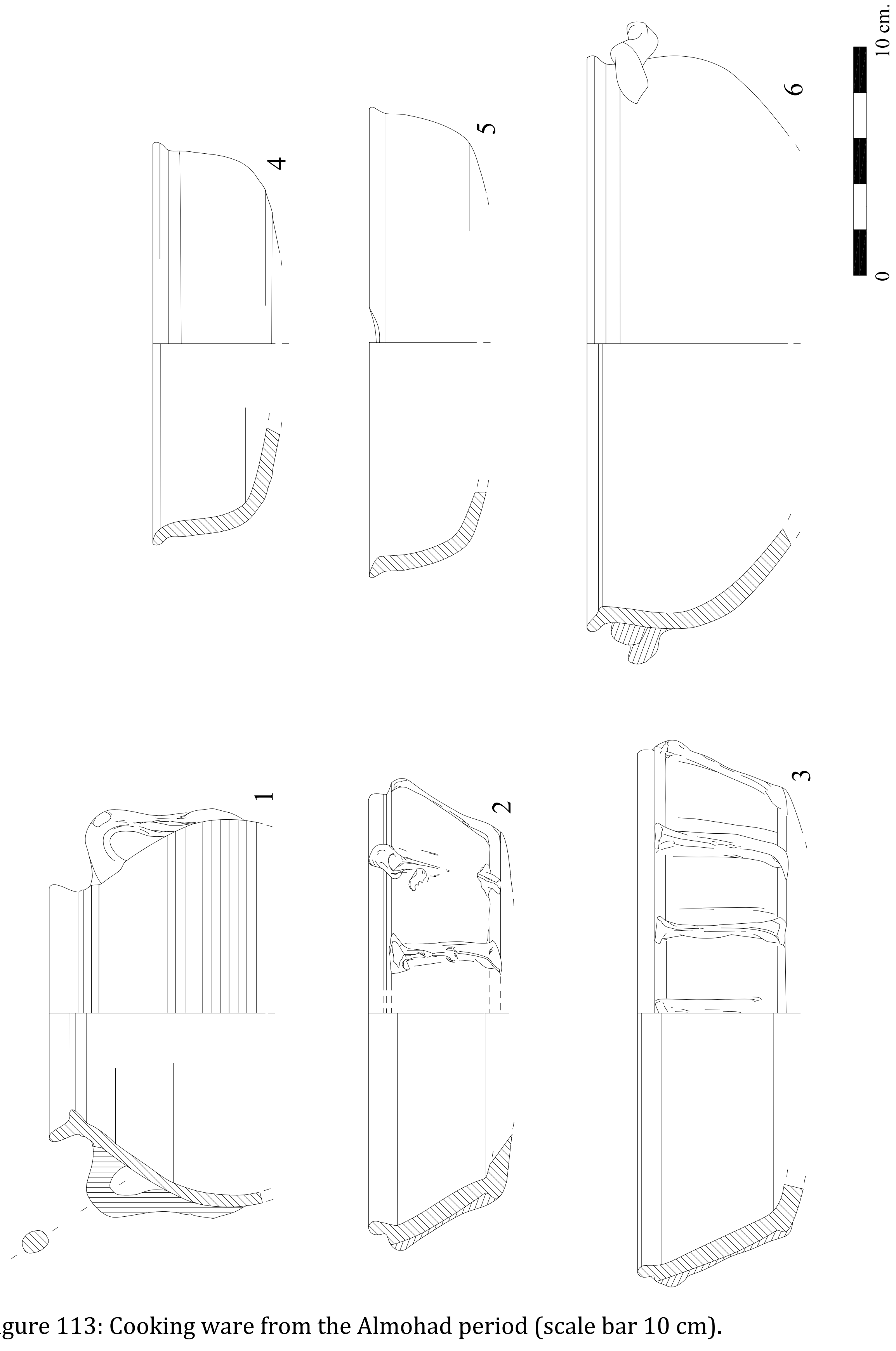


Figure 113: Cooking ware from the Almohad period (scale bar 10 cm).

2. Storage and transportation ware

In the archaeological excavation an interesting set of one and two handled jugs was recovered. These jugs have buff or buff-orange fabric. Among the pieces, the most common have flat or convex bases, ovoid or pear-shaped bodies with grooves, cylindrical or trefoil mouths, and one or two handles. Some pieces are decorated with traces of manganese on the body, handles, neck and rim (Figure 114, nos. 2, 3 and 4).

Furthermore, 'orzas' (small closed form for storage of food) were identified, with globular bodies, two or more handles, and different types of rims; sometimes they could support a lid (Figure 114, no. 1).

This group of ceramics for storage and transportation is completed by two more types: the 'cantimplora' (canteen) to carry water while travelling; and 'botellas' or small containers with the shape of a miniature bottle, that were used to package small quantities of possibly pharmacy or toilet substances (Figure 116, no. 6).

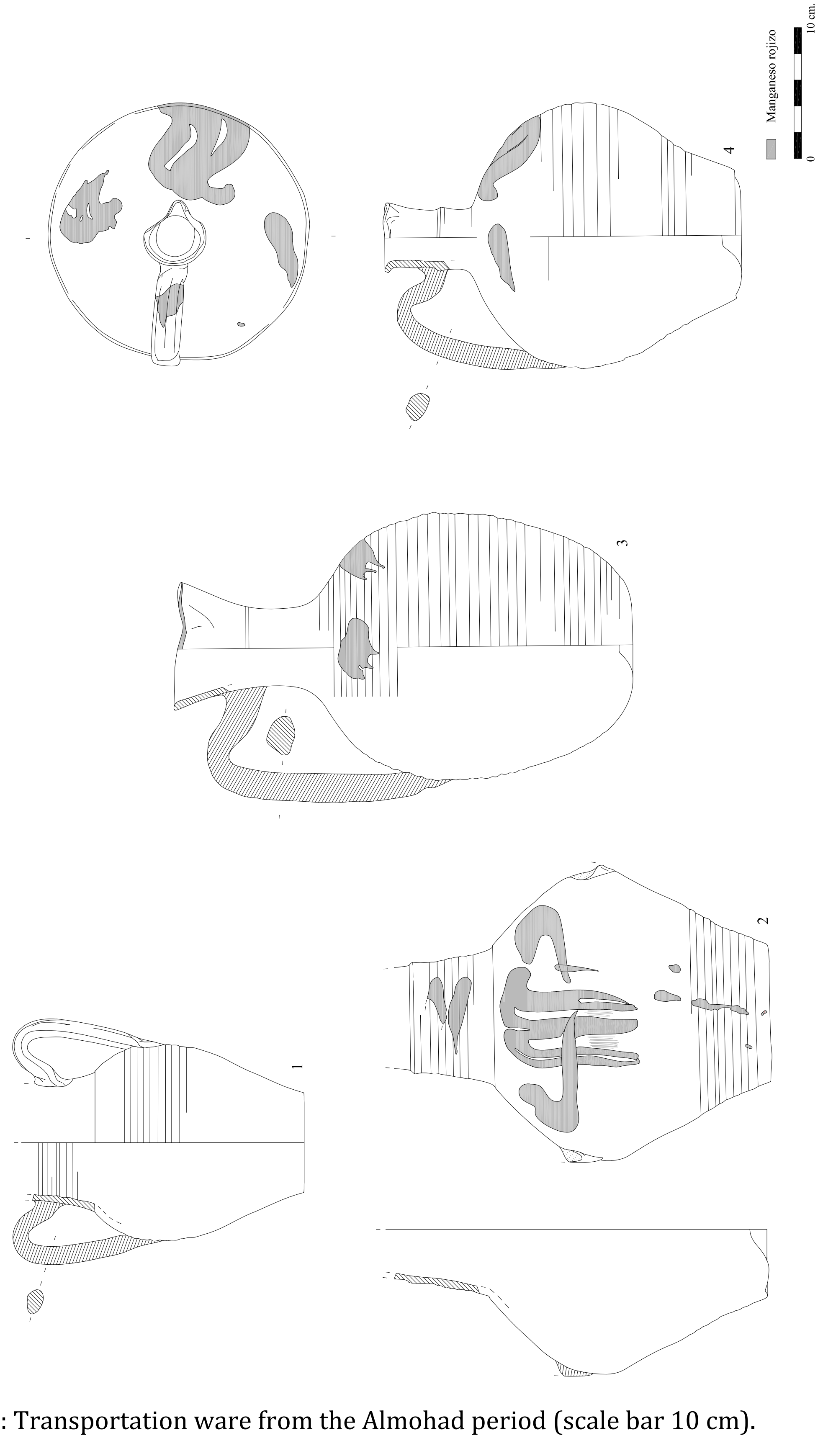


Figure 114: Transportation ware from the Almohad period (scale bar 10 cm).

3. Tableware

The tableware group is well represented, both the open and closed subgroups, although the latter are more difficult to identify due to their fragmentation. Within the subgroup of open forms, according to the diameters of the pieces, three types have been differentiated: 'ataifor' (20-36 cm), 'jofaina' (10-19 cm) and 'cuenco' (< 10 cm).

Among the open types, the most representative piece is the 'ataifor' with a carinated profile, high foot-ring and thickened edge. The most common type was used as everyday tableware, with red fabric and honey glaze on both surfaces. These pieces are not usually decorated, except for one or two incised circles on the bottom. However a few fragments with manganese lines have been documented here, which is indicative of a later chronology. On the other hand, high-quality 'ataifores' have also been documented. They usually have a refined buff or orange fabric, and both surfaces are covered with a glazing technique. This glaze can be monochrome -honey, green or white- or two-coloured, one for each side; some pieces are decorated with small stamps in the bottom (Figure 115, nos. 6-10).

A second type of 'ataifor' has open walls with a soft carinated profile and it is smaller than the carinated types with more pronounced profiles. 'Jofainas' -smaller pieces- with similar technical characteristics have been documented. Red fabric and honey glaze in both sides are predominant, although some high-quality pieces with white or straw-yellow glaze have been identified (Figure 115, nos. 4 and 5).

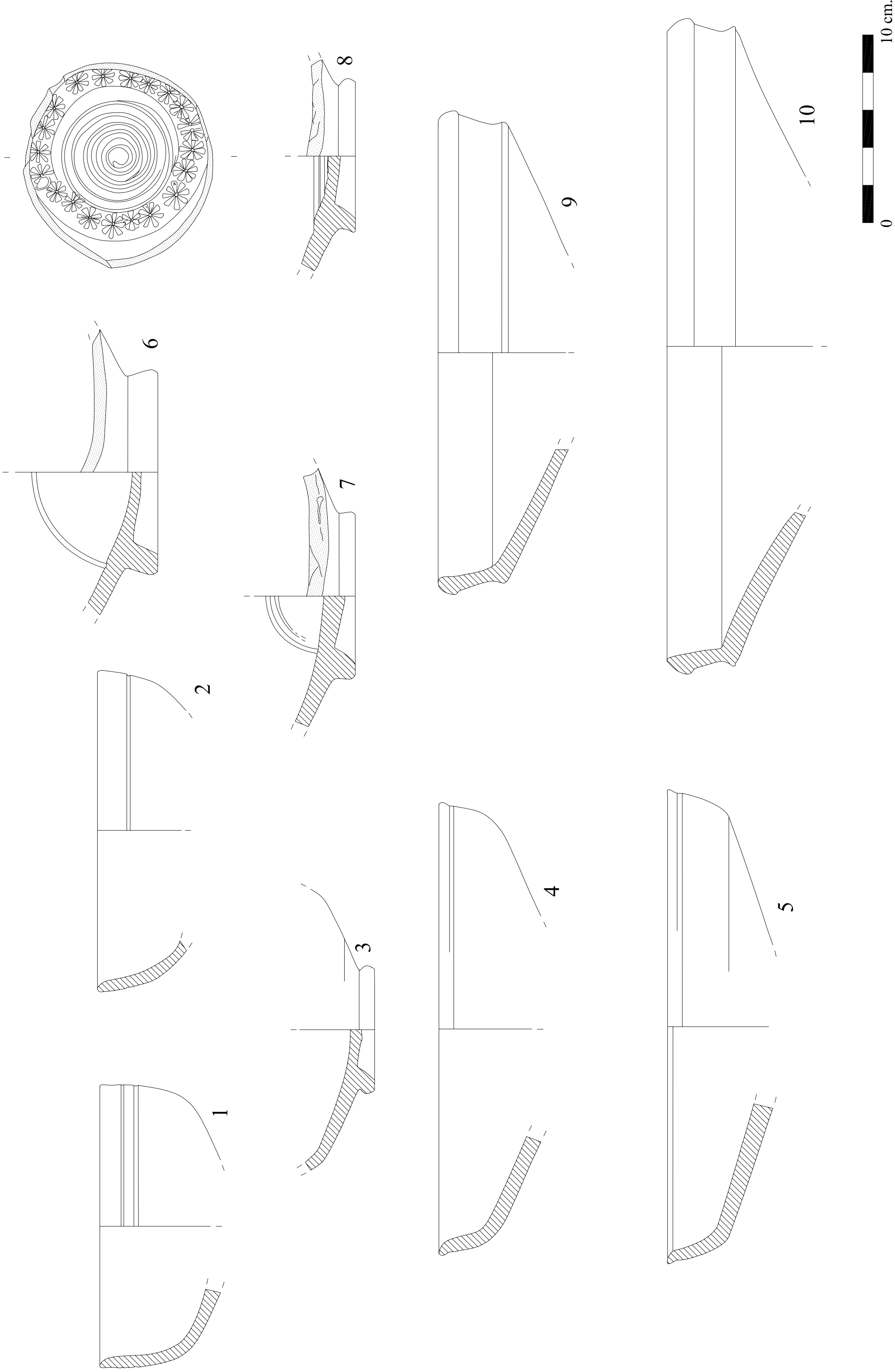


Figure 115: Tableware ceramics from the Almohad period (scale bar 10 cm).

'Cuencos' (bowls) have higher and more closed walls than 'ataifores' and 'jofainas'. Two types have been documented, each with some variations. The first type is a hemispherical 'cuenco' (bowl), usually decorated with one or two incised lines on its outer side. It has a red fabric with honey glaze covering both sides (Figure 115, no. 1 and 2). The second is a high-quality tableware type with very refined fabric. It often has a yellowish or whitish glaze on its inner surface, while on the outside it presents incised decoration under a green glaze cover. These bowls are usually associated with lids that have similar characteristics (Figure 115, no. 3).

The closed subgroup is more complex and heterogeneous. Some fragments of different types have been identified: refined and porous buff fabric 'jarritas', honey glazed 'jarras' and 'jarritas', 'jarras' and 'jarritas' with glazed traces over biscuit firing, that is indicative of a late chronology (Figure 116, no. 3); in addition to other types, such as 'jarros' with a pouring spout, biscuit firing 'jarros' (Figure 116, no. 2 and 4) and honey glazed 'jarros' (Figure 116, no. 1). Finally, 'redomas' are well represented with everyday use types and high-quality refined and glazed types (Figure 116, nos. 5, 7 and 8).

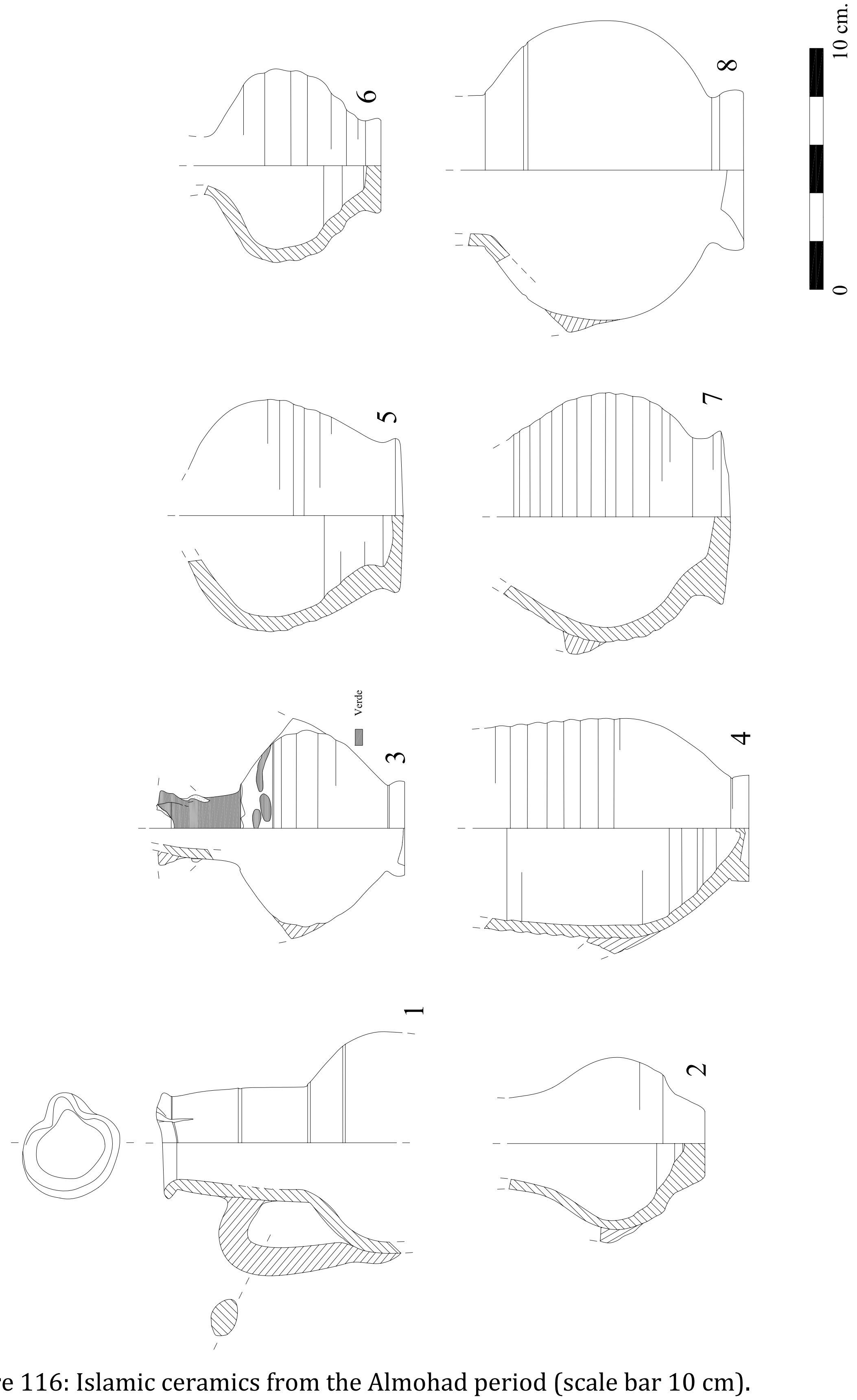


Figure 116: Islamic ceramics from the Almohad period (scale bar 10 cm).

4. Fire containers

For lighting, 'candiles' (oil lamps) were used, of which an interesting assemblage has been recovered. There are 'candiles' of various styles: with a tall stand (Figure 117, nos. 1 - 3) or with an open receptacle (Figure 117, no. 6). They have red fabric and are covered with a high quality honey-coloured glaze. Less common is a late type of 'candil' with an open receptacle, a short spout and a central stem (Figure 117, nos. 4 and 5).

For cooking, 'anafes' (small portable stoves) were used. Numerous fragments have been documented, usually belonging to evolved types and also some later types. The best represented here have a dual chamber with a central grid. Their fabrics are red and usually have a decoration consisting of incised lines, stamps, applied motifs -some of them on the handles- (Figure 118, nos. 2 - 3); a late type has raised base, hemispherical body and an inward sloping rim.

The 'brasero' (brazier) for heating is also documented from a moulded piece with ribs (Figure 118, no. 1).

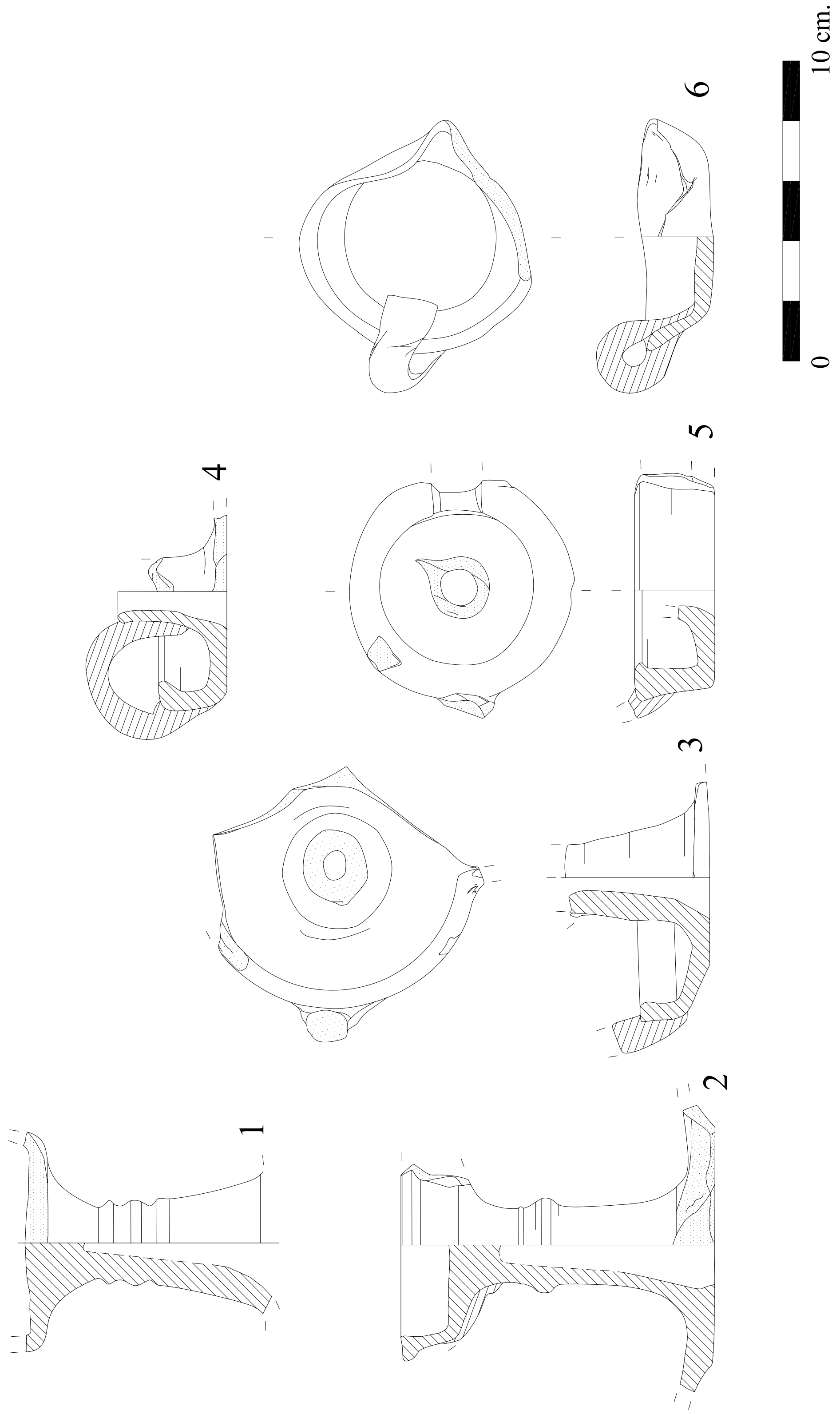


Figure 117: Oil lamps from the Almohad period (scale bar 10 cm).

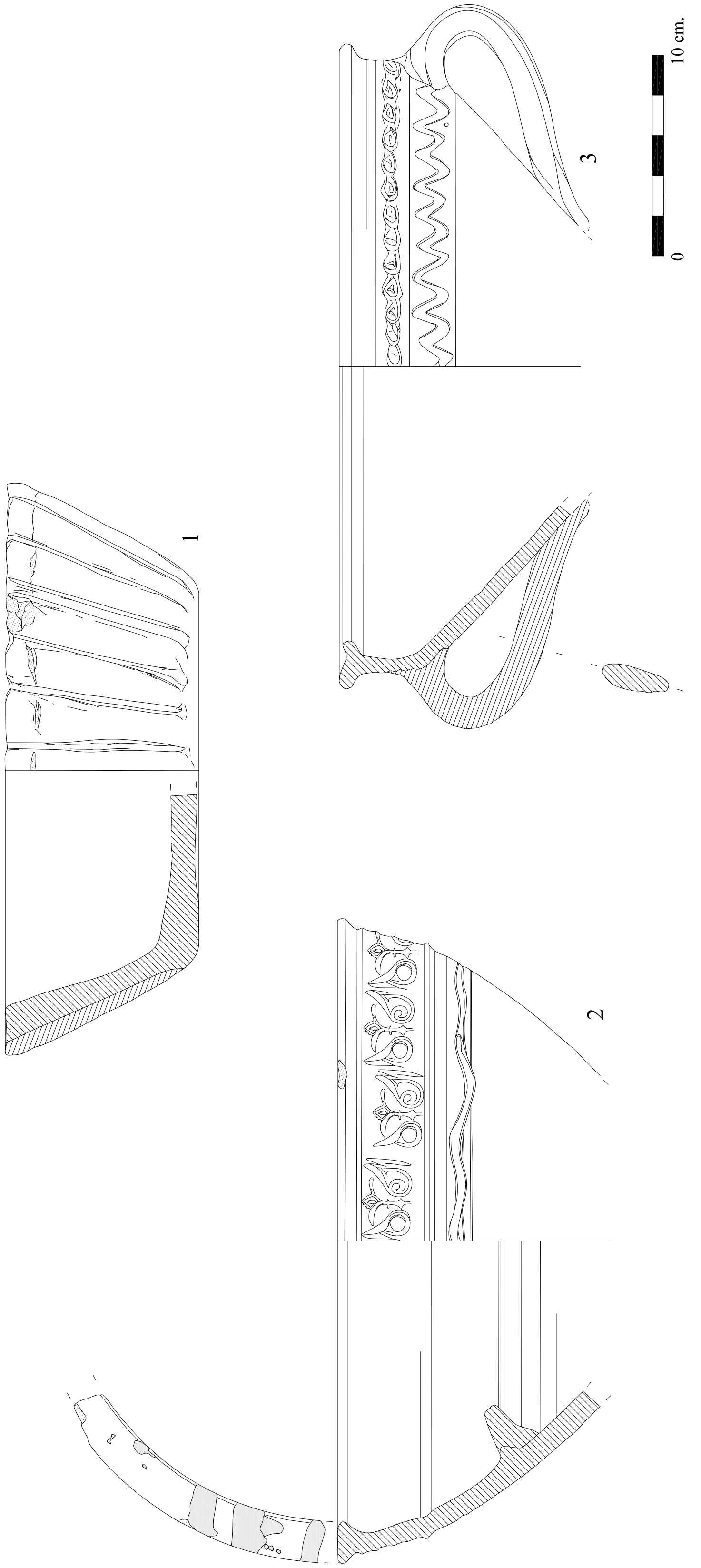


Figure 118: Fire containers from the Almohad period (scale bar 10 cm).

5. Other domestic uses

A 'Lebrillo' (basin) with open walls and large and bulbous rim was found and classified. It usually has a polished and a waterproofing inner face. Other documented forms are 'bacines' (chamber pots) and open 'barreños' (basins), which usually have an incised or stamped band under green glaze (Figure 119, nos. 6 and 7).

6. Complementary ware

The best documented complementary element is the 'tapadera' (lid), and various types have been documented: small lids with a winged rim or with a hemispherical profile and incised decoration (Figure 119, nos. 1 and 2), some lids for bowls (Figure 119, no. 4); in addition to a type of lids that have a recessed rim and conical shape (Figure 119, no. 3). Moreover, some fragments of a large lid, used to cover a large storage container, have also been recovered. They are stamped in combination with green glaze.

7. Productive use ceramics

The Almohad 'arcaduces' are of different sizes: the largest, with a cylindrical body and a central recess, could be used in waterwheels located at open spaces, such as gardens or orchards; but also small pieces have been documented that possibly were used in domestic waterwheels (Figure 119, no. 5).

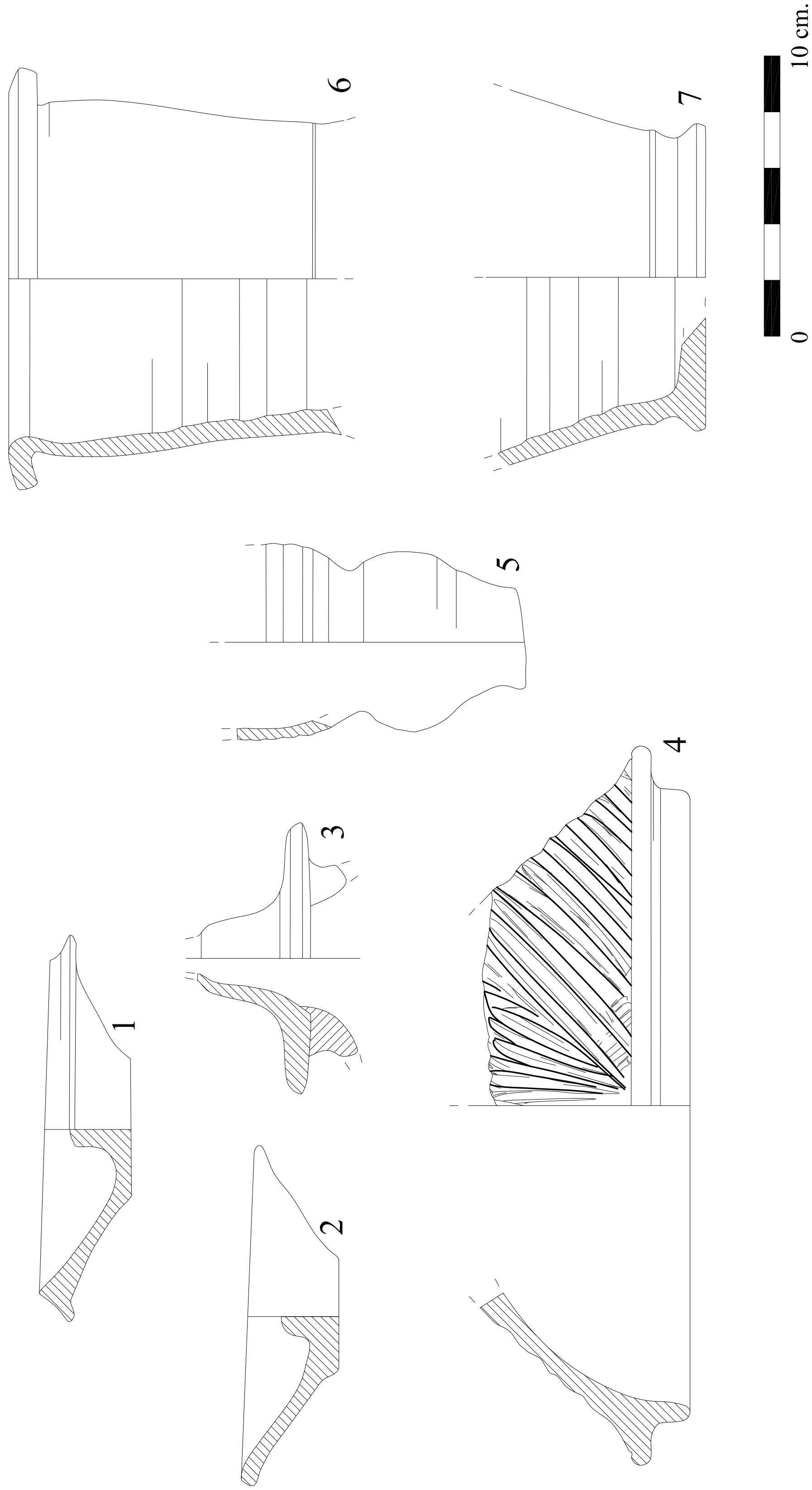


Figure 119: Islamic ceramics from the Almohad period (scale bar 10 cm).

8. Large pieces

Within this group, from which we exclude jars and storage containers for purely functional reasons, we find the 'brocales de pozo' (well linings), of which some fragments have been documented, highlighting those with the stamped decoration under green glaze.

5.2.2.1 Interpretation of the Plaza Nueva ceramics artefacts

Aside from the Islamic assemblage, there is a group of ceramics from the Roman and late Roman period which is mainly composed of amphorae and which was discussed earlier (see Chapter 3). There is a small group of Islamic ceramics from the Caliphate and *Taifa* periods with chronologies from the 10th and 11th centuries. The largest volume of materials among the ceramics from Plaza Nueva corresponds to the Almoravid-Almohad period (*circa* AD 1100 - 1250), which is complemented by the second largest group of Islamic ceramics corresponding to the late Almohad period (i.e. first half of the 13th century). Finally, there is a smaller group of Christian late medieval ceramics from the 14th to the 16th centuries, and a group of modern ceramics from the 17th to 19th centuries.

Regarding the ceramics found at Plaza Nueva, the following observation could be made. The small number of ceramics with chronologies prior to the 12th century could indicate that this area was not occupied until then. This suggests that it was not occupied before the 11th century, as has been found for all archaeological excavations west of the ancient channel of the Baetis River (Figure 120). This supports the hypothesis that the palaeo channel of the Guadalquivir River occupied this area until the 11th century as suggested by the wear and abrasion that all the Roman ceramics, mostly amphorae, present (see Chapter 3).

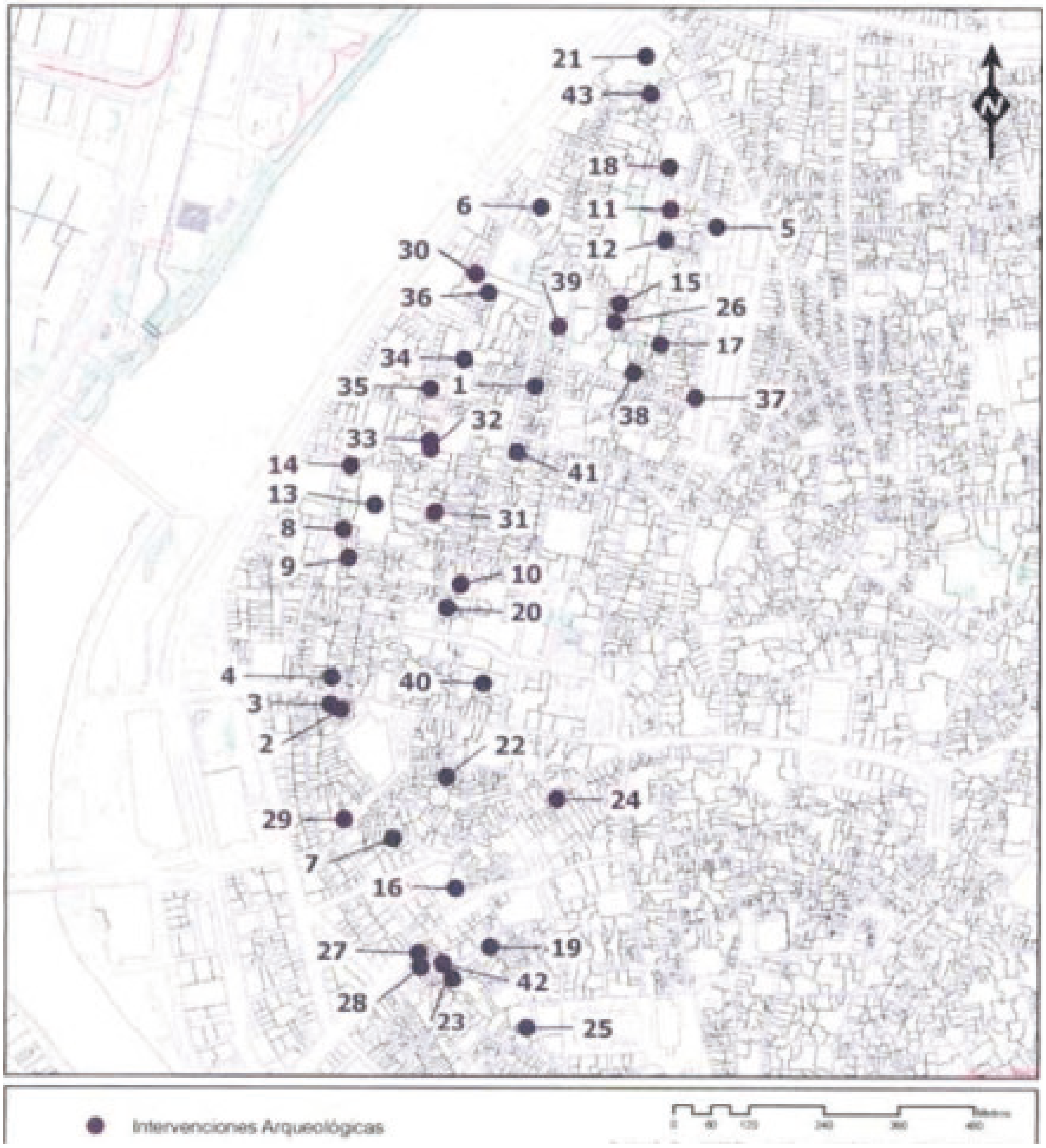


Figure 120: Excavations where archaeological materials from prior to the 11th century have not been found (after Jiménez Maqueda, 2011: fig. 40, scale bar 400 m).

The Almohad group is consistent with the very characteristic ceramic containers of the period. However, there is an unusual abundance of certain typologies, for example casserole dishes or cazuelas de costillas (Instituto de Estudios

Almerienses, 1993: 44-47), which have a bright appearance because of their glaze. In contrast, there are almost no examples of other typologies such as cooking globular pots or ollas (Instituto de Estudios Almerienses, 1993: 52), which are usually found very fragmented and look charred and unattractive. This seems to be the result of the circumstances of the assemblage recovery, via a hand picked subjective selection process, rather than by a systematic objective collection.

The presence of potters' specialised equipment, such as kiln spacers or 'atifles' and kiln bars or 'birlos' (Instituto de Estudios Almerienses, 1993: 153-154) both used for stacking and arranging pots inside the kiln during the firing process, suggests the nearby presence of potters' workshops. This supports the hypothesis that in this area there was a potters' district, which had its own mosque next to which a graveyard was constructed in the 11th century (*vide supra*), as described in the historical accounts of Ibn ʿAbdūn (ed. García Gómez and Lévi-Provençal, 1981: 95).

The Islamic assemblage recovered from Plaza Nueva is consistent with a landfill for disposal of household and pottery production waste during the 11th century onwards, with the secondary objective of filling the marshy area left by the palaeo channel of the river (*vide infra*). This is consistent with other nearby excavations such as Calle Pedro Parias 4 (Pecero, Romo and Vargas Jiménez, 1998: 43-44, 47), and Zanja de la Avenida (Carriazo Arroquia, 1974-1975: 95-96).

The complete absence of Christian pottery from the second half of the 13th century, as well as the reduced number of items in the group of the 14th century, suggests that the area was not used or occupied until the 14th century. This is consistent with the creation of the monastery of the Great House of San Francisco in AD 1258 and its construction in different stages from the late 13th century onwards (*vide supra*).

5.2.3 The 1981 salvage excavation at Plaza Nueva: the shipwreck remains

The most significant archaeological findings from the Plaza Nueva were a wooden boat and an iron anchor discovered during the construction of Seville´s underground railway in 1981. As we have seen, the fact that the ancient riverbed runs through the city centre of Seville is the reason why a boat and an anchor were found at Plaza Nueva, located far from the Atlantic Ocean in the busy city centre. The Plaza Nueva shipwreck could provide new knowledge about ship construction techniques in antiquity. The available body of knowledge pertaining to riverboat construction is scant, and the best known archaeological examples come from Central and Northwest Europe (see Chapter 3). In fact, the Plaza Nueva shipwreck is the only surviving archaeological remains of an ancient ship found to date at the Guadalquivir River.

In addition to the findings described in this Thesis, on at least three occasions shipwrecks (or remains thereof) were found during the second half of the 20th century in areas where the ancient riverbed ran. Guerrero Misa (1984: 96) reports that another shipwreck was found at Plaza Nueva during the construction of the Hotel Inglaterra, located at the west side of the square. The fragment of a Roman statue (of a toga attired male) and a fragment of a Roman funerary inscription (according to J.M. Carriazo Arroquia both from the early 2nd century AD) were found during the construction of the retail El Corte Inglés in 1969 (Newspaper ABC

Sevilla 18-09-1969). Because of the position of the site and the reported great depth at which the fragments were found, Ordóñez Agulla (2003: 67) interpreted them in relation to another possible shipwreck. In contrast, Corzo (1997: 198) interprets these remains as belonging to an extramural Roman necropolis (*vide infra*). Campos (1986: 146) mentions another shipwreck in the Alameda de Hercules area. Unfortunately, further information about these findings is not offered by these publications due to the regrettable absence of any archaeological control or inspection at the time of each of these discoveries (Ordóñez Agulla, 2003: 67).

Finally, in 1970 at La Puebla del Río, a town about 18 km down the Guadalquivir from Seville, the remains of a 12 m long ship were found after a large flood of the river (Figure 121). Mr Salvador de Sancha, the archaeologist who inspected the remains of the ship, believed to be of Roman chronology on the basis of Roman sigillata sherds found at the site (Newspaper ABC Sevilla 25-11-1970) and some authors reported this interpretation (e.g. Ponsich, 1974; Abad Casal, 1975). However, other authors believe that the ship could have been lost in the Middle Ages, perhaps in the 11th century, on the basis of the direct inspection and study of geological deposits where the ship was found. Unfortunately, the remains of the ship were completelly burned in 1974, so no further study could be made (Ménanteau and Clemente, 1977: 170-171).

Figure 121: Photograph of the ship remains found in 1970 at La Puebla del Río (Salvador de Sancha).

In early June 1981 the remains of a wooden boat were found at the salvage excavation of Plaza Nueva. The hull remains were found 11 metres from the surface (Figure 122), in a stratum where pottery sherds from the Islamic period appeared in abundance (Guerrero Misa, 1984: 95).

Figure 122: Published photograph of the remains of the wooden boat found *in situ* at Plaza Nueva (Archaeological Museum of Seville).

At the time of its discovery, the hull was split into two parts. It is unclear if this was a result of the construction work or if the boat was split from antiquity. Apart from being split into two parts, the boat was fairly complete, just lacking the uppermost strakes that comprised its gunwale. Unfortunately, the reinforced concrete structure that comprised the walls of the underground railway tunnel pit, was directly above the remains, leaving only part of the boat accessible to the archaeologists (Guerrero Misa, 1984: 95). According to the initial reports of the archaeologists, the accessible end of the boat was the bow, therefore the port side is the one depicted in the initial photographs (Figure 123). The upper edge of the port side strakes of the hull was first found in the mud. Despite the fact that nearly the entire boat was preserved, as shown in the first photographs that were taken, only a few remains of the boat were actually recovered from the pit.

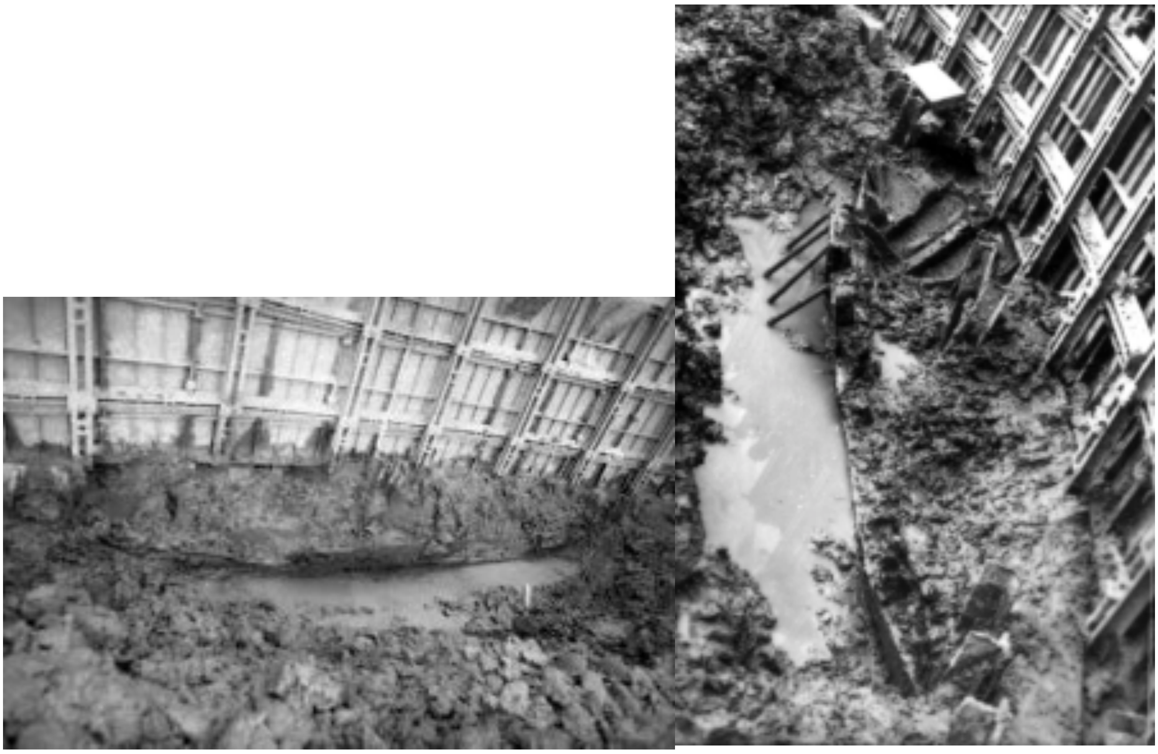


Figure 123: The wooden boat was rather complete when it was discovered. The image shows the split port side of the boat still *in situ* (Archaeological Museum of Seville).

Several factors made the recovery of the remains very difficult. First, the walls of the underground railway tunnel pit were directly above the remains, resulting in many steel-reinforcing bars (from the reinforced concrete structure) piercing the hull remains of the boat in several places (Figure 122).

Second, the depth of the pit (i.e. 11 metres) meant that the muddy sediment and the uneven surface made access to the timber remains very complicated and dangerous for the archaeologists. In order to make the area more accessible for them, a large crane excavator was used to even the surface by removing substantial portions of sediment (Figure 124). Due to the industrial size of the clamshell bucket attached to the crane excavator, the operation was not carried out carefully enough. As a result, the hull remains were damaged in the process, and port side timbers of the boat were lost.

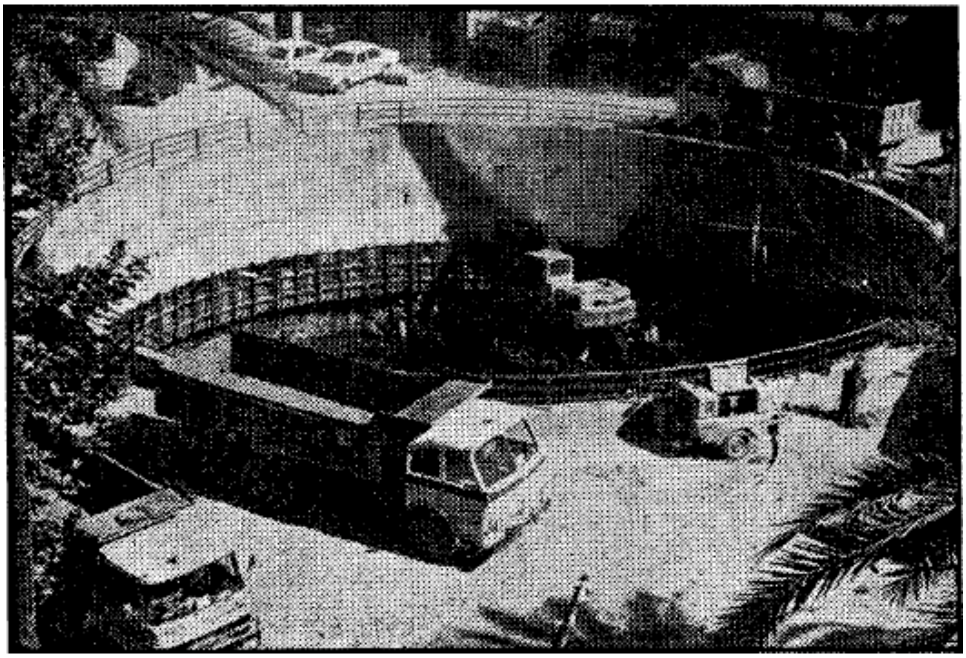


Figure 124: 1981 newspaper photograph of the tunnel pit works at Plaza Nueva. Note the crane excavator in action at the centre of the pit (*ABC Sevilla*, 4 September 1981).

Third, the particular characteristics presented by waterlogged wood were also a problem. Waterlogged wood is a particularly difficult material to deal with and complex to conserve (Grattan and Clarke, 1987). On one hand, it is very heavy due to the weight of the water contained within the wood. On the other hand, the wood is very soft and fragile due to the chemical and biological degradation processes that it has experienced (Grattan, 1987).

The sum of all these factors resulted in the destruction and loss of the boat's port side and the fore part of the vessel, before the pit was fully accessible to archaeologists (Guerrero Misa, 1984: 95). These losses can be appreciated by comparing some of the original photographs taken at the time of the retrieval (*cf* Figure 122 and Figure 123).

It should be noted and taken into consideration that this was not an archaeological excavation, but was a large and expensive public infrastructure development. The main objective was to excavate a tunnel pit, and not to recover the wooden remains of an ancient vessel. Legislation at that time (1981) did not protect cultural heritage found during public works inside urban areas, and archaeological supervision was only recommended, not required. Thus it was up to the chief engineer who directed the work to allow the archaeologists to retrieve the wooden remains. Once the surface of the pit was even and it was safe for the archaeologists to walk over it, they were given three days to retrieve the timber remains (Fernando Fernández personal field diary).

Figure 125: Archaeologists inspecting the wooden boat found at Plaza Nueva (Archaeological Museum of Seville).

Once the pit was accessible, archaeologists rushed to document the remains and to attempt recovery of some of the remaining boat timbers (Figure 125). As a result of the fragile consistency that waterlogged wood presented, and the fact that the hull remains were partially trapped underneath the reinforced concrete structure, not all of the preserved hull remains were recovered from the site (Fernando Fernández personal comment). Gerrero Misa (1984: 95) reported that the following hull remains were recovered: part of the stem and the bow timbers, part of the central axis (keelson?) and some of the frames and planks, mainly from the port side of the boat. During the retrieval of the remains, a few photographs, without a scale, were taken and one basic sketch of the ship remains was drafted. The retrieved wooden remains of the small boat were transferred and deposited in the Seville Archaeological Museum. Until the time of this DPhil research, these wooden remains had not previously been studied.

Although studies on the wooden remains from Plaza Nueva were never conducted, a bibliographical reference to the ship found at Seville appeared in 1988 in the catalogue of an exhibition called *"La Arqueología Subacuática en España"* (Museo Nacional de Arqueología Maritima y Centro Nacional de Investigaciones Arqueológicas Submarinas, 1988: 63, 166). Both, the exhibition and its published catalogue, were one of the first large scale public academic endeavours devoted to underwater archaeology in Spain. The work included several chapters on different subjects, such as the history of underwater archaeology in Spain, and underwater archaeological methods, etc. Additionally, the book included three appendices: the first of them was a directory of ancient shipwrecks found in Spain. In this directory, the discovery and retrieval of the Plaza Nueva timber remains was included and described as the "Seville Ship." The brief entry in the directory included a photograph and succinct text that indicating the location, year, and conditions of the discovery. This description identified the wooden remains of the ship as Byzantine from the sixth century AD. The cultural origin and date suggested by this catalogue were established by relating the remains of the ship to the anchor found beneath the vessel. Neither further description of the remains of the ship nor additional data to support the cultural or chronological hypothesis were offered in the publication. The report of a Byzantine shipwreck found in the western Mediterranean, on the banks of the Guadalquivir River, seemed quite an unusual and potentially very important discovery. Hence, I decided to conduct a study in order to support or dismiss the above hypothesis regarding the "Seville

Ship”, with the objective of shedding light into the characteristics, cultural affiliation, and chronology of the ship remains found at Plaza Nueva.

5.2.4 Graphic evidence and the reconstruction of the boat

When consulted for the present research, the Archaeological Museum of Seville reported that it had no record of keeping any graphical documentation on the Plaza Nueva salvage excavation. However, in 1981 at the time of the retrieval, the archaeologists took at least two photos of the boat remains, which were later published (Museo Nacional de Arqueología Maritima y Centro Nacional de Investigaciones Arqueológicas Submarinas, 1988: 63, 166). Additionally, when I first interviewed Mr Fernando Fernández Gómez in 2007, he remembered that photos were taken and should be stored somewhere at the Archaeological Museum of Seville. After, “digging” for a few days in the archives of the museum, a series of negatives from the summer of 1981 were found. These negatives, among other photographs, include the two snapshots that were published. Fortunately, these two photos were part of a series of 20 photographs that were taken that day. These original photographs are of paramount importance for reconstructing the original morphology and shape of the Plaza Nueva boat.

In addition to the photographs, one of the most valuable pieces of information is an original sketch that the archaeologist made of the timber remains at the time of the retrieval (Figure 126). Mr Fernando Fernández mentioned the existence of this sketch and emailed me a low-resolution scanned version of it in 2007. From the sketch and the original photographs, the overall dimensions of the boat, and other construction features, can be reconstructed. During the 2012 season, I had occasion to examine the original sketch for the first time. Unexpectedly, the sketch made by the archaeologists was in fact a scale-drawing on drafting paper (i.e. Mylar paper). The issue was that the sketch does not include a reference scale. Nevertheless, as happened with the photographs, after an inspection of the museum archives, I found the original 1:10 scale drawing of the boat. This is a pencil drawing made on millimetric graph paper with annotations on the timbers such as dimensions and numbering (Figure 126).

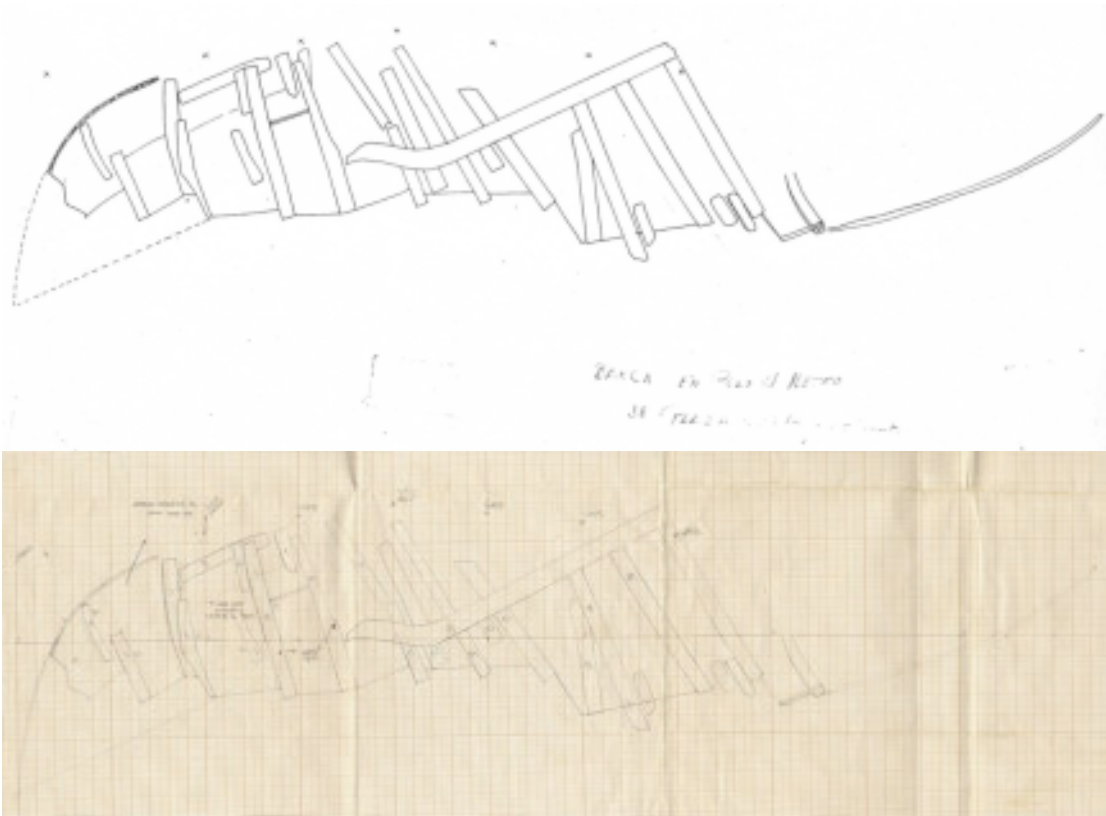


Figure 126: Original sketch of the timber remains from Plaza Nueva (top) and 1:10 scale drawing of the boat as found *in situ* (bottom) (Archaeological Museum of Seville).

Some of the original photographs (Figure 122, Figure 123 and Figure 125) show a general view of the remains at the time of the retrieval. They show the prefabricated modular frameworks used to build the reinforced concrete structure of the underground railway pit. These modular frameworks were 80 cm wide. Using these photographs, the width of the modular framework and, with the aid of the photogrammetric software Photomodeler®, the basic dimensions of the boat can be reconstructed to *circa* 7 metres in length by *circa* 2.4 metres in beam. This estimate concurs with the overall dimensions recorded on the 1:10 scale drawing of the boat made at the time of the retrieval.

5.2.4.1 Study of the Plaza Nueva wooden boat remains

The wooden remains of the boat were found in a stratum composed of successive horizontal layers of clay and fine silt (Figure 127), which allowed the preservation of the wooden remains (Grattan, 1987: 55-67). The layers of clay continued for 30 cm below the boat remains and immediately after that there was a stratum of sand and gravel (Fernando Fernández field diary), which contained the Roman amphorae (see Chapter 3).

Figure 127: Fine silt or clay still adhered to a fragment of the wood remains from the Plaza Nueva shipwreck (scale 15 cm, Author).

In 2007, I first visited the Archaeological Museum of Seville to briefly inspect the timber remains of the Plaza Nueva shipwreck during one morning. Back in 2007, there were twelve PVC storage boxes containing the timber remains (Figure 128) (Cabrera Tejedor, 2007). The Museum was then organizing and making a new inventory of its collection of over 600.000 artefacts. At that time only ten boxes were known which contained timber remains from the shipwreck deposited in the storage rooms of the Museum. The PVC boxes were originally labelled indicating the approximate area of the hull from where the timbers came.

Figure 128: Eight of the twelve PVC storage boxes containing the shipwreck remains from Plaza Nueva (Author).

In April 2012, I visited the Archaeological Museum of Seville in order to document the timber remains from the shipwreck in more detail. When the PVC boxes containing the timber remains were transported to the allocated working space, I realised that there seemed to be more boxes with material than previously expected. During the continuing organization and inventory after my first visit in 2007, more boxes had been found. At present the Museum has 19 PVC storage boxes of the timber remains from the Plaza Nueva shipwreck; hence, seven more boxes than at the first visit in 2007. It seems improbable that more boxes will appear, now that the organization and inventory of the Seville Archaeological Museum collection is close to completion, although we should not completely discard this possibility.

One of the boxes that I inspected in 2007 seemed to be missing in 2012; although some of the timbers originally kept in this "missing" PVC box were present in an "unlabelled" PVC box. I was informed that a researcher from Spain started a study of the timber remains in 2008. This researcher, after photographing a small number of them, placed them in three "unlabelled" PVC boxes. It seems that after a few days, he stopped his study and never returned to the Museum. Thus some of the timber remains, which in 2007 were inside the "missing" box, are currently kept in a different "unlabelled" PVC box. It is possible that a few timber remains that were inspected in 2007 are now missing, but this is currently difficult to verify.

The original proposal for documenting the Plaza Nueva timber remains during the 2012 season was: 1) to take photographs of all timber remains; 2) to classify, catalogue and create an inventory of them; 3) to draw some of the significant timber remains; and 4) to take samples in order to identify the different wood species present in the remains. It was planned to complete the proposal within 10 days. The unexpected presence of seven new PVC boxes of timber remains had a significant impact on the schedule and time length required for achieving the original proposal. Consequently, only stages one, two and four of the proposal were completed for the timber remains kept in the 19 PVC boxes.

The timber remains were in an extremely poor state of preservation. They were completely dried out, warped and twisted and in unclean, dusty, fragile and brittle condition. Mr Diego Oliva, Curator of the museum, explained that in 1981, when the remains were deposited, some preventive conservation measures were taken. Following the advice of a senior conservator, a large brick walled pool was built in the basement of the Museum, filled with river sand, and the timber remains were reburied in the sand pool. In this temporary container, the sand and the wooden timber remains were kept damp through the process of watering the sand with tap water on a daily basis. The idea was to keep the timbers in their current waterlogged state until they could receive conservation treatment. Unfortunately, at some point in time, the remains were not watered anymore and subsequently they dried out in an uncontrolled manner. In 2005, the remains were extracted from the sand reburial in the basement and placed into the PVC boxes that now housed them (Figure 128).

There are more than 400 pieces of the timber remains of the Plaza Nueva shipwreck currently in the museum. All the surviving timber remains were documented in 2012 by taking more than 1000 digital photographs. Both general photographs and detailed close up ones were taken, all with the aid of a metric scale (Figure 129).

The process of inspecting and documenting the remains had the objective of identifying any typological or diagnostic shipbuilding construction features that could relate them to Byzantine shipbuilding traditions from the Late Antique period in order to verify the sixth century AD chronology proposed for the boat (Museo Nacional de Arqueología Maritima y Centro Nacional de Investigaciones Arqueológicas Submarinas, 1988: 166). Accordingly, different construction features such as planks, frames, junctures, fastenings, etc. were identified, inspected, and documented.

Figure 129: One of the largest of timber remains from the Plaza Nueva shipwreck (scale 15cm, Author).

The more than 400 documented pieces were identified, classified, and catalogued in a data sheet. They can be divided into eight main groups or categories: 1) hull planking fragments; 2) framing fragments; 3) a large timber possibly from the stem 4) keelson fragments; 5) remains of the oars; 6) fragments of wooden pieces of uncertain origin; 7) iron nails used as fastenings; and 8) fragments of cylindrical wood pieces from timber piles or mooring-posts.

5.2.4.2 Wood identification of the remains of the Plaza Nueva boat

In 2013, as part of the study of the Plaza Nueva boat timber remains, 23 pieces of various wood components were sampled. The wooden samples taken for identification could be arranged in three different groups as follow:

1. Samples from clearly defined parts of the shipwreck: nine samples including planking, frames, keelson, stem?, oars and repairs.
2. Samples of unclear provenance within the timber remains of the shipwreck: five samples, one of them from a frame and another from planking.

3. Samples from the wooden post found in the Plaza Nueva salvage excavation: nine samples from the posts.

These wood samples were in a very poor state of preservation. All were very hard, and parts of them were also twisted and deformed; consequently, some of them were partly crushed when sectioned for wood identification. In early 2014 the 23 wood samples were sent to Prof Nili Liphschitz at the Institute of Archaeology, the Botanical Laboratories in Tel Aviv University (Israel) in order for her to identify the wood species of the samples.

Prof Liphschitz reported that before sectioning the wood, each sample was immersed in tap water to enable its thin sectioning. Cross, longitudinal, tangential and radial sections were made for each sample with a sharp razor blade. Identification of the wood up to the species level, based on the three-dimensional structure of the wood, was achieved by microscopic analysis of these sections. Comparison was made with reference sections prepared from systematically identified recent trees and shrubs, as well as with anatomical atlases.

The results of the identification are compiled in Tables 4 and 5. Fifteen samples out of the twenty-three studied samples could be sectioned and identified up to the species level. Seven wood samples were severely twisted and deformed and, therefore, could only be identified up to the genus level. One remaining sample could not be sectioned and, consequently, wood identification was not possible.

Wood samples from clearly defined parts of the shipwreck		
Sample #	Origin of the sample	Identified tree species
1	Planking	*Pinus sylvestris*
2	Frame with number 8	*Ulmus campestris*
3	Keelson	*Pinus halepensis*
4	Stem?	*Quercus* sp. (deformed)
5	Oar (short)	*Pinus* sp. (deformed)
6	Oar (long)	*Pinus* sp. (deformed)
7	Oar blade	*Pinus halepensis*
8	Repair timber # 1	*Abies alba*
9	Repair timber # 2	*Abies alba*
Wood samples of unclear provenience within the shipwreck's remains		
Sample #	Description of the sample	Identified tree species
1	Dark heavy wood	*Quercus* sp. (deformed)
2	Dark heavy wood	Unidentified (totally concreted)
3	Wood from a frame	*Quercus* sp. (deformed)
4	Golden brown light wood	*Pinus halepensis*
5	Wood from planking	*Pinus halepensis*

Table 4: Wood species used for the construction of the Plaza Nueva shipwreck.

Wood samples from wooden post found at the Plaza Nueva site		
Sample #	Origin of the sample	Identified tree species
1	Post #1	*Pinus* sp. (deformed)
2	Post #2	*Pinus halepensis*
3	Post #3	*Pinus halepensis*
4	Post #4	*Pinus halepensis*
5	Post #5	*Pinus halepensis*
6	Post #6	*Pinus halepensis*
7	Post #7	*Pinus* sp. (deformed)
8	Post #8	*Pinus halepensis*
9	Post #9	*Pinus* sp. (deformed)

Table 5: Wood species of the wood posts found at the Plaza Nueva site.

One sample from the planking of the boat was made of *Pinus sylvestris*. Ten other samples including the keelson, oar blade, posts and one sample from the planking were identified as *Pinus halepensis*. Two oar samples and three post samples were identified as *Pinus* sp. A sample from a frame was identified as *Ulmus campestris*. A sample from the stem and two timber remains of unknown provenance within the shipwreck's timbers (but similar in colour, density and characteristics to the wood from the stem) were identified as *Quercus* sp. Two timbers used for repairs were identified as *Abies alba*.

One of the oak samples was utterly concreted, for reasons that Prof Liphschitz was unable to explain. However, it is probable that the hardening of the wood samples was a result of their unorthodox and uncontrolled drying (*vide supra*). All wood species identified grow natively in Spain. In spite of the very few wood remains identified so far, it can be assumed that the Plaza Nueva boat was built in Spain. The construction of the boat was planned in an organised manner. Soft woods were used for the strakes of the planking (i.e. *Pinus sylvestris* and *Pinus halepensis*) and hard woods for the internal structures of the boat, that is the frames and the stem (i.e. *Ulmus campestris* and *Querqus* sp.). This selection of soft and hard woods represents a very logical assembly for hull construction of wooden boats and ships. It was common to use different species of wood as long as they had similar mechanical/material characteristics, so it is reasonable to find diverse types of pinewood used for the planking. Similar occurrence and heterogeneous use of many different types of wood have been recorded in contemporary 9th – 10th century ships found at Yenikapi (Istanbul) in the Theodosian Harbour of Constantinople (Liphschitz and Pulak, 2009; Pulak *et al.*, 2013).

5.2.5 Preliminary analysis of the timber remains of the Plaza Nueva shipwreck

The majority of the timber remains belong to the internal frames and the external hull strakes of the original vessel. At this stage, it is difficult to evaluate how much of the hull was recovered in 1981 and is now preserved in the museum. At best, it seems that less than 30% of the original hull is currently kept at the museum.

One of the first approaches that was followed in the process of identifying the timbers, was that similar diagnostic characteristics are expected to be found in any ship coming from the same cultural milieu. The seventh century *Yassi Ada* shipwreck had unpegged mortise-and-tenon joints used to align the planks until the planks could be secured to the frames (Steffy, 1994: 80). This type of construction was typical in the Eastern Mediterranean during Late Antiquity and very predominant in the Byzantine tradition. Therefore, the timber remains of the Plaza Nueva shipwreck were inspected to search for similar construction diagnostic features. Based on their size, at first glance it was evident that the wooden remains probably belonged to a small boat rather than to a seagoing ship coming from Byzantium. The average thickness of the planking remains from the Plaza Nueva shipwreck is less than 2 cm. This thickness provides limited space to make mortises in which tenons are placed. In fact, after inspecting all the timber remains, no traces of mortises or tenons were found. Thus, the first impression was that the boat seemed to belong to a different shipbuilding tradition than the Late Antique/Byzantine. However, this impression has to be treated with caution because small boats are often built following local methods and, therefore, they do not always follow mainstream shipbuilding traditions. For example, although nowadays almost all ships are constructed from steel, fibreglass or composites, many small boats are still made with wood following traditional methods.

5.2.5.1 Internal structure of the Plaza Nueva shipwreck

The internal frames provide structural stability to the hull and the external planking is attached to the frames to complete the construction. Based on the timber remains kept at the museum, it is possible to estimate that less than 30% of the original frames are preserved. The preserved timber remains seem to be mainly fragments from the original frames. Only one small frame appears to be preserved in one piece, and seems to have originally been placed at the end of the hull.

The surviving frames are in an extremely poor state of preservation being severely fragmented and warped. Wood identification analysis concluded that the frames were made of elm and possibly oak wood (i.e. *Ulmus campestris* and *Quercus* sp.) (*vide supra*). Despite their highly degraded state, it was possible to observe that the frames were originally square in section. Central frames were around 10 cm thick sided and moulded (*vide supra* Figure 125), whereas smaller frame timbers, of about 6 cm thick, were used as futtocks and towards the bow.

All the preserved frame fragments are smaller than 50 cm in length, and they all seem to have been straight originally (i.e. not curved). Based on observations of the remains, it seems that each frame was composed of two half-frames placed transversely to the centreline of the boat or longitudinal axis; then, each half-frame seems to have been extended upwards with futtocks on each side creating an angular hard chine in the hull at about 115°. It is difficult to assert the original lengths of the frames. Taking into account the preserved remains and the sketch of the boat (*vide supra*), it could be estimated that all frame timbers were smaller than 100 cm in length. Therefore, the maximum beam of the boat amidships seems to have been no larger than 2.4 metres.

The remains of the frames had limber holes allowing water to freely move in the bilge (Figure 130). The limber holes are square in shape and are *circa* 2 cm wide and 2 cm high. Probably each frame originally had two to four limber holes in it. It is complex to establish how many frames the boat once had. In the photographs taken at the time of the salvage, at least seven evenly distributed frames can be clearly distinguished from one end of the boat to amidships (see Figure 122 and Figure 125). In addition, at least ten frames were documented in the original sketch (*vide supra*) that the archaeologists made at the time of the retrieval (Figure 126). Therefore, the total number of frames was more than 10 and probably less than 24.

Figure 130: One frame fragment with a square limber hole (scale 15 cm, Author).

Remains of a keelson were found among the timbers from the Plaza Nueva shipwreck. It is also clearly recognizable in the original photographs (Figure 122, Figure 123 and Figure 125) and the sketch made by the archaeologist (Figure 126). A keelson is an internal longitudinal timber, mounted atop the frames along the centreline of the boat, which provides additional longitudinal strength to the bottom of the hull. It acted as an internal keel (Steffy, 1994: 274). The keelson was originally made of one half of a long tree trunk of pine (i.e. *Pinus halepensis*) (*vide supra*) roughly worked and from which only the bark and the branches were crudely removed. However, the keelson, as for the other boat timbers, is now divided into several fragments. Mr Fernando Fernández annotated in his field diary that the empty spaces between frames directly underneath the keelson were "reinforced with stones". These stones, noted by the archaeologist, were probably a sort of ballast installed in the bilge with the aim of providing stability to the boat.

There is one large piece of wood that is difficult to identify because, in its present condition, it seems not to have any fastening or working marks which would allow for its accurate classification. It is a curved heavy timber about 50 cm long with a square or trapezoidal section, of about 10 cm sided by 20 cm moulded, with butted ends (Figure 131).

Figure 131: The largest timber found in the 1981 salvage excavation at Plaza Nueva (scale 15 cm, Author).

This large piece of wood is in an extremely desiccated condition and somehow brittle. The wood is dark tan brown, greyish in colour, extremely dense and hard, and thus very heavy in weight. Wood species identification analysis concluded that this timber was made of oak wood (*Quercus* sp.) (*vide supra*).

It presents biological attacks (i.e. pitting) compatible with wood that has been underwater for extended periods of time, so could have been part of a boat or ship. Its overall dimensions are somewhat different from the other surviving timber remains from the Plaza Nueva Shipwreck. Because of its curved shape, it would be possible to, tentatively, identity this timber as the remains of the stem of a boat. However, the complete lack of fastening marks (holes from iron nails) on the timber's surface make it impossible to confirm this hypothesis.

There is also another possibility. Mr Fernando Fernández, annotated in his excavation field diary of the works the following: *"At this depth (i.e. 10 m) a complete rib from a boat, made of oak, is found"*. This timber, described as a "complete rib (i.e. frame) made of oak", was found at 10 metres of depth days before the Plaza Nueva boat was discovered at 11 metres. It is possible, therefore, to suggest that the curved timber kept at the museum is the oak frame found at 10 metres of depth. Taking into account the size and characteristics of the other timber remains from the boat, it seems that this large curved timber could indeed be the piece described by Mr Fernando Fernández and, consequently, may not be related to the boat.

Because of its curved shape and overall dimensions, it is very likely that this wood timber is related to naval construction, albeit it seems that it was never used due to the lack of fastening marks on it. Thus, it would attest for shipbuilding practices in the port of Seville, which were common through the ages. A radiocarbon dating analysis of the timber could shed light on the historical period to which it belongs.

5.2.5.2 Hull planking of the Plaza Nueva shipwreck

The planking of the boat was constructed with at least two types of pine wood (i.e. *Pinus sylvestris* and *Pinus halepensis*). The construction details present on the fragments attest that the hull was carvel built which is a method of constructing wooden boats in which the planks are lying flush or edge-to-edge. Several planks in line create a strip of planking called strake, which runs longitudinally along the side of the vessel. The strakes run horizontally one above the other. They run on each side of the ship from the point where the keel and first strake (i.e. garboard) join, to the top strake of the hull (i.e. sheer-plank) from one end of the vessel to the other (i.e. from bow to stern).

The planks were fastened to the internal frames with numerous wrought iron nails driven from the exterior of the hull (Figure 132). The planks forming the strakes were fastened to internal frames so that the planks gained support from the frames. Only wrought iron nails were found within the boat remains, there were no dowels, mortises-and-tenon, treenails, or bolts; it seems, therefore, that wrought iron nails were the only fastener used in the construction of the boat.

Figure 132: Top face of the frame with “red number 8” (top), and the lower face of the same frame (bottom). Note the numerous holes left by iron nails (scale 15 cm, Author).

All the iron nails that were found have a square body section with a circular rounded head. The length of the nails ranges from small ones of *circa* 2 to 4 cm to larger ones from *circa* 7 cm up to *circa* 15 cm (Figure 133).

Figure 133: The remains of five iron nails from the Plaza Nueva shipwreck (scale 15 cm, Author).

It was observed that the width of the planks range from *circa* 15 cm to *circa* 30 cm and that wider planks are located in the upper most strakes of the hull. They present thicknesses smaller than 2 cm. Many fragments from the planking of the hull have survived and their size ranges from small fragments (i.e. few centimetres in length) to the largest, which belongs to an uppermost strake of the hull of approximately 150 by 30 centimetres in size (*vide supra* Figure 129).

Among the surviving planking remains, two types of scarfs were documented. A scarf is an overlapping joint used to connect two timbers or planks without increasing their dimensions (Steffy, 1994: 279). Butt joints seem to have been used to connect planks from the same strake (Figure 134).

Figure 134: End of one plank salvaged from the boat at Plaza Nueva, with a butt scarf. Note that pitch has only been applied over the joint with nails (scale 15 cm, Author).

However, among the timbers at the museum there is a plank with a flat scarf whose diagonal end was nibbed or cut off (Figure 135). These planks are located near the bow or stern, and are nibbed with the aim of accommodating several rows of strakes within the decreasing hull surface area. This timber attests that the bottom of the hull, possibly, rocketed towards the bow and also that this end of the hull was curved. The *in situ* drawings of the hull made by the archaeologists at the time of the retrieval (*vide supra*) documented how the end of the hull was curved towards the bow (Figure 126), thus supporting the evidence provided by the plank with the nibbed flat scarf.

Figure 135: End of one plank salvaged from the boat at Plaza Nueva, with a flat scarf that was nibbed (scale 15 cm, Author).

Carvel planking construction requires caulking between the joints. Caulking is the combination of a filler and sealant substance that is used in building and repairing wooden boats. The purpose of the caulking is to make the hull as watertight as possible. In antiquity, organic fibres such as hemp or animal fur were used to make the filler. For caulking a hull, the fibres are driven into the seams between planks with the aid of a broad chisel-like tool called a “caulking iron” and a mallet. The fibres are then covered over with burned pine resin or pitch, in a process referred to as paying. The Plaza Nueva shipwreck seems to have been caulked with organic vegetal fibres and pitch (Figure 136).

Figure 136: The remains of caulking material on the lower edge of a timber from the Plaza Nueva shipwreck (scale 15cm, Author).

The pitch seems to have been applied only to the external surface of the hull and not inboard. The external surface of the hull, corresponding to the draught (i.e. area of the external hull which remains underwater at all times), was completely covered with pitch (Figure 137). However, for the external parts of the hull corresponding to the freeboard (i.e. area which remains above the water at all times), only the seams between the planks were covered with pitch.

Figure 137: The remains of abundant pitch (ochre layer) covering the external surface of a fragmented and warped plank from the Plaza Nueva shipwreck (scale 15cm, Author).

This peculiar way of applying pitch to the external surface of the hull by completely covering the area corresponding to the draught but only the seams of the freeboard area was still being used in Guadalquivir River during the 1980s by traditional wooden boat shipwrights of Coria del Río (Fernández de Paz, 1991: 199-205, figs. 40-45, 56).

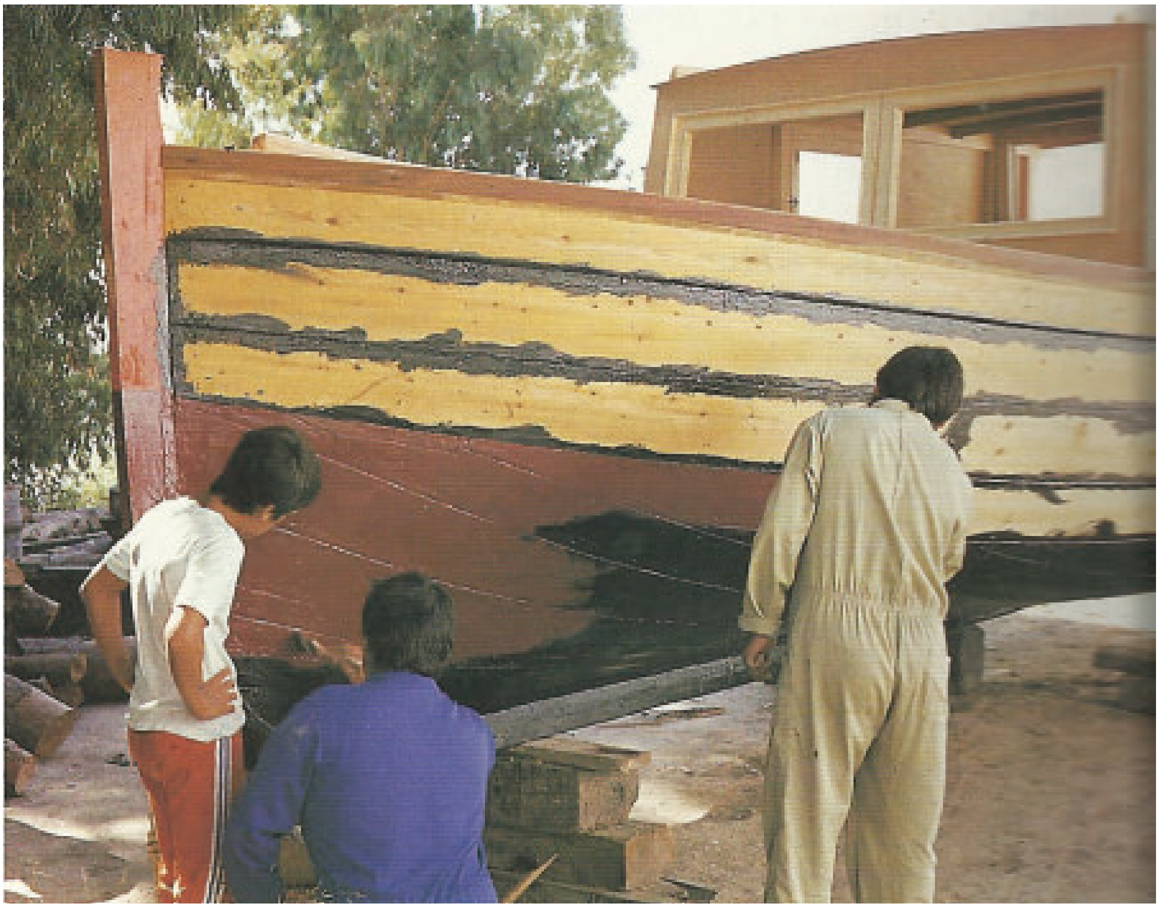


Figure 138: Construction process of a traditional wooden ship at Coria del Río in the 1980s. The shipwrights are starting to paint the hull in a red brown colour, note that the pitch protection (black) has been previously applied, completely covering the area corresponding to the draught (lower area of the hull) but only the seams of the freeboard area (after Fernández de Paz, 1991: fig. 56).

5.2.5.3 Construction of the boat and building sequence

The small thickness of the planking, the size and lengths of the nails, and the fact that no treenails or bolts were found, all support the hypothesis that the wooden remains belong to a boat rather than a ship. The preserved evidence suggests that the boat found at Plaza Nueva had carvel planks that were fastened to the frames with iron nails driven from the exterior of the hull. A keelson was then nailed longitudinally on top of the frames. There seems to be no evidence for the existence of a keel on the boat; it is not mentioned in the reports, it is not observable in the photographs, and it was not drawn on the sketch. Consequently, it seems that the boat did not have a keel. In other words, based on the preserved evidence it seems that the wooden remains from Plaza Nueva belong to a flat-bottomed boat, which was probably built following a bottom-based construction (see Chapter 3 and McGrail, 1995). Evidence from the preserved planks of the boat as well as from the *in situ* drawing, seem to indicate that the boat had curved ends. The preserved timber remains show a rather rudimentary construction. Nevertheless, the exact or complete sequence used to build this boat is difficult to ascertain at this stage, and further research should be conducted to offer a sound hypothesis.

5.2.5.4 Propulsion system of the boat and other findings

No remains of a mast step, mast, or any rigging element were found, reported or documented at the time of the retrieval in 1981. However, during the inspection of the wooden remains that I conducted in 2012, the remains of what are probably the handles of two oars, and remains of the blade of one of them, were found (Figure 139). These timbers were probably inside the hull of the boat at the time of its retrieval. The unexpected presence of what appear to be the remains of two oars was a nice surprise for the research that, as we will see, has significant implications.

Figure 139: The remains of what seems to be the handles of two oars (top) and remains of one oar's blade (scale 15 cm, Author).

The wood of the oars is in an extremely desiccated condition; it is light in weight, very brittle, and has a dark brown colour. Samples from these three timber remains were analysed in order to identify the species of the wood. The analysis concluded that all three samples were made of pine wood: the blade of *Pinus halepensis* and the two oars of *Pinus* sp. The two handles are the end part of the oar that the oarsman holds while rowing (Figure 139), and they served as the propulsion and steering system for the boat. Since no remains of mast or rigging element were found (that would have indicated the use of a sail for propelling the boat), it seems that the only propulsion system used were the two oars.

In addition to the oars, Mr Fernando Fernández, annotated the following in his works field diary: *"(...) amid the mud in between the frames of the boat the stone of a peach is found"*. The unexpected presence of what seem to be the remains of oars and the stone of a peach, as we will see, has significant implications in relation to how the boat was lost.

5.2.6 Remains of wooden posts or piles

We have seen that within the timbers kept at the museum, there are remains of more than 20 large wooden cylindrical pieces among which the remains of at least nine distinguishable cylindrical wooden piles are present. They are poorly worked and seem too thick and heavy to have been any structural part of the Plaza Nueva boat, thus they are not part its structural design. Wood identification analysis concluded that they were made of pine wood; some were identified as *Pinus alepensis* whereas others only as *Pinus* sp. (*vide supra*). Because of their reduced length and the white residue on their ends, it seems that some of these posts were probably pile foundations for buildings or other structures of the ancient port of Hispalis during the Roman era (see Chapter 3).

The only post preserved completely is *circa* 75 cm long. *A priori*, due to its short length it seems unlikely that these posts were used as mooring-posts, to which vessels, such as the Plaza Nueva boat, could have been moored. However, this possibility should not be completely discarded since half of the surviving posts are severely fragmented and it is possible that parts of the posts were lost. In this regard, radiocarbon dating analysis of each post was proposed with the aim of obtaining a chronology for them, but lack of funding has not allowed this thus far. To offer a more definitive hypothesis about the original function and use of the wooden posts found at Plaza Nueva, further radiocarbon analysis and research should be conducted.

5.2.7 Chronology of the Plaza Nueva boat: results of the radiocarbon analysis

Despite the association that earlier publications made (Museo Nacional de Arqueología Maritima y Centro Nacional de Investigaciones Arqueológicas Submarinas, 1988: 63, 166), it stands to reason that the iron anchor of *circa* 2 metres in length found at Plaza Nueva (see Chapter 4) could not belong to the wooden boat since this was *circa* 7 metres in length. Therefore, among other evidence aforementioned, the boat remains are not related to the anchor (apart from the fact that they were found in the same pit) and they most likely belong to different historical periods (Cabrera Tejedor, 2013, 2014, 2016; 2017; forthcoming).

With the objective of determining the historical period to which the boat belongs, radiocarbon dating analysis was conducted (Cabrera Tejedor, 2013: 523; 2014: 243). One sample was extracted from the wooden remains of the boat discovered at Plaza Nueva. This selection of the sample was made with caution since ships and boats often contain repairs made with timbers that were reused from other boats or felled after the construction of the craft. Consequently, the collected sample for radiocarbon dating analysis was taken from the keelson, one of the main original structural pieces of the boat, which did not seem to be a repair or reused piece. Additionally, the timber of the keelson was chosen because originally it was made of a tree trunk roughly worked where only the bark and the branches were crudely removed (*vide supra*). Finally, the wood sample was taken from the outer rings of the original tree trunk (directly beneath the bark) with the aim of obtaining a radiocarbon dating close to the date when the wood was felled and the boat was built (Figure 140).

Figure 140: Fragment of the keelson. Note that this was originally made out of a tree trunk roughly worked and only the bark and the branches crudely removed (scale 15 cm, Author).

The sample was taken for radiocarbon dating analysis at the Oxford Radiocarbon Accelerator Unit (ORAU) of the University of Oxford. The result was received in December 2012, and gave dates with 12.6% probability of 898-920 calAD and 82.8% probability of 947-1023 calAD (Figure 141).

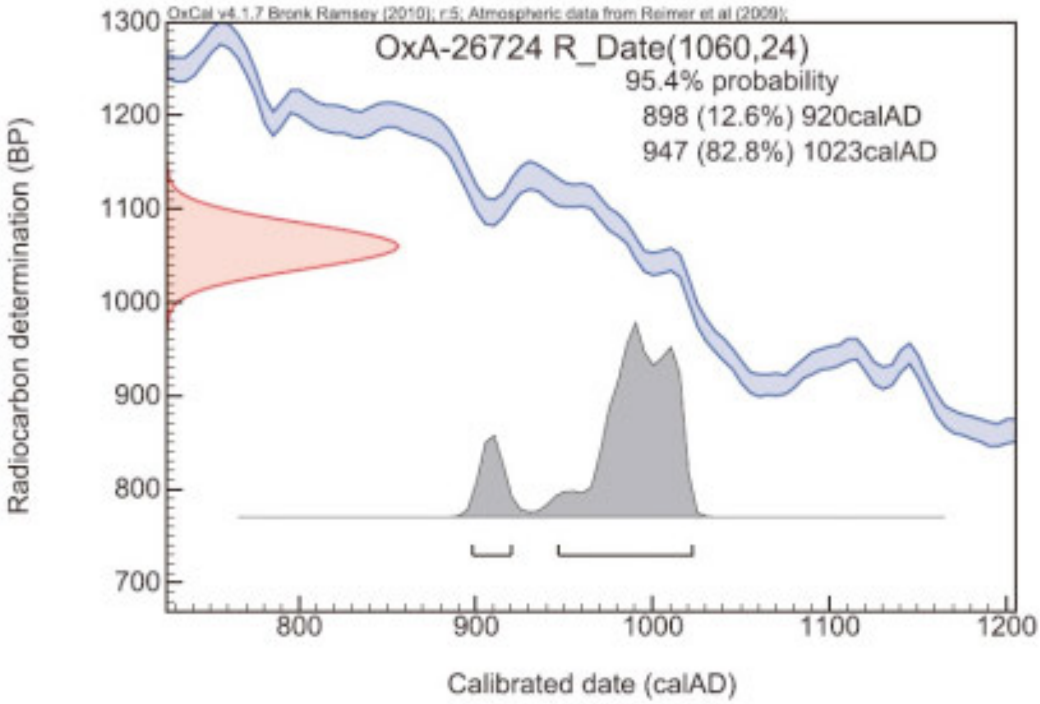


Figure 141: Radiocarbon dating analysis results from one sample of the Plaza Nueva shipwreck.

Further radiocarbon dating analysis should be conducted in order to obtain a more precise date, but lack of funding has not allowed this thus far. Nevertheless, taking into account the statistical distribution of the results, they indicate that there is a 95.4% probability that the boat was constructed and used during the second half of the 10th century or the first quarter of the 11th century, and that it probably belongs to the period of the Caliphate of Córdoba (AD 929 to 1031). The fact that pottery sherds from the Islamic period appeared in the same stratum where the ship was found (Fernández Gómez, 2007: 168) would support this chronology. The results oppose and dismiss the previous hypothesis that described the "Seville Boat" as Byzantine from the sixth century AD (Museo Nacional de Arqueología Maritima y Centro Nacional de Investigaciones Arqueológicas Submarinas, 1988: 63, 166).

These results respect the *terminus ante quem* for the existence and navigability of the ancient riverbed of the Guadalquivir in the year 1022, suggested by the presence of a necropolis in the Plaza Nueva (Lévi-Provençal, 1931: 43-46). Consequently, based on the preliminary results of radiocarbon dating analysis, it seems that the boat found at Plaza Nueva was lost during the last period of use of that anchorage area; probably during the last decades in which the ancient riverbed of the Guadalquivir was navigable.

5.2.8 Boat design, operational environment and function of the Plaza Nueva boat

The preliminary analysis that presented above is the result of a 10 day inspection and partial documentation of the boat remains, since archaeological drawings and detailed measurements were not completed due to time constraints (*vide supra*). Accordingly, a future detailed and complete documentation of all the timbers, as well as a subsequent study of the remains of the Plaza Nueva boat, would potentially provide more information about this riverine craft.

Nevertheless, following the preliminary analysis of the boat remains, some observations can be made. Thanks to the 1:10 scale drawing made at the time of the retrieval (Figure 126) and several original photographs taken on the same occasion, the overall measurements of the boat can be reconstructed to at least *circa* 7 metres in length by *circa* 2.4 m in beam. The preserved timber remains suggest that the Plaza Nueva boat was flat-bottomed and had a rudimentary, but effective, construction. Evidence from the preserved planks of the boat, as well as from the *in situ* drawing, seems to indicate that the boat had a rounded bow.

The discovery of two oars, and the lack of any other remains of mast or rigging, suggests that oars were the only propulsion and steering system of the boat. The lack of a sail as a propulsion system seems to indicate that the boat was not used for maritime navigation or large-scale fishing, but rather for locally riverine-based operations. The scarce surviving remains and their highly degraded state of preservation made it very difficult to further describe the original boat.

Diagnostic factors of the wooden remains, such as their relatively small size, the lack of mortises and tenons, and the presence of iron nails, suggest that the boat probably belonged to a shipbuilding tradition different from the Late Antique/Byzantine. This was confirmed by radiocarbon analysis, which gave a chronology to the boat of the second half of the 10th century or the first quarter of the 11th century. It is probable, therefore, that the boat was built locally according to the local shipbuilding traditions of its milieu. Despite the fact that the wooden remains seem to come from a local boat and not to belong to the Byzantine period, they are still very important remains. For one thing, they are the only known remains from a shipwreck from any historical period preserved in Seville. Additionally, little is known regarding Islamic or early medieval shipbuilding. Knowledge regarding riverine boats during these periods is practically non-existent.

Based on the preliminary study, the Plaza Nueva shipwreck was probably a flat-bottomed boat used to carry people, animals, or goods from larger ships, anchored in the Guadalquivir River, to the port facilities on the shores of Seville or to cross the river from one bank to another (Cabrera Tejedor, 2013: 521; 2014: 243; 2017; forthcoming). This type of multipurpose boat could be referred to as a lighter or tender boat.

The Arabic word to designate this type of lighter boat is *qārib* from the Greek term *kárabo*, from which the Spanish word *cárabo* derives (Lirola Delgado, 1993: 336-337). If the boat was slightly larger than a lighter it could have been a *zawraq* (Lirola Delgado, 1993: 341), medium sized boat that in Spanish is known as *barca*. In the *Hisba* treatise on the city of Seville, written by Ibn ʿAbdūn at the beginning of the 12th century, the safe use of boats on the river is described. According to the treatise, boats should never have been overloaded as that would risk the lives of the passengers. To achieve this there should always be two boats on each pier. Boatmen should not be allowed to carry stolen goods, thieves or people with the intention of drinking wine. It was also forbidden for the boatmen to force the passengers to row since the latter are paying for a service (Ibn ʿAbdūn, ed. García Gómez and Lévi-Provençal, 1981: 101-103, 147).

It seems that the Plaza Nueva shipwreck was probably a flat-bottomed multipurpose boat and these boats in Seville were built locally as shown in engravings and pictures from the early 17th century (Figure 142). On the Guadalquivir River, boatmen used flat-bottomed boats propelled by two oars, very similar in design and proportions to the one found at Plaza Nueva, from Roman times until the last decades of the 20th century (Figure 143 and Figure 144).

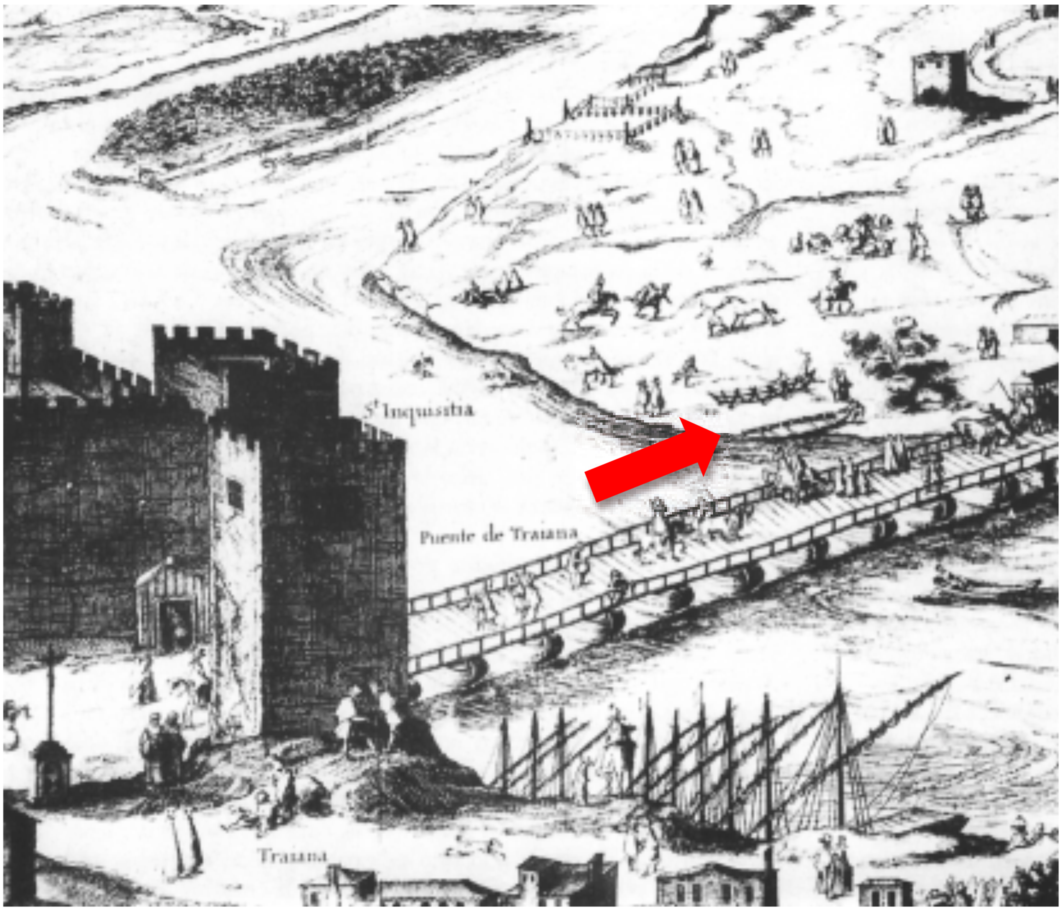


Figure 142: Flat bottomed boats being built at Seville as depicted in a 1617 engraving (after Aa.Vv., 1985: 44).

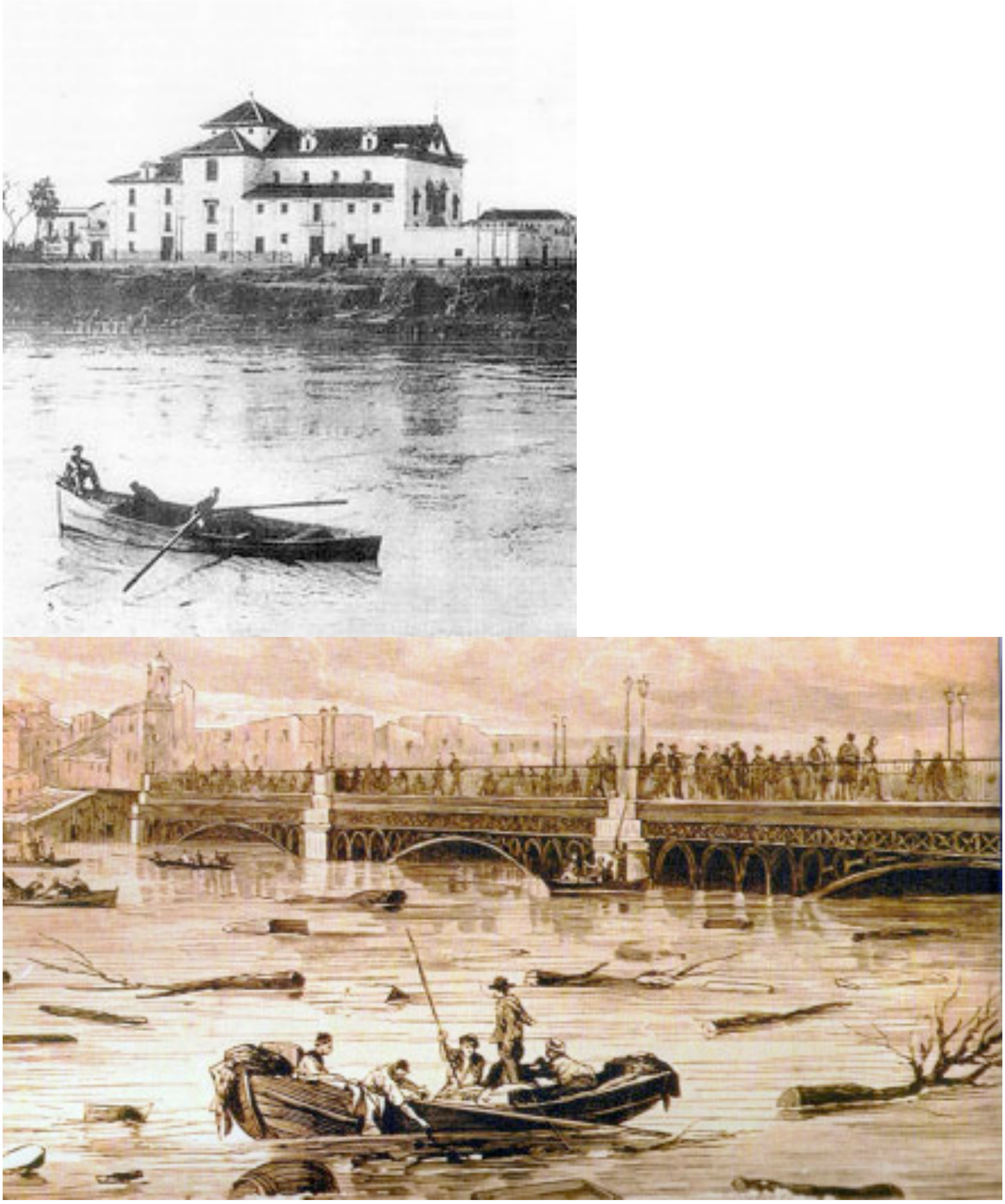


Figure 143: Two images of traditional flat bottomed boats at Seville during the last decades of the 19th century (after AA.VV., 1985).

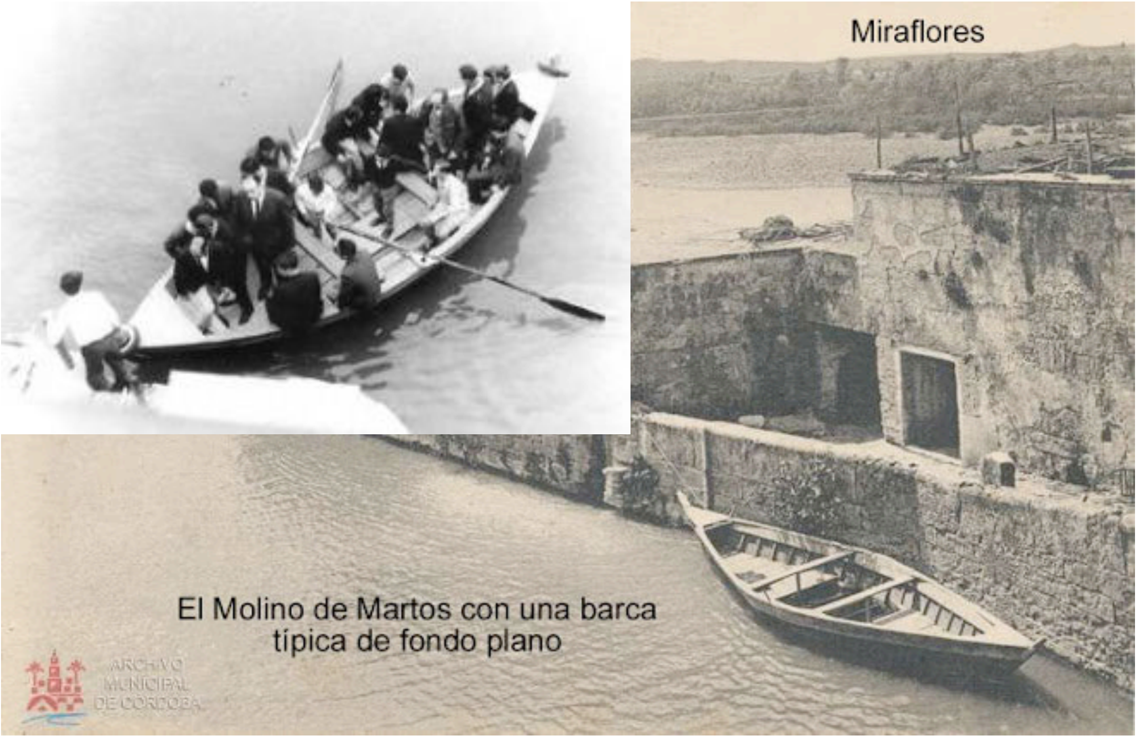


Figure 144: Two images of traditional flat bottomed boats at Cordoba used on the Guadalquivir River until the last decades of the 20th century (Archivo Municipal de Córdova).

The presence of the original oars within the boat remains, as well as finding the stone of a peach (possible remains of a snack consumed by the boatman), suggest that the boat was not intentionally abandoned or scuttled. On the contrary, it seems that the boat suffered some sort of unexpected sudden wreckage. Therefore, the remains found at Plaza Nueva seem not to be a derelict vessel but a shipwreck (Richards, 2008). The wreckage probably resulted from an unforeseen incident of severe weather, such as a big storm/s and the subsequent flash flooding of the Guadalquivir River. This hypothesis is supported by the nature of the stratum in which the boat was found, since it was composed by fine silt or clay (*vide supra* Figure 127).

There are, at least, two other archaeological examples of riverboats lost due to an unforeseen incident (e.g. flash flood) while at berth. First, some of the Roman period ships found at Pisa (Bruni, 2000; Camilli, 2002; Camilli *et al.*, 2005; 2006a; 2006b). Second, the Arles 3 shipwreck, a 1st century AD barge that sank right at the place where it was moored to a quay of the right bank of the River Rhône at Roman Arelate (Marlier, 2014: 264-265, 289).

5.2.9 Reconstructing the stratigraphy of the Plaza Nueva excavation

As noted by Ménanteau (2008: 61), on the façade of Seville's City Hall located at the east end of Plaza Nueva, there is plaque indicating the absolute height above sea level (Figure 145). The National Geographical and Statistical Institute of Spain placed this plaque, along with many others in different cities of Spain, at the end of the 19th century, when the 0 metres height ordinance datum of the mean sea level for Spain was established in Alicante (where sea level fluctuations from tides are the smallest). The plaque on Seville's City Hall is placed at 9.10 metres above the 0 metres height ordnance datum at Alicante. The plaque is about 1.60 metres from the ground level of the Plaza Nueva Square. Consequently, the ground level of the square can be estimated to be about 7.50 metres above the mean sea level.

Figure 145: The plaque on Seville's City Hall is placed at 9.10 metres above the 0 metres height ordinance datum at Alicante (Sevilla en Ruta).

The wooden boat discovered at Plaza Nueva in 1981 was found at 11 metres of depth (Guerrero Misa, 1984: 95). If we take into account the current height of the ground at Plaza Nueva (7.50 metres above the mean sea level), it can be estimated that the wooden boat was found *circa* 3.5 metres below mean sea level. However, the wooden boat was found 11 metres below the "0 metres" level of the excavation work. We do not know, however, where exactly the "0 metres" level of the construction works was positioned by the civil engineers of the works, nor its precise height with respect to mean sea level.

We can compare the information that we have about the works at Plaza Nueva in 1981 with other geo-archaeological data from the same area. The geologist Francisco Borja Barrera bored a 6 metre deep core in the Plaza Nueva reaching 1.50 metres above mean sea level (Borja Barrera, 2014: 302 fig. 17). This documented the different strata found within the bore sample (Figure 146).

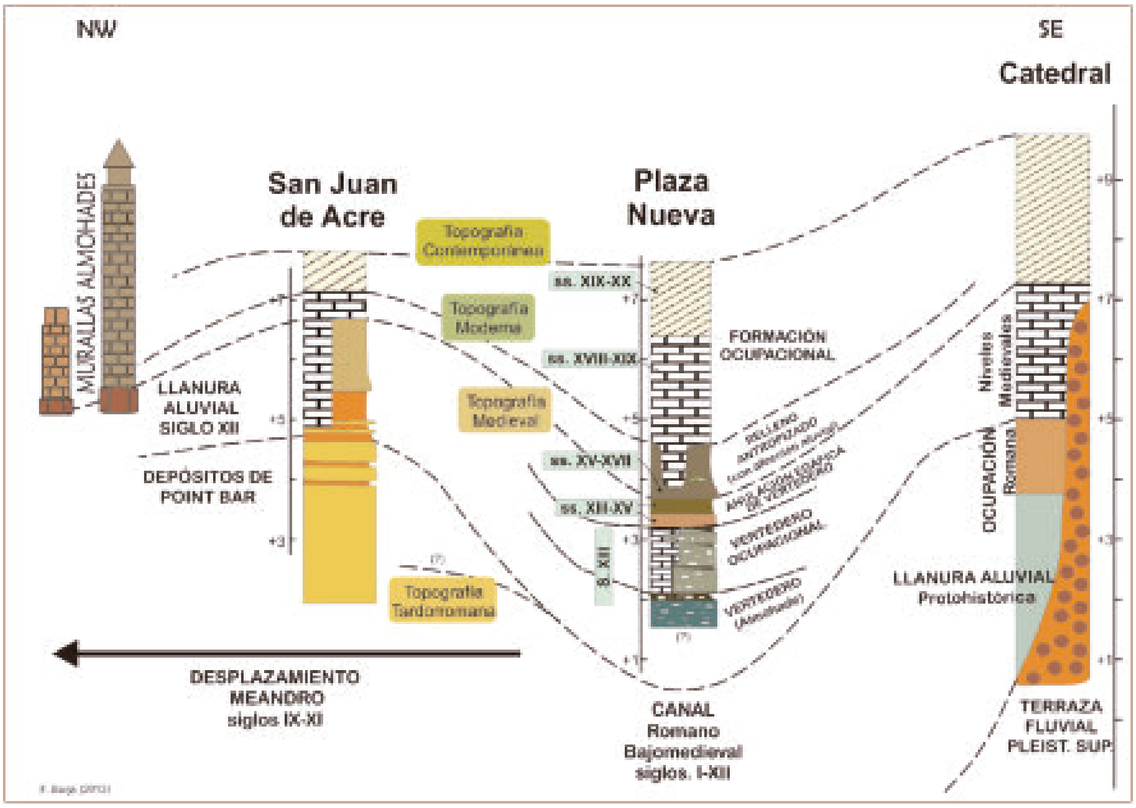


Figure 146: Diagram of three vertical sections in Seville. The section in the centre belongs to Plaza Nueva (after Borja Barrera, 2014: 302 fig. 17).

The core sample attested the existence of a landfill made of ceramic waste from the Almohad period that started at a level 2 metres above mean sea level. This stratum of Almohad ceramic waste, continued to a depth of at least another 50 cm to 1.50 metres above mean sea level, where the core ended (Figure 146). From Mr Fernando Fernández's field diary of the excavation at Plaza Nueva in 1981, as well as from the labels that accompany the ceramic sherds found at the Museum (see Appendix), we know that the Almohad pottery stratum started to be found at a depth of 8 metres from the “0 metres” level of the excavation works.

We know from the bore core sample that the Almohad ceramic waste stratum started at about 2 metres above mean sea level; we also know that in 1981 the same Almohad pottery stratum was found at about “8 metres of depth” (from the unknown position of the “0 metres” level of the excavation works). 2 metres above mean sea level plus “8 metres of depth” equals 10 metres above mean sea level: that is, the “0 metres” level of the excavation works of 1981 was placed by the civil engineers of the works approximately 10 metres above mean sea level. Since ground level at Plaza Nueva is 7.50 metres above mean sea level, the “0 metres” level of the excavation works was approximately 2.5 metres above the ground surface.

With that information we can now re-estimate the depths where the finds were discovered. The wooden boat discovered at Plaza Nueva in 1981, reported to be found at a depth of 11 metres (Guerrero Misa, 1984: 95; Fernández Gómez, 2007), was discovered at approximately minus 1 metre below mean sea level. Similarly, the iron anchor, reported to be found at a depth of 15 metres, was discovered approximately at minus 5 metres below mean sea level. Considering that the water surface of the river is about 1.5 metres above mean sea level, these would correspond to approximate depths of 2.50 and 6.50 metres respectively. These two depths correspond better to a boat that was probably lost moored on the riverbank, and with the depth of the ancient channel of the Guadalquivir River where a ship deployed the iron anchor which was later lost. Taking into account this reconstruction of absolute depths, in addition to the archaeological information, the field notes from Fernando Fernández, and the bore samples from Francisco Borja Barrera, we can now reconstruct the approximate stratigraphy of the 1981 Plaza Nueva excavation (Figure 147).

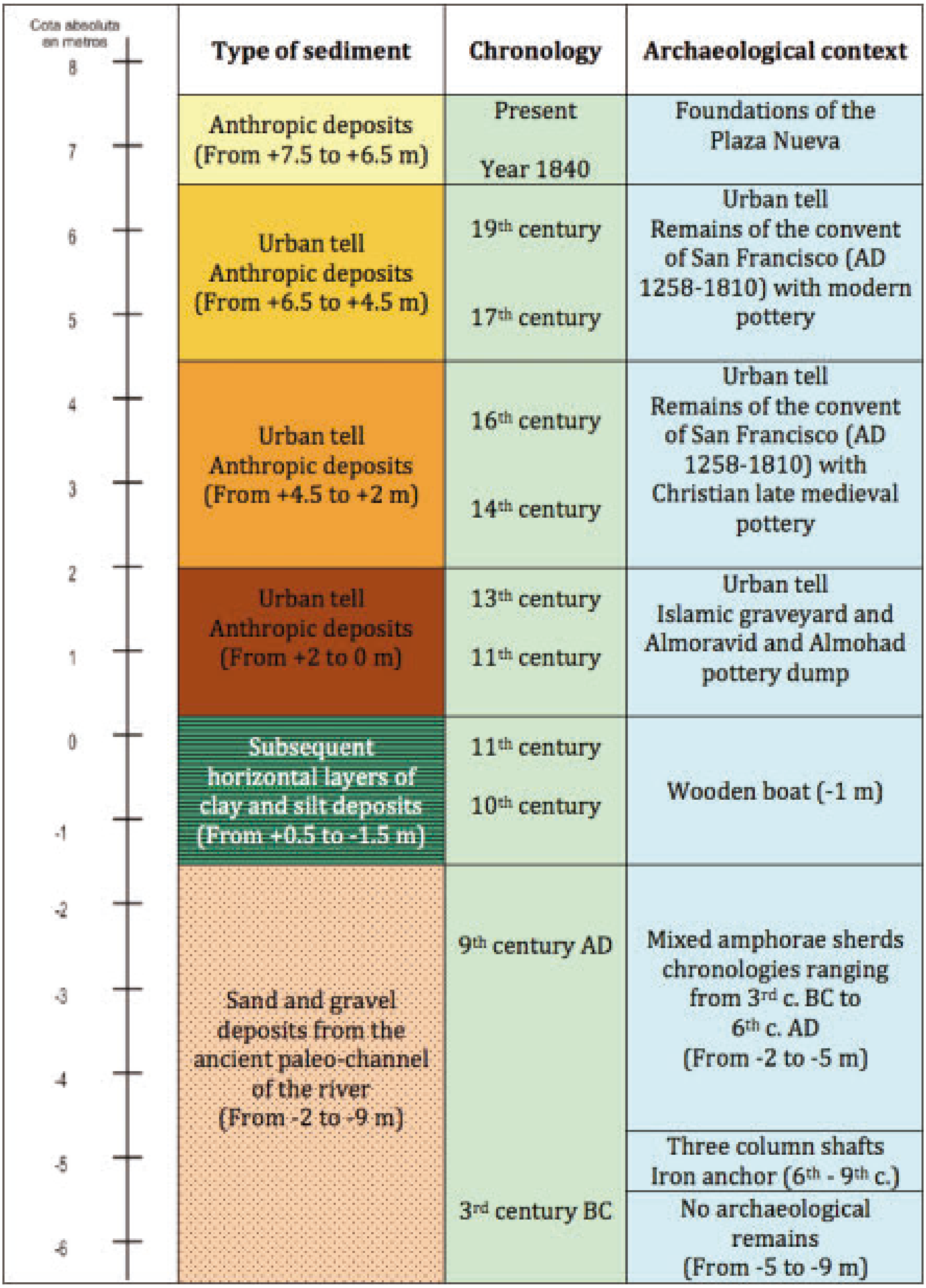


Figure 147: Reconstruction of the approximate stratigraphy of the 1981 Plaza Nueva excavation (Author).

5.3 The *al-wādi al-kabīr* during the Islamic period

Based on historical chronicles of the period, archaeological data, palaeo-geomorphological records, and palaeo-environmental studies of the Iberian Peninsula, this section will discuss climatic events that probably had an impact on the history and development of the Guadalquivir River in Seville during the Islamic period. It will be proposed and argued that these climatic events were so severe that they produced the displacement of the meander of Seville, leading to the disappearance of the ancient port of Seville.

5.3.1 The historical record

The hydrological cycle of the Guadalquivir River is characterised by violent and regular rises. The majority of these happen during the cold months of the year, especially in December, January, February and March. The volume of flow of the river increases rapidly in December reaching its maximum in March, followed by a rapid decrease of the flow in April. The years in which the river rises or great floods occurred tend to cluster in periods that are directly related to the frequency of intense rainfall in Seville (Ménanteau and Vanney, 1985: 119).

One of the characteristics of the Lower Guadalquivir is the large occurrence of floods greater than 5,000 m^3/sec. The frequency of floods in the Guadalquivir River varies according to the season and the time period being considered. Floods could be classified in three categories according to the peak discharge of the river during the inundation: millennial floods, with a peak discharge of about 12,000 m^3/sec reaching heights of 11 to 12 m above mean sea level; centennial floods, with a peak discharge of about 9,800 m^3/sec reaching heights of 10 m above mean sea level; and decennial floods, with a estimated peak discharge of about 4,800 m^3/sec (Ménanteau and Vanney, 1985: 120).

Accordingly, one of the oldest sources of information for studying the hydro-morphology transformations that the Guadalquivir River underwent during its past are the historical chronicles that recorded significant floods. In the late 19th century, a prominent historian from Seville, Mr Francisco de Borja Palomo (1878), compiled all the available historical accounts of historical floods in the Guadalquivir River in an exceptional work entitled *"Historia crítica de las riadas o grandes avenidas del Guadalquivir en Sevilla desde su Reconquista hasta nuestros días"*[56]. However, this work compiled all the available historical information written in Spanish by Spanish chroniclers from 1248 onwards; consequently, the Islamic period was not covered.

It was not until the 20th century that scholars started to translate Islamic Chronicles from the time of the Islamic period in Spain. The chronicler from Cordoba, Ahmad ibn Muhammad al-Rāzī, described the "great river" or *al-wādi al-kabīr* (i.e. Guadalquivir River) *"it is calm in its gentle flow, and its inundations cause little damage at its origin. On the contrary, in Seville it causes much more damage when its water flow increases with the rains... "* (al-Rāzī's description found in Maqqarī, *Analectes*, vol. I, ed. Dozy 1855: 313-314, cited in Cabrera Muñoz, 2008: 203).

[56] Critical history of the river rises or great floods of the Guadalquivir in Seville from its Reconquista until the present day (translation of the title by the author).

Cordoba is located at the upstream end of the middle basin of the Guadalquivir, whereas Seville is at the end of the middle basin where the river meets the tides of the Atlantic Ocean (see Chapter 3). Historical accounts of the inundations of the Guadalquivir River indicate that they were frequent and cyclical occurrences. In some cases, the severity of the floods and their consequences seem to have been fairly dramatic. The awareness and fear that the inhabitants from Hispalis had of the river floods produced by heavy rain, is attested in the hagiography of St Fructuosus of Braga written by Valerius of El Bierzo. The work records how in the 7th century, the Baetis River rose upon heavy constant rains in the winter months (Valerius, *Vita Fruct.*, 12, ed. Fear, 1997: 134-135). Valerius also tells us that when there were storms and rain, sailing on the Baetis River was so dangerous that the citizens and the bishop of Hispalis advised St Fructuosus not to travel by boat until the weather improved (Valerius, *Vita Fruct.*, 14, ed. Fear, 1997: 136-137).

Some of the Islamic historical chronicles recorded significant climate events such as earthquakes and floods at the Guadalquivir River. From surviving historical accounts by Islamic authors that lived in al-Andalus, news regarding floods of the Guadalquivir River can be reconstructed.

During the 8th century, in the year AD 798-799[57], there was an inundation of the Guadalquivir that destroyed much of the suburb near the bridge of Cordoba, which

[57] Islamic chroniclers recorded significant events using Hijri years (i.e. *Anno Hegirae*) but in the present Thesis these are given in Gregorian years for simplicity. Because the Islamic lunar calendar has only 354 or 355 days in its year, it slowly rotates within the Gregorian year. Therefore, one Hijri year nearly always corresponds to two consecutive Gregorian years and *vice versa*.

also affected the Shaqunda neighbourhood, located south of the river (Ibn ʿIdhārī, *Bayan*, vol. II, ed. Fagnan 1904: 112).

It is probable that because of the beginning of a series of severe floods in the Guadalquivir, in AD 827-828 the fourth Umayyad Emir of Córdoba Abd ar-Rahman II (AD 792–852) ordered the construction of a large and strong artificial 'reef' (i.e. *al-Rasif*) on the façade of the city facing the river. Ibn ʿAbd al-Munʿim al-Ḥimyarī described how this artificial embankment was built with heavy stone ashlars with the purpose of protecting the riverbank from the river (al-Ḥimyarī, ed. Levi-Provençal, 1938: 189). It was built over the Roman dock of the city and an esplanade was built on top of it that reached the city walls which, ultimately, would also protect the city from flooding (Pizarro Berengena, 2013: 79).

From the 9th century, in January AD 850, overflows are documented of both the Guadalquivir River and its tributary, the Genil. The historian Ibn Ḥayyān described the events:

> *"This year there was a great flood in the river of Córdoba, on the month of Rayab al-Quamari which is analogous to the month of Yunayr of the solar year, which is the beginning of the year of Christians in al-Andalus (January AD 850). The water of the river overflowed the riverbed just as did the Shanil (Genil) River. The latter gnawed the arches and pillars of the bridge over Écija. Additionally, the river also overflowed in the kura of Seville, although it seems that here the flash flood stopped. Nevertheless, between Seville and the river mouth at the sea it inundated 16 villages."* (Ibn Ḥayyān, *Muqtabis*, ed. Makkī, 1973: 145-146, cited by Cabrera Muñoz, 2008: 203).

During the 10th century reported inundations of the Guadalquivir River are numerous. Islamic chroniclers recorded eight serious floods, five of them occurring in a span of only 30 years, between AD 942 and AD 975.

In AD 901 the water overflowed the bridge at Cordoba and broke off one of its arches (Ibn Ḥayyān, *Muqtabis*, ed. Antuña, 1937: 139). According to the chronicler Ibn Ḥayyān, a few years later in AD 908-909, the largest river inundation ever remembered before took place (Ibn Ḥayyān, *Muqtabis*, ed. Antuña, 1937: 144). In AD 942-943 and AD 945-946, more floods occurred and were documented. According to Ibn ʿIdhārī, the flood of AD 945-946 destroyed part of the bridge at Cordoba, and the water came up to the "Tower of the Lion", one of the Caliph's alcázar (i.e. castle-palace) (Ibn ʿIdhārī, *Bayan*, vol. II, ed. Fagnan, 1904: 349). Ibn ʿIdhārī also described a new flood in AD 962-963 (Ibn ʿIdhārī, Bayan, vol. II, ed. Fagnan 1904: 389). In the winter of AD 973-974 a new period of flooding began. It started, according to the historical source, on December 27th AD 973, and then continued until February AD 974. On the 19th of February AD 974, according to the chronicle of al-Rāzī, the river water rose "to the top of the tables of butchers" within the city (al-Rāzī, ed. García Gómez, 1967: 183-184). A new period of deluges and inundations occurred in March AD 975, causing extensive damage. Specifically, on the afternoon of the eighth day of March AD 975, the water of the river overflowed the riverbed and spilled over the stone artificial reef at Cordoba. A group of residents of the city dared to try to cross the river by boat, and after a violent wave capsized the boat, all but the boatman (who knew how to swim) lost their lives drowning in the unsuccessful attempt (al-Rāzī, ed. García Gómez, 1967: 249-250).

In the winter of AD 992–993, one of the most catastrophic floods in the Islamic period occurred. The Islamic chronicler Ibn Abī Zarʿ al-Fāsī recorded *"(…) the* *inundation of Cordoba, which destroyed the bazaars and reached Medinat al-Zahra, (…)"* (Ibn Abī Zarʿ, *Rawḍ al-Qirṭās*, ed. Huici Miranda, 1964: 220).

At the beginning of the 11th century, more floods occurred. The Islamic chronicler Ibn ʿIdhārī recorded that in December AD 1008, *"the Guadalquivir flooded the Ibn Galib orchards, next to al-Zahira, and it almost reached the Cadí (judge) Court, on top of the Zoco Grande, in the lower Cordoba…."* (ed. Huici Miranda, 1953). It is almost certain that there were more floods in the 11th century but there are no records, because the 11th century was a period of instability and civil war or the *Fitna* of al-Andalus (AD 1009–1031). The conflict ended with the definitive abolition of the Cordoban Caliphate in 1031, dividing all of Al-Andalus into a series of *Taifa* Kingdoms (*vide supra*).

In the 12th century, however, the chroniclers recorded more floods. In the year AH 532, 19th September of AD 1137 to 7th September AD 1138, there was a flood in the Guadalquivir that affected the troops of King Alfonso VII while on campaign (Ibn Abī Zarʿ, *Rawḍ al-Qirṭās*, ed. Huici Miranda, 1964: 322, footnote 33).

Between October AD 1168 and September AD 1169, a great flood caused damaging inundations in Seville and its province. The force of the water was so violent that it destroyed part of the city walls of Seville erected on the bank of the river. The Almohad Caliph Abu Ya'qub Yusuf (AD 1135-1184) assumed the cost of the repairs at his personal expense (Ibn Ṣāḥib al-Ṣalāh, ed. Huici Miranda, 1969: 64). Modern day geologists described this flood of AD 1168/1169 as a millennial flood (occurred every 1000 years), estimating that it reached a peak discharge of 12,000

m^3/s or 50 times the mean discharge of the Guadalquivir River (i.e. 229 m^3/s), and rose up to 11 or 12 metres above mean sea level (Ménanteau and Vanney, 1985: 120).[58] Another flood occurred between June AD 1178 and June AD 1179 which inundated the Triana district of Seville (Ibn ʿIdhārī, *Bayan*, vol. I, ed. Huici Miranda, 1953: 32).

At the beginning of the 13th century the chroniclers recorded the worst of the floods occurring during the Islamic period. According to two different chronicles, one by Ibn Idari and the other by Ibn ʿAbd al-Munʿim al-Ḥimyarī (al-Ḥimyarī, ed. Levi-Provençal, 1938: 27-28), between the 9th March and 6th April AD 1201, a flood of an unprecedented scale occurred of the Guadalquivir River, creating inundations and damage on both banks of the river from Cordoba to the island of Cadiz[59]. Seville suffered the worst of the damage, and according to the chronicles, the current of the river destroyed 6000 houses, and 700 corpses were recovered from the riverbanks downstream (Ibn ʿIdhārī, *Bayan*, vol. I, ed. Huici Miranda, 1953: 221). In the spring of AH 609, AD 1213 the Guadalquivir overflowed, flooding both of its banks in the vicinity of Jaen (Ibn ʿIdhārī, *Bayan*, vol. I, ed. Huici Miranda, 1953: 272).

[58] Jean-René Vanney initially mentioned that the flood of AD 1168/1169 may have been responsible for as many as 63,000 deaths. If this death toll is correct, it was the worst river flooding catastrophe in recorded European history (Vanney, 1970: 111-112; Drain *et al.*, 1971: 71). However, Vanney does not provide the historical source from which he obtained this death toll, nor does he mention this again on a later article (Ménanteau and Vanney, 1985). I have not found a historical source mentioning either this or another modern author referring to it. Additionally, the Islamic historical chronicles refer to the flood of AD 1201 as "of an unprecedented scale" (*vide infra*). Consequently, the initial comment from Vanney that the flood of AD 1168/1169 caused 63,000 deaths seems not to be properly documented or supported.

[59] Cadiz is an island about 30 km south of the mouth of the Guadalquivir River. It is likely, therefore, that the Islamic chronicler wanted to emphasize the magnitude of the destruction produced by the floods, despite taking liberties regarding geography.

5.3.2 Palaeo-hydromorphology of the Guadalquivir River during the Islamic period

There is one essential study (Barral Muñoz, 2009) for understanding the palaeo-geomorphology of the area of the city of Seville. It is based on data gathered from stratigraphic analysis of many archaeological excavations as well as from dozens of bore core samples from Seville. Despite the vast amount of information gathered, the study was unable to decipher what happened to the Guadalquivir River in the Early Middle ages. However, the latest studies of palaeo-geomorphology in the area of the city of Seville (Borja Barrera, 2014), based on the experience and data gathered during the last 20 years, seems to have achieved this goal. The study suggests that during the Islamic period of Seville (i.e. 712 – 1248) there was a dramatic change in the fluvial dynamics of the Guadalquivir River in the area of Seville.

In general terms, the phase from the Late Roman period to the Middle Ages could be described as a period during which the hydro-morphological processes of the Guadalquivir River were active again. However, between the 6th and 8th centuries there was an intermediate period characterised by a certain degree of stability. This stable phase was a direct consequence of a decrease in the mean sea level, along with average lower temperatures, as well as average low precipitation totals. All these factors resulted in a very stable riverbed (Borja Barrera, 2014: 293).

Recent studies of urban palaeo-geomorphology conducted in Seville, from several archaeological excavations as well as from core samples taken, attest that the western sector of the city (the area of the west bank of the ancient river) rests on top of point bar sediments (Borja Barrera, 2014: 294). A point bar is a depositional feature made of alluvium that accumulates on the inside bend of streams and rivers below the slip-off slope. Point bars are found in abundance in mature or meandering streams (Figure 148).

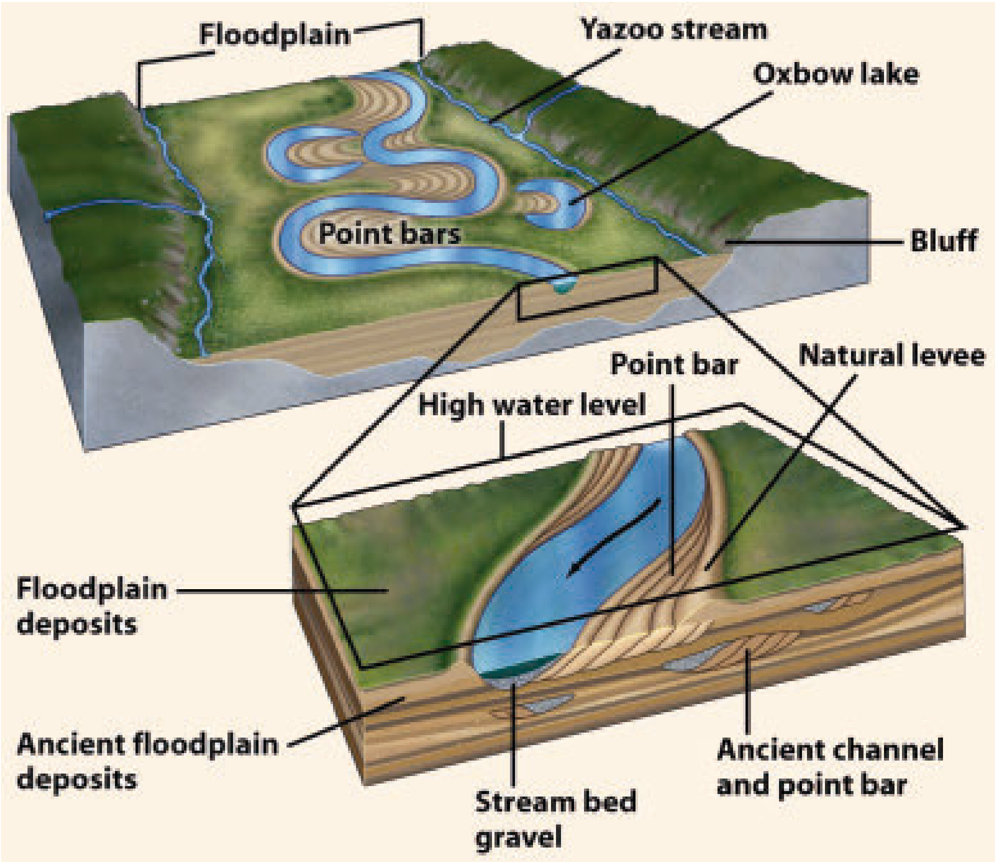


Figure 148: Two images explaining the different features of a meandering channel and the creation of point bars (Author).

These point bar sediments of the meander of Seville, documented in several archaeological excavations on the west side of the city, without a doubt attest to the displacement of the meander of the river towards the west. They are clearly documented at four sites at different heights of 4.40, 4, 4.55, and 3 metres above mean sea level respectively. Occupational strata from the Almohad period (i.e. 12th

to 13th centuries) topped these point bar sediments in all the archaeological excavations (Borja Barrera, 2014: 296).

However, these point bar sediments are not present at two archaeological sites located directly on top of the ancient Roman channel of the river: the Alameda de Hércules and the Plaza Nueva. At them, the occupational strata from the Almohad period are located much lower than the other sites, at heights precisely from 1 to 3 metres above mean sea level (Borja Barrera, 2014: 296). This seems to indicate, as has been interpreted by Borja Barrera (2014), that the meander of the river that migrated towards the west (indicated by the point bar sediments) is a different channel than that of the ancient riverbed from the Roman period.

Consequently, there was a new channel or riverbed, in the western area of the city, formed from the ancient Roman channel. In other words, the evidence suggests that the Guadalquivir River progressively divided into two different channels or riverbeds. This splitting process (called avulsion in the field of fluvial geomorphology) was produced by progressive silting of the main riverbed from the sediments (i.e. alluvium) transported by the river. This new channel slowly became the main one and its meander was displaced westwards, leaving point bar sediments, and meanwhile the ancient Roman channel became secondary (Borja Barrera, 2014: 298-299) (Figure 149).

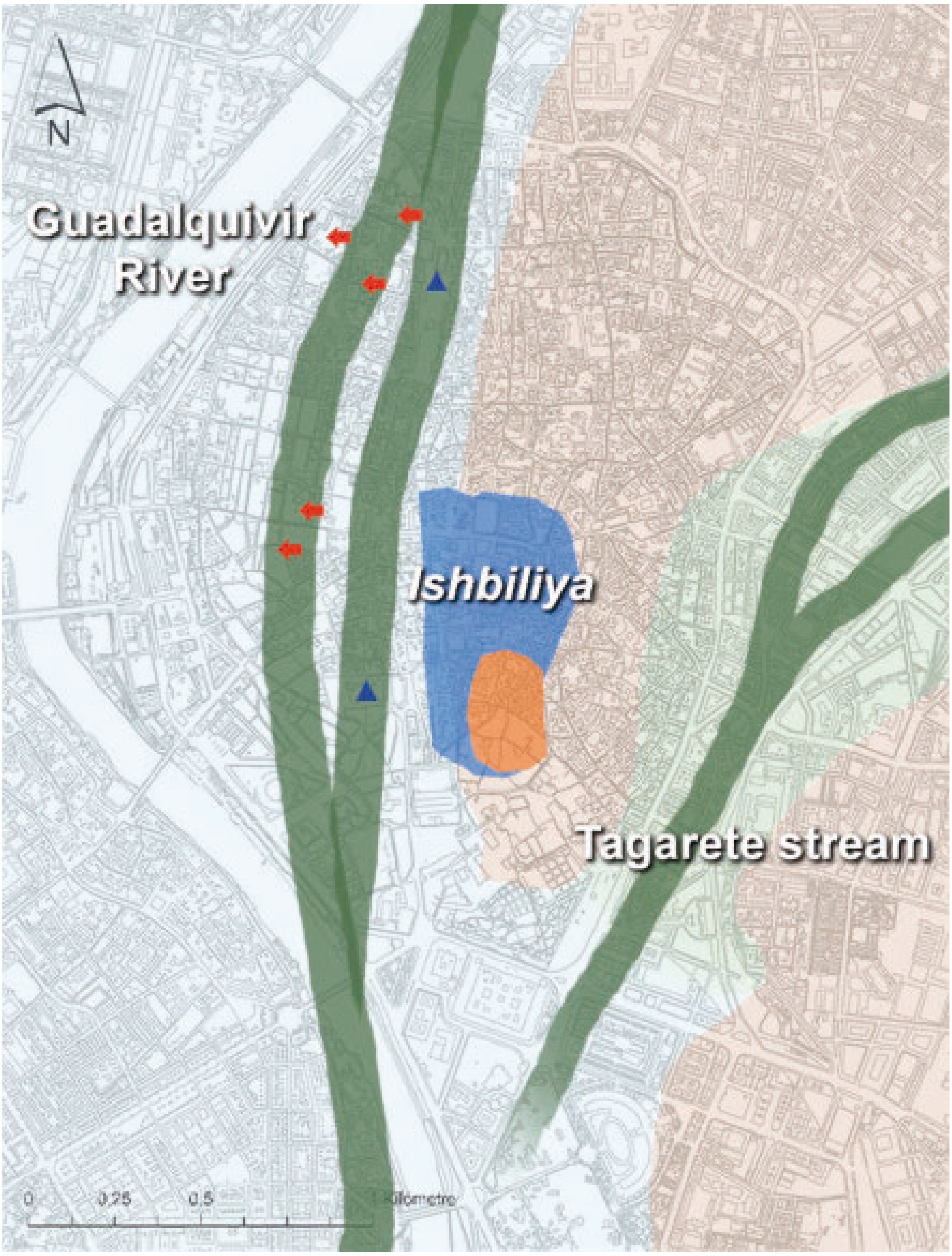


Figure 149: Red arrows mark the position of excavations with point bar sediments atestting the displacement of the meander of the river towards the west. Blue triangles mark the position of excavations without point bar sediments (data from Borja Barrera, 2014: 296). Approximate position of the two channels of the Guadalquivir River, after the avulsion process, during the 9th century. Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27). The city was then called Ishbiliya (scale bar 1 km, Author).

The evidence suggests that the ancient river channel from the Roman period remained stable at its position during Late Antiquity and during the hydro-morphological stable period of the 6th to 8th centuries. In fact, the remains of the iron anchor found at Plaza Nueva indicates that the ancient Roman channel was navigable for seagoing ships and, on the basis of the chronology of the anchor, at least during the 6th or 7th centuries and possibly until the 9th or beginning of the 10th (see Chapter 4). However, the existence of a necropolis in the Plaza Nueva (Lévi-Provençal, 1931: 43-46) in AD 1022 suggests a *terminus ante quem* for the existence and navigability of the ancient riverbed of the Guadalquivir. Consequently, the evidence suggests that the new channel evolved in the period of time between the 9th to the 11th centuries (Borja Barrera, 2014: 301). This implies that during that period the two channels or riverbeds coexisted.

The splitting process or avulsion that created a new Islamic channel was produced by progressive silting of the Roman channel, because of immense amounts of alluvium transported by the river. This avulsion was caused by a complex combination of different phenomena such as climatic conditions (low temperatures between the 6th and the 8th centuries), geological factors (i.e. high position of the mean sea level) and also anthropogenic causes such as deforestation and the expansion of the agricultural land that occured in the 10th century (Uribelarrea and Benito 2008: 30) (*vide infra*). It is precisely between the 9th and 11th centuries when the mean sea level was higher, impeding the discharge of the alluvium from the river (Borja Barrera, 2014: 302). As a consequence of all these factors, the Roman channel or riverbed (which had existed since ancient times) reached a critical point when it could not assimilate any more sediment, and the force of the current created a new Islamic channel through which the water could flow freely.

This process was gradual and needed events of high energy in the form of flash floods and/or inundations that provided the necessary quantities of alluvium required to start the aforementioned hydro-morphological processes. Borja Barrera (2014: 300) noted that, according to the documented point bar sediments, the Seville meander displaced 50 metres westwards for every 4 events of high-energy. On that basis he estimated that *"if in-between the position of the Roman palaeo-channel and the position of the river located outside the city walls of the Almohad period there are 500 metres (…) in order for the river to migrate from one location to the other, at least, about 40 high-energy events would be needed. (…) about 150 years would be sufficient for these 40 large floods to have occurred"* (Borja Barrera, 2014: 300). However, these estimates seem to be an oversight by Borja Barrera. As was clearly demonstrated, the Roman palaeo-channel remained stable until its complete sedimentation, and it did not migrate towards the west; it was the newly formed Islamic channel that was the one that migrated westwards. Therefore the estimates of the precise number of high-energy events (40) and the years needed (150) made by Borja Barrera (2014: 300) seem to be incorrect because they are based on the position of the Roman palaeo-channel. Nevertheless, this is just an unintended oversight; thus the main Thesis of the avulsion of the river remains very plausible indeed, and what seems undisputable is the need for high-energy events in order to produce the division of the river.

If we take into account that by the 11th century the ancient riverbed was no longer navigable, the following could be proposed: the latest studies of urban palaeo-geomorphology (Borja Barrera, 2014) suggests that during the 9th and 10th centuries, the ancient Roman riverbed of the Guadalquivir began to split gradually and the Roman channel become secondary, gradually reducing its navigability. For a lengthy but undetermined period of time, between the 9th and 10th centuries, the two channels or riverbeds, the ancient Roman one and the new Islamic one coexisted. Gradually the new western Islamic channel became the principal one, while the ancient Roman channel silted up until it became not navigable by the beginning of the 11th century.

The meander of western channel or riverbed, once it was formed, progressively moved westwards leaving a path of point bar sediments. The Almoravid-Almohad city walls were completed at the middle of the 12th century, *circa* AD 1150, and at that time the Islamic channel of the river flowed outside them. The distance between the position of the river outside the Islamic city walls and the excavation in Seville (located furthest east) where the point bar sediments are documented (i.e. Calle Monsalves) is about 350 metres. If 4 events of high-energy for every 50 metres of westward movement could be taken as a unit of measure (Borja Barrera, 2014: 300), then we can estimate a total number of 28 high-energy events for the 350 metres westwards displacement of the Islamic channel.

Regarding floods in the Guadalquivir, the 10th century is probably the best-documented century of the Islamic period (*vide supra*). In this century, when the climatic factors and sea level conditions were at their optima, the Islamic chroniclers recorded eight exceptional floods. We have estimated that the westward displacement of the Islamic channel took place in about three and a half centuries (*vide supra*); this is at an average rate of seven high-energy events per century, thus very similar to the eight floods recorded in the 10th century. The total displacement of 350 metres occurred approximately in 350 years (i.e. about 1 metre of lateral displacement per year). This estimate is consistent with contemporary values of lateral migration rates documented in a palaeo-geomorphological study by Uribelarrea and Benito (2008: 29) of the Guadalquivir River at Cordoba.

Since the Islamic city walls were erected in *circa* AD 1150, this would mean that the high-energy events and the avulsion of the river would have started 350 years before, that is around AD 800. Supporting this estimate are the Islamic historical accounts (*vide supra*) that indicate a period of increasingly more severe inundations or floods starting precisely in the year AD 798-799. Additionally, recent studies of palaeofloods in the Iberian Peninsula during the Holocene (Benito *et al.*, 2015) support this hypothesis (*vide infra*). The study suggests that a period of increasing inundations started around AD 800 and continued until reaching an apex in the form of two unprecedented catastrophic floods at the end of the 12th century and the beginning of the 13th century (*vide supra*).

The Islamic channel of the Guadalquivir River remains today, separating the city centre of Seville from the “Triana” neighbourhood on the west bank of the river, although during the High Middle Ages this channel was located further east than its current position.

5.3.3 Palaeo-climatology of the southwest Iberian Peninsula during the Islamic period

Different palaeo-environmental studies provide data that match the historical chronicles and also that support the palaeo-morphology hypothesis with respect to the Guadalquivir River in Seville during the Islamic period.

The Medieval Warm period (MWP) that occurred from *circa* AD 900 to AD 1300 could also be termed the Medieval Climate Anomaly (MCA). The definition Medieval Warm period (MWP) was coined because this period is the most recent preindustrial warm era in European climatology; similarly, Medieval Climate Anomaly (MCA) refers to the same period due to its large heterogeneity in space and time (Mann *et al.*, 2009).

For the Iberian Peninsula, in a study of marine records from the Alborán Sea basin (South East coast of the Iberian Peninsula), the MCA is defined as the period from AD 800 to AD 1300. The data obtained clearly suggest more humid conditions between AD 800 and AD 1000 (Nieto-Moreno *et al.*, 2013: 1234). Another study that includes lake records (Moreno *et* al 2012: 29) suggests that the MCA period (in the south Iberian Peninsula) was characterised by low temperatures and generally increased humidity. However, in the later part of the MCA, between AD 1000 and AD 1300, an abrupt arid phase is recognised to have occurred in the south of the Iberian Peninsula (Nieto-Moreno *et al.*, 2013: 1234). The authors of the study noted that this arid period coincides with the medieval solar activity maximum (AD 1100 – AD 1250) (Jirikowic and Damon, 1994).

The effects of climate change on hydrological regimes in the Iberian Peninsula have been the focus of some studies (Macklin and Woodward, 2009; Thorndycraft and Benito, 2006; Benito *et al.*, 2008). The amount of precipitation and the air temperature are two key factors that determine the hydrological cycle of a river. Precipitation largely defines the amount of water present, and temperature determines the amount of evaporation. In the cold months, elevated levels of rainfall and lower temperatures generally cause higher basin discharge. Conversely, in the summer limited rainfall and higher temperatures generally lead to lower discharge.

Consequently, the hydrology of Mediterranean rivers is a strong reflection of the differences of precipitation during each season (Thornes *et al.*, 2009). In the Mediterranean region, the river flow regime is characterised by maximum discharge during the cold season, minimum discharge in the summer, and extreme variability on both seasonal and annual timescales. Peak discharges (i.e. floods) are often 50 times larger than average flows (Luterbacher *et al.*, 2012: 108).

Hydrological records from the past reflect similar hydroclimatic variability, with wet and dry episodes alternating over decadal to centennial timescales. These are punctuated by abrupt transitions reflecting changes in atmospheric circulation (Benito *et al.*, 2003a,b; Macklin and Woodward, 2009). Another indicator of changing atmospheric circulation is flood records and patterns, which are mainly controlled by climate variability (Macklin *et al.*, 2006; Thorndycraft and Benito, 2006; Benito *et al.*, 2008).

Although it is impossible to fully reconstruct the ancient hydrology of a river, some general observations can be drawn from studies in palaeoclimatology. A small increase in temperature (i.e. +1° C) will cause total annual precipitation to fall, winter precipitation to increase, and summer precipitation to decrease. Due to increased evaporation and decreased precipitation, the overall discharge of a river will decrease by values ranging from 5% to 15%. Drier climates will also affect the morphology of rivers, generally causing them to become broader and shallower, creating meanders, which will increase the volume of water in the stream. In contrast, a small decrease in mean temperature (i.e. -1° C) will result in an increase of annual precipitation, which will result in a larger riverine discharge and increased alluvium to be carried by the water. Variability of precipitation extremes would be more balanced, although flash flood events would occur more often. Larger humid periods will also affect the morphology of rivers; it could create braiding systems, where channels are obstructed and the flow is forced around sediment occupying multiple channels. Braiding systems could potentially make navigation more difficult (Franconi, 2013: 709).

With these general patterns in mind, we can hypothesize how the climatic data presented by Büntgen *et al.* (2011: fig. 4) would have defined the hydrological regime of the Guadalquivir River during the Islamic period, or in palaeo-climatological terms the Medieval Climate Anomaly. At the end of the 8th century a significant decrease in mean temperature commenced, reaching its minimum in the first quarter of the 9th century with a change in temperature of about -1° C. As a result, there was a subsequent and significant increase in precipitation, which reached its maximum at the middle of the 10th century with a significant peak increase in precipitation totals (Figure 150).

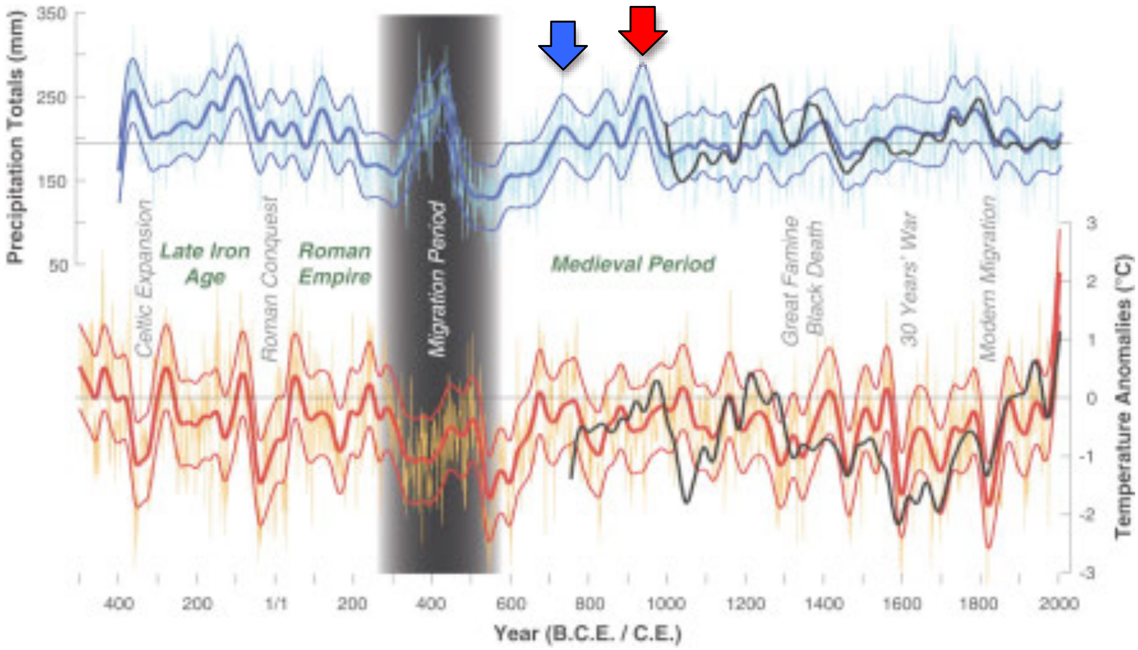


Figure 150: Reconstructed precipitation totals (top) and temperature anomalies (bottom). Bold lines are 60-year low-pass filters. Periods of demographic expansion, economic prosperity, and societal stability are noted, as are periods of political turmoil, cultural change, and population instability (after Büntgen *et al.*, 2011: fig. 4). The blue arrow marks the beginning of a humid period; the red arrow marks a significant increase in precipitation around the middle of the 10th century.

This pattern is supported by the data obtained from marine records of the Alborán Sea basin (*vide supra*) that clearly suggest more humid conditions between AD 800 and AD 1000 (Nieto-Moreno *et al.*, 2013: 1234). These changes in temperature and precipitation would have, in theory, produced frequent floods in the Guadalquivir basin. In fact, this theoretical period of frequent floods indeed occurred, as the historical accounts of Islamic chroniclers recorded (*vide supra*) which precisely coincides with the prediction derived from the climate reconstruction. According to the historical records from the Islamic period, an epoch of frequent and severe floods in the Guadalquivir River started at the end of the 8th century reaching its maximum in the 10th century and lasting at least until the beginning of the 11th century (*vide supra*).

A clearly different pattern occurred afterwards, according to the data gathered by Büntgen *et al.* (2011: fig. 4). From the beginning of the 11th century, a period of stable precipitation commenced, which lasted approximately 250 years. This pattern is supported by the data obtained from marine records of the Alborán Sea basin (*vide supra*) that clearly suggest an abrupt arid phase between AD 1000 and AD 1300 (Nieto-Moreno *et al.*, 2013: 1234). During the same years, a period of temperature disequilibrium took place; first, an increase in mean temperature occurred at the first quarter of the 11th century; this was followed by a significant decrease of about -1° C, reaching its minimum in the first decades of the 12th century; and finally, an abrupt and rapid increase in temperature reaching its maximum by mid 12th century (Figure 150). These rapid diametrical changes in mean temperature would have wreaked havoc on the hydrological cycle of the Guadalquivir River during those centuries.

Recent studies of palaeofloods in the Iberian Peninsula during the Holocene (Benito *et al.*, 2015) support this hypothesis. This, and other analogous studies, show how a major break in increasing fluvial activity and vertical alluviation rates occurred from the 10th century onwards, which coincides with higher flood frequency (Benito *et al.*, 2015: fig. 3)(Figure 151). However, as the palaeoclimate studies suggest, this was an arid period of moderate precipitation and a maximun in the solar iradation (*vide supra*). Therefore, the increase in vertical alluviation rates that transported higher sediment loads was not the result of increased precipitation, but was the consequence of deforestation and the expansion of agricultural land to marginal areas (Uribelarrea and Benito 2008: 30). The environmental disequilibrium and accelerated alluviation peaked around AD 1100, (Figure 151) and this has been documented in radiocarbon-dated floodplain sediments in other Spanish rivers (Thorndycraft and Benito, 2006) and in the burial of irrigation devices (Butzer *et al.*, 1985). It was the beginning of a period of land-use changes and periodic clusters of extreme precipitation events that lasted until the 16th century (Butzer, 2005; Uribelarrea and Benito 2008: 30).

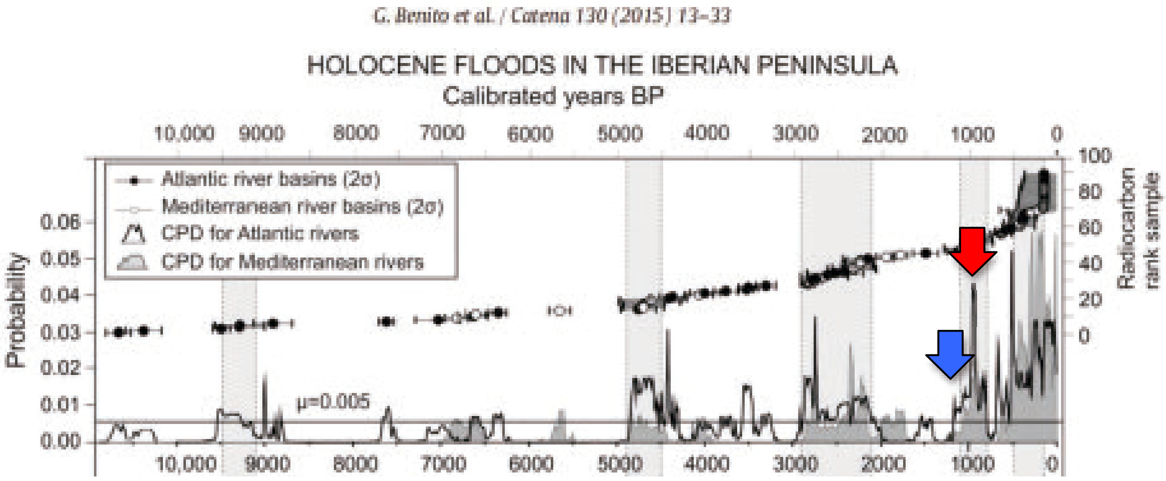


Figure 151: Cumulative probability density plots (CPD) of radiocarbon dates from floods and extreme fluvial event units of the Iberian Peninsula. Horizontal line indicates the mean probability above which a period of major flooding is inferred. Shaded vertical bars show periods of enhanced flood/fluvial activity above the mean and with at least three radiocarbon dates in 200 years. Black and white dots are radiocarbon aged samples (after Benito *et al.*, 2015: fig. 3). The blue arrow marks the beginning of a period of increasing flooding around AD 800; the red arrow marks a significant increase in the probability of flooding at around AD 1100.

To summarize this section, I consider that the agreement among first, the dates of historical accounts recording floods; second, the estimations of the displacement of the river channel based on geomorphological studies of sediments in Seville; third, the reconstructed palaeo-climatic data; and fourth, the results of palaeoflood studies in the Iberian Peninsula is no coincidence. All these different proxies indicate that around AD 800 a humid period of increased precipitation began which led to the avulsion of the Guadalquivir River in the meander of Seville.

5.4 The two ports of Ishbiliyya: new challenges and relocation

5.4.1 Deciphering the disappearance process of the ancient port of Seville

As we have seen, the existence in the year 1022 of a necropolis in the Plaza Nueva area (Lévi-Provençal, 1931: 43-46) provides a *terminus ante quem* for the navigability and existence of the ancient riverbed of the Guadalquivir. In light of archaeological evidence, it seems that the ancient riverbed, which throughout Antiquity and the Early Middle Ages flowed close to the city and accommodated the ancient port on its east bank, gradually silted up until it was no longer navigable. This must have happened at some point prior to the 11th century when the ancient riverbed of the Guadalquivir, as well as the port on its east bank, would have no longer existed (in that particular area of the city). The riverbed seems to have changed its position and morphology no later than the early 11th century.

The question is: when and how did the change in the river occurred? Considering the historical chronicles, archaeological remains, the geomorphological information of the Guadalquivir River, and the palaeoclimatology studies it is possible to propose a hypothesis.

As we have seen in Section 4.3, geomorphological information on the Guadalquivir River suggests that between the 6th and 8th centuries there was a period characterised by a certain degree of stability in the hydrology of the river (Borja Barrera, 2014: 293) (Figure 152).

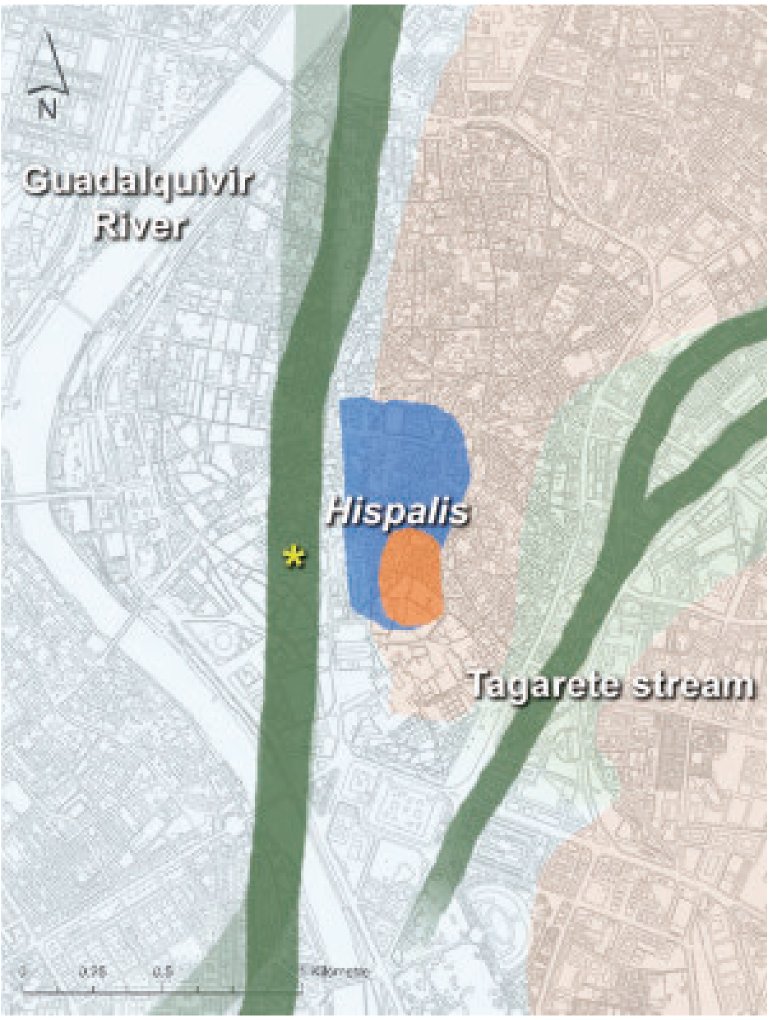


Figure 152: Approximate position of the channel of the Guadalquivir River during the stable phase between the 6th and 8th centuries as shown in Figure 98 (*vide supra*). Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27). The asterisk marks the location of the Plaza Nueva. The faded areas along the river correspond to the position of the meanders during the previous phase *circa* 4th century AD (scale bar 1 km, Author).

The evidence suggests that, around AD 800, the Guadalquivir River started to progressively divided into two different channels or riverbeds. This occurred through a process of avulsion that progressively silted up the main riverbed with alluvium transported by the river (Borja Barrera, 2014: 298-299). Geology and palaeo-climatology studies seem to indicate that this process of avulsion was triggered by a combination of a higher mean sea level and climatological factors such as changes in mean temperature and precipitation totals (*vide supra*). These combined factors produced a period of high-energy events, of floods in the river and so the ancient Roman riverbed was silted up. Historical chronicles documented a series of high-energy events starting around the beginning of the 9th century and these were exceptionally frequent and violent during the 10th century, which coincides with a dramatic peak in precipitation totals (Figure 150). Additionally, recent studies of palaeofloods in the Iberian Peninsula during the Holocene (Benito *et al.*, 2015) show how a major break in increasing fluvial activity and vertical alluviation rates occurred from the 10th century onwards, which coincides with higher flood frequency (Benito *et al.*, 2015: fig. 3). The newly formed channel slowly became the main one, and its meander was displaced westwards leaving point bar sediments, meanwhile the ancient Roman channel became secondary (Borja Barrera, 2014: 298-299). The process of avulsion, and the complete sedimentation of the ancient Roman channel, lasted approximately two centuries from roughly AD 800 to AD 1000, since the existence in the year 1022 of a necropolis in the Plaza Nueva area (Lévi-Provençal, 1931: 43-46) provides a *terminus ante quem* for the navigability and existence of the ancient Roman riverbed. During the 9th and 10th centuries, the Guadalquivir probably had two navigable channels (Figure 153 and Figure 155).

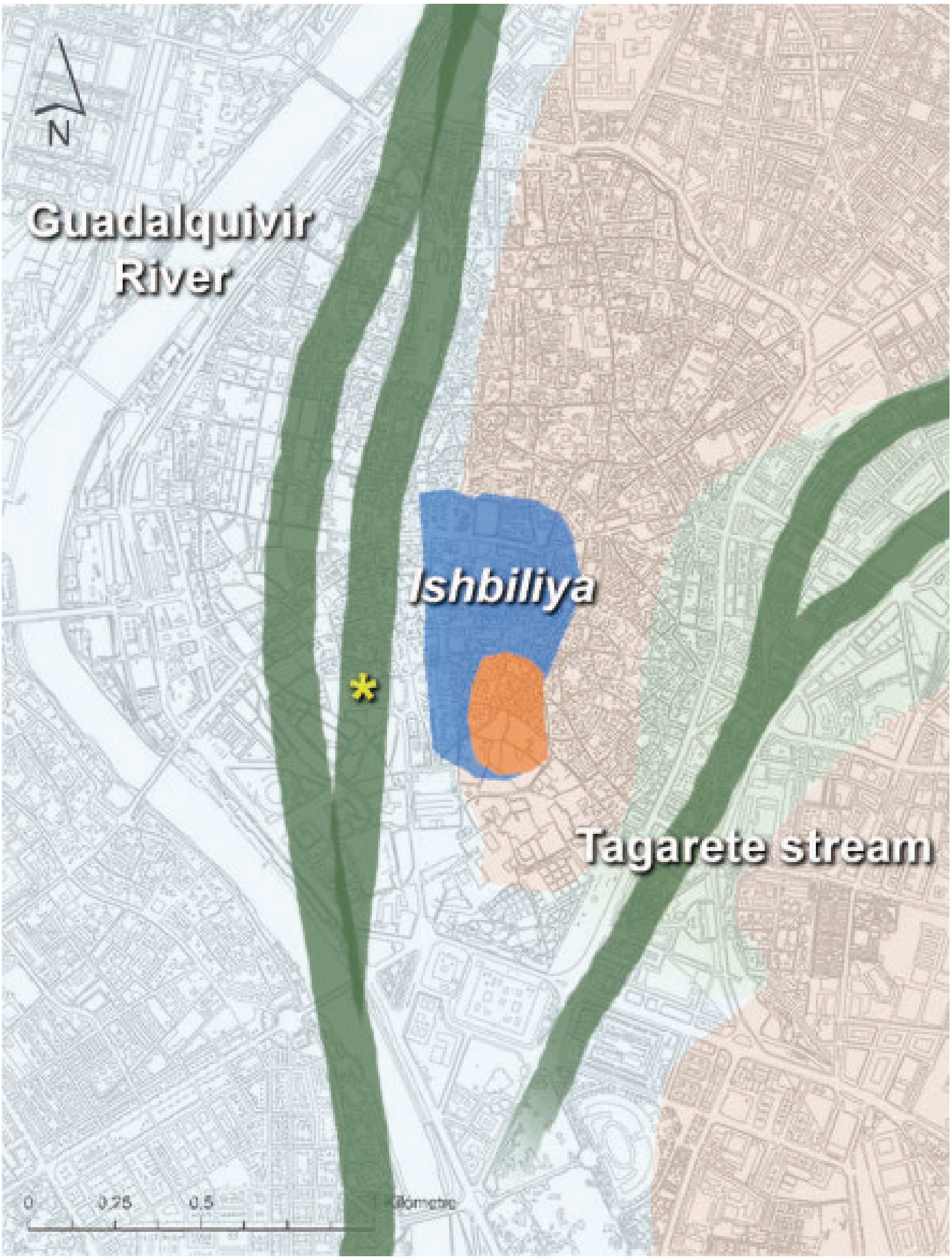


Figure 153: Approximate position of two channels of the Guadalquivir River, after the avulsion process during the 9th century. Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27). The city was then called Ishbiliya. The asterisk marks the location of the Plaza Nueva (scale bar 1 km, Author).

These two channels of the river were approximately 100 metres apart from one another. In the area occupied by the new channel, the force of the river current probably destroyed any archaeological remains that once existed and stood there. The subsequent and progressive migration of the newly formed channel westwards (*vide infra*) would, in a similar fashion, potentially have damaged or destroyed most of the existing archaeological remains that once existed in that area. That would explain why all the archaeological excavations conducted there have never found archaeological remains from prior to the 11th century (Jiménez Maqueda, 2011: fig. 40)(see Figure 120).

However, on the strip of land established between the two channels, any existing archaeological vestiges could, potentially, remain preserved (Figure 154). This could explain the funerary remains found during the construction of the retail store Galerías Preciados in 1969: first, a fragment of a Roman statue (of a toga attired male) and a fragment of a Roman funerary inscription (Newspaper ABC Sevilla 18-09-1969), which according to Carriazo both dated from the early 2nd century AD; second, *"a funerary monument with several funerary urns"* as reported by Corzo Sánchez (1997: 198 footnote 10). These funerary archaeological remains might have come from a Roman necropolis, located on the west bank of the Baetis River, that Collantes de Terán Delorme (1977: 78-79) proposed (*vide supra*).

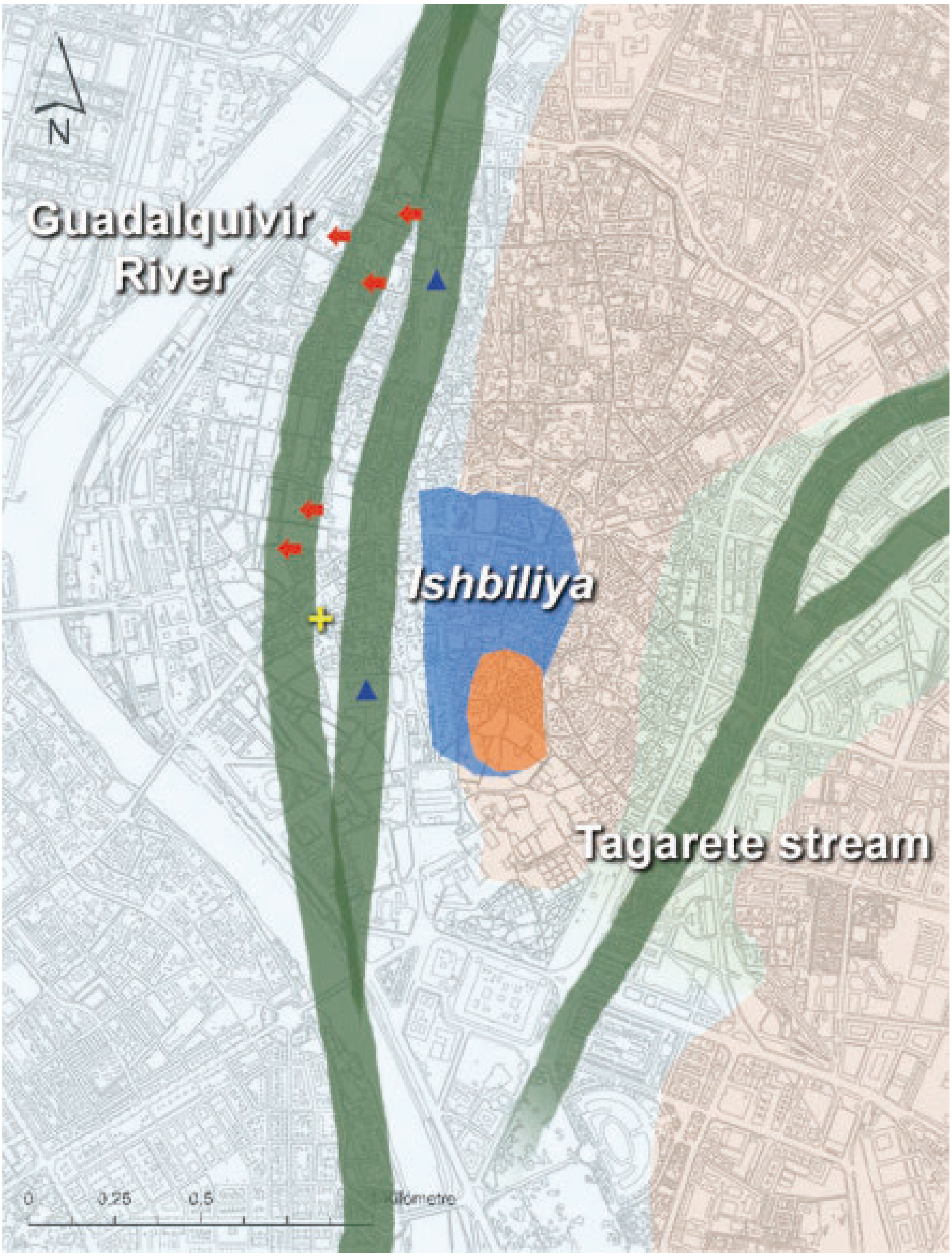


Figure 154: Approximate position of two channels of the Guadalquivir River after the avulsion process, during the 9th century with the location of point bars (red arrows) as shown in Figure 149. The yellow cross marks the site of the Galerías Preciados (currently El Corte Inglés) adjacent to the Plaza de la Magdalena. Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27)(scale bar 1 km, Author).

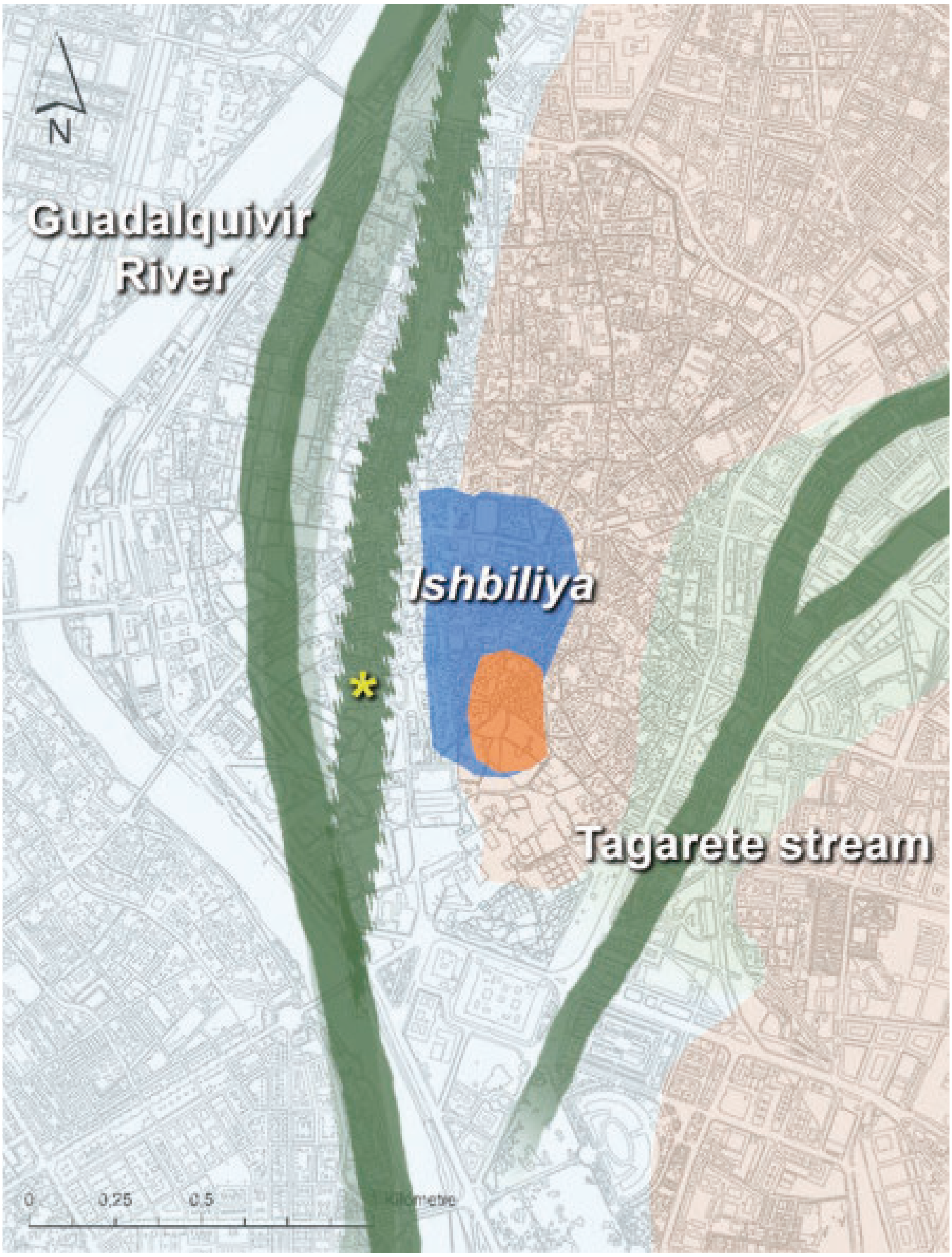


Figure 155: Approximate position of two channels of the Guadalquivir River, after the avulsion process, during the 10th century. Note how the ancient Roman channel starts to progressively disappear while the new Islamic riverbed begins migrating westwards. The faded areas along the river correspond to the position of the meanders during the previous century. Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27). The asterisk marks the location of the Plaza Nueva (scale bar 1 km, Author).

The roughly two centuries that the avulsion process of the river lasted was very fast in geological terms but rather unnoticeable to the human eye. This explains why there are no historical chronicles describing a sudden change in the river. However, the probable existence of two navigable channels in the Guadalquivir River during the 9th and 10th centuries, could potentially explain some details of a particular historical account. The chronicle of al-Udri describing the Viking attack on Ishbiliyya in AD 844 attested that *"(…) at dawn they arrived in front of the city in an area that is known as of potters' place. (…) After that, the Normans advanced with their ships until positioning them in the middle of the city of Ishbiliyya. (…)"* (Valencia, 1986: 123).

Rafael Valencia (1986, 123-124, footnote 73) identified the area *"(…) known as of potters' place (…)"* through which the Vikings arrived to Ishbiliyya in the southwest corner of the city. Archaeological excavations in that area (i.e. Avenida de Roma) that indicated the existence of potters' kilns (Gamarra y Camiña 2006: 494-498) supported this hypothesis (Figure 156). The present reconstruction of the Guadalquivir River during the 9th and 10th, with two probable navigable channels, could explain what al-Udri meant when he wrote *"(…) the Normans advanced with their ships until positioning* ***<u>them in the middle of the city</u>*** *of Ishbiliyya. (…)"* (Valencia, 1986: 123).

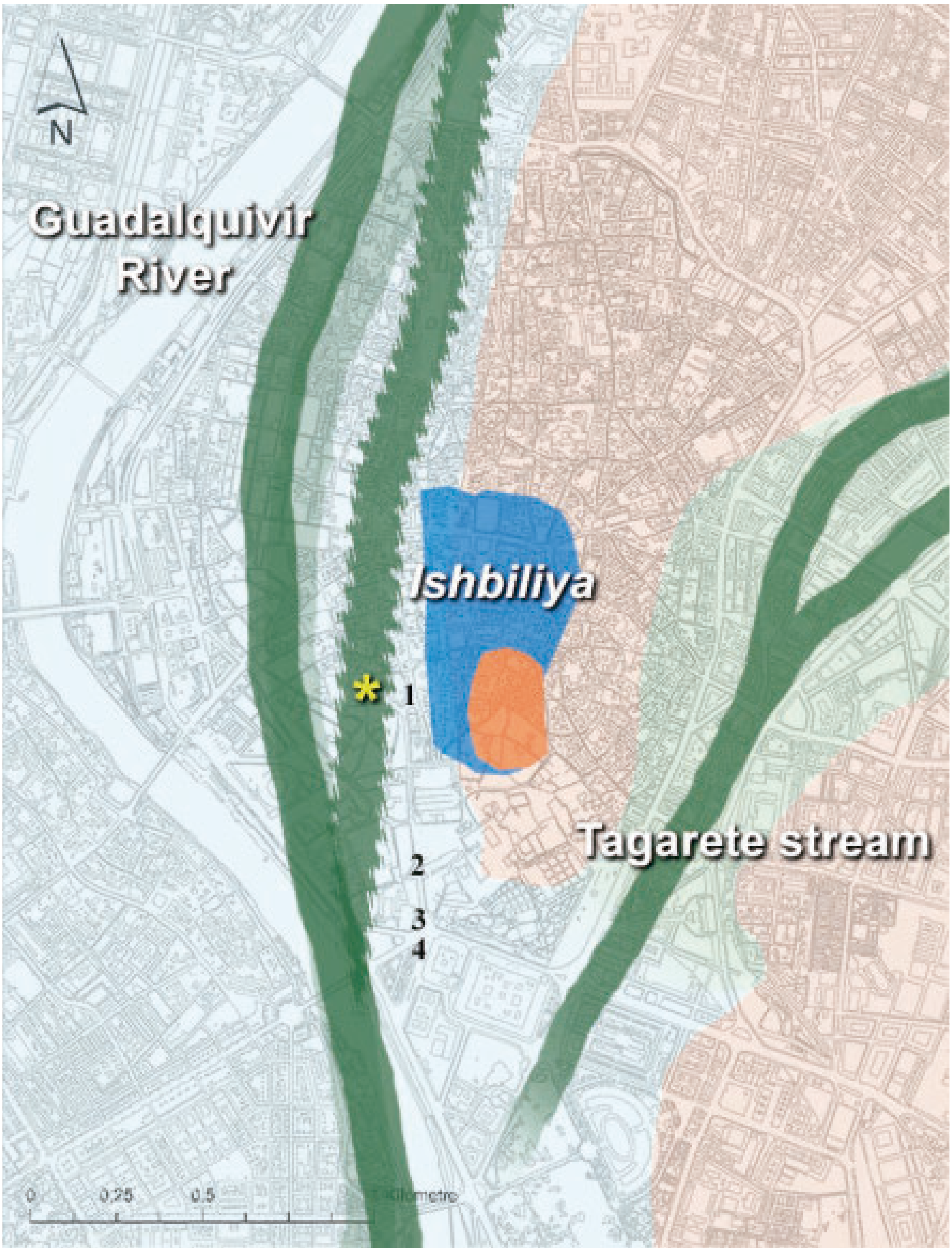


Figure 156: Approximate position of two channels of the Guadalquivir River, after the avulsion process, during the 10th century. Archaeological sites where potters' kilns or/and workshops have been unearthed: 1, Plaza de San Francisco; 2, Zanja de la Avenida; 3, Puerta de Jeréz; 4, Avenida de Roma. Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27). The asterisk marks the location of the Plaza Nueva (scale bar 1 km, Author).

Regarding the boat from Plaza Nueva, we saw that it was found with its oars *in situ* within sediment consisting of fine silt, suggesting that its loss was an accidental product of a violent flood. It is possible, therefore, to propose that the incident in which the boat was lost was one of the episodes of high energy or floods that recent palaeo-geomorphology studies have shown were part of the avulsion process of the ancient Roman riverbed. The radiocarbon dating of the boat suggests that it may belong to the period of the Caliphate of Córdoba (AD 929-1031). This chronology respects the *terminus ante quem* derived from the presence of a necropolis in AD 1023, and coincides with exceptionally frequent and violent period floods documented by chronicles in the 10th century (*vide supra*).

Considering all of the above, it is possible, therefore, to conclude that the boat of the Plaza Nueva was lost in one of these exceptionally violent floods that occurred in the second half of the 10th century. Trying to specify in which particular flood (i.e. AD 962-963, AD 973-974, AD 975 or AD 992-993) the boat was lost would be purely conjectural with the present state of knowledge. However, future dendro-chronological studies on the wood from the boat could produce evidence to answer this question further.

By the 11th century the morphological changes of the Guadalquivir River caused the wide corridor (through which the ancient Roman riverbed ran) and its extensive port, to be no longer navigable, and to become a large barren area (Figure 157). Floodplains, ponds and sloughs made up this area and it was affected by the rise and fall of the river's water level caused by the Atlantic Ocean tides. At the same time, several archaeological excavations have attested how the city expanded in this period, with new districts emerging both on the south and the north of the city (Figure 157).

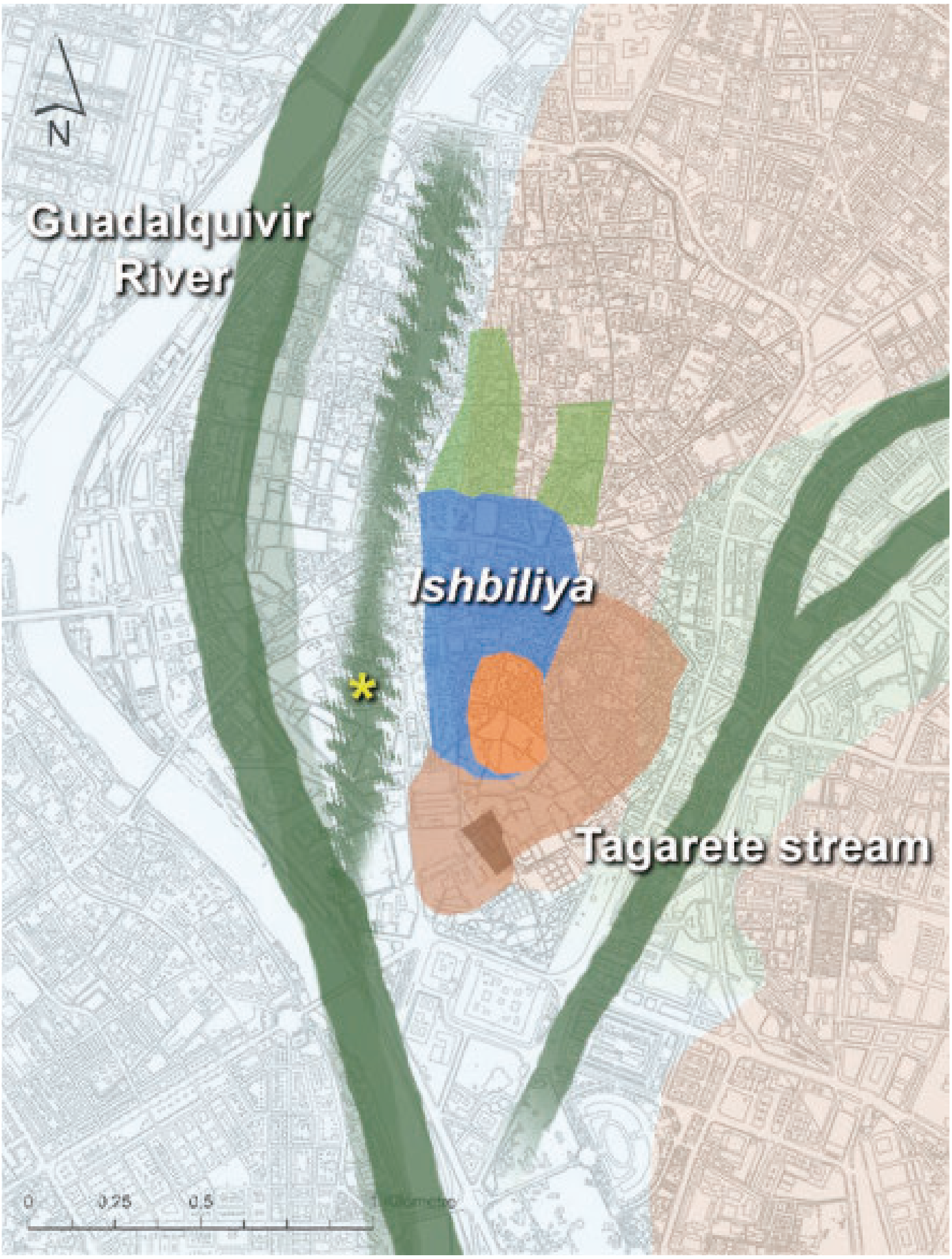


Figure 157: Approximate position of two channels of the Guadalquivir River in the 11th century. Note how the ancient Roman channel has silted up and it is no longer navigable. The new Islamic riverbed keeps migrating westwards and new quarters emerge north and south of the city (green and light brown)(after Valor Piechotta,

2008: 180) and the Alcázar (dark brown)(after Tabales Rodríguez, 2013: fig. 5). Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27). The faded areas along the river correspond to the position of the meanders during the previous century. The asterisk marks the location of the Plaza Nueva (scale bar 1 km, Author).

In fact, two lagoons remained in the north and south areas which the ancient Roman channel had occupied. From the geological point of view these are considered to be oxbow lakes, which is a U-shaped body of water that forms when a wide meander from the main stem of a river is cut off, creating a freestanding body of water. The two lagoons remained in the city during the Christian era and were known as the Laguna de la Feria, in the north area, and Laguna de la Pajarería, in the southwest area of the city. The Laguna de la Feria was drained at the end of the 16th century and transformed into the Alameda de Hércules, which still exists. The Laguna de la Pajarería was not drained until the end of the 19th century (Collantes de Terán Delorme, 1977: 33).

The areas around the lagoons would have had limited use, although they were utilised for some purposes. Potters of the city would certainly have found them convenient, since they provided unlimited supplies of quality raw material (i.e. fine clay) for the development of their craft (Figure 158). In fact, as we have seen, at the beguining of the 12th century Ibn ʿAbdūn described the presence of a potters' neighbourhood with a mosque (Ibn ʿAbdūn, ed. García Gómez and Lévi-Provençal, 1981: 95). Archaeological excavations in the southwest area of the city have provided direct evidence of the presence of potters' kilns, workshops, and production waste located on the ancient east bank of the river towards the south of the city (Figure 156): at Plaza Nueva (vide supra), Zanja de la Avenida (Carriazo

Arroquia, 1974-1975: 95-96), Puerta de Jerez (Martínez López and Pozo, 2007: 156, 157, 181 and 213), and Avenida de Roma (Gamarra y Camiña 2006: 494-498).

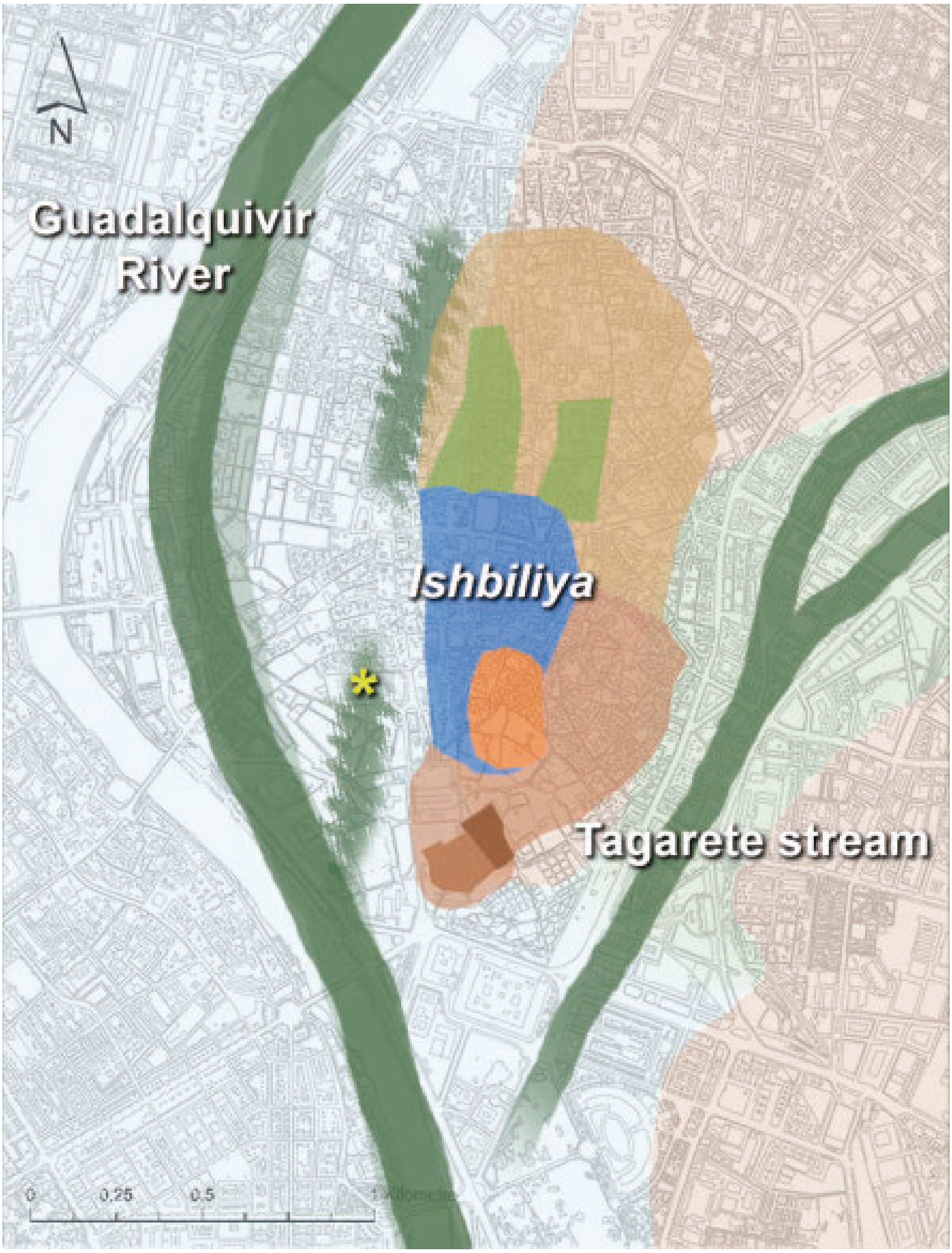


Figure 158: Approximate position of the Guadalquivir River in the 12th century. Only two lagoons remain from the ancient Roman channel. The Islamic riverbed

keeps migrating westwards and the city keeps expanding. The north quarter of the city expands (beige)(after Valor Piechotta, 2008: 180) as well as the Alcázar (dark brown)(after Tabales Rodríguez, 2013: fig. 6). Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25 and 27). The faded areas along the river correspond to the position of the meanders during the previous century. The asterisk marks the location of the Plaza Nueva (scale bar 1 km, Author).

Additionally, Islamic toponymy of the city provides indirect evidence for the presence of a potters' quarter in this area. The Islamic chronicler Ibn Sahib al-Sala attested the existence of a city gate in the 12th century that had the name of "bab al-Kuhl" or "gate of the Alcohol", which was located in the south of the city (Ibn Ṣāḥib al-Ṣalāh, ed. Huici Miranda, 1969: 65, 188, 200). Carriazo Arroquia (1974-1975: 95-96) found a large deposit of ceramic production waste in that area. He proposed, following the suggestion of Mr Felix Hernandez, the hypothesis that the toponym "gate of the Alcohol" comes from the lead sulphur that potters use to glaze pottery (Carriazo Arroquia, 1974-1975: 96). Carriazo Arroquia also suggested that the potters' quarter was located outside the "gate of the Alcohol" until the end of the 12th century when the Almohad citadel was built, forcing the potters to move to the west bank of the river in the Triana area.

The area vacated by the river would also be suitable for the erection of graveyards. We have seen that at Plaza Nueva a graveyard was constructed at some point during the 11th century. It has been hypothesised that the Islamic necropolis found at Plaza Nueva is the graveyard of the potters that Ibn ʿAbdūn describes (Valor Piechotta, 1989: 331). We have seen (*vide supra*) that this graveyard seems to have extended 200 m south from Plaza Nueva, attested by the dozens of graves found at the intersection of the Avenida de la Constitución and Calle Alemanes

(Hunt, 2008). Another graveyard located further south of the ancient east bank of the Guadalquivir River was documented at Avenida de Roma (Gamarra y Camiña 2006: 494-498).

Despite the usefulness of these floodplains to the potters and those resting in adjacent necropoleis (i.e. the deceased), the rest of the inhabitants of the medina Ishbiliya probably thought that this area was dangerous and insalubrious. In fact, documents of the late 15th century attest how nuns from a convent located next to the Laguna de la Pajarería, in the southwest area of the city, complained about the insalubrity of this swamp area (Collantes de Terán Delorme, 1977: 33, footnote 6). Both the Laguna de la Feria and the Laguna de la Pajarería became inundated at every major flood of the Guadalquivir until the 20th century (Figure 159).

Figure 159: Alameda de Hércules (former Laguna de la Feria) inundated during the flood of the 9th December 1876 (after Menantéau, 2008: 60).

The emergence of this new large area in the western part of the city certainly caused urban and administrative challenges for the Islamic rulers of Ishbiliya. This area of floodplain with two lagoons separated the medina from the new position of the vital Guadalquivir River and its port, forcing people to constantly cross through it.

The westward migration of the river, with the subsequent emergence of this new large area in the western part of the city, certainly led to the major urban transformations that Ishbiliya underwent during the 12th and 13th centuries. I am referring in particular to the construction of a new city wall (Figure 160) initiated by the Almoravids (Torres Balbás, 1951: 465; Collantes de Terán Delorme, 1957:

18-21, 24; Almagro Gorbea, 1987: 427-428; Jiménez Maqueda, 2011: 386) and whose greatest period of urban renewal and expansion of the city occurred during the Almohad Caliphate (Valor Piechotta and Tahiri, 1999; Valor Piechotta, 2008).

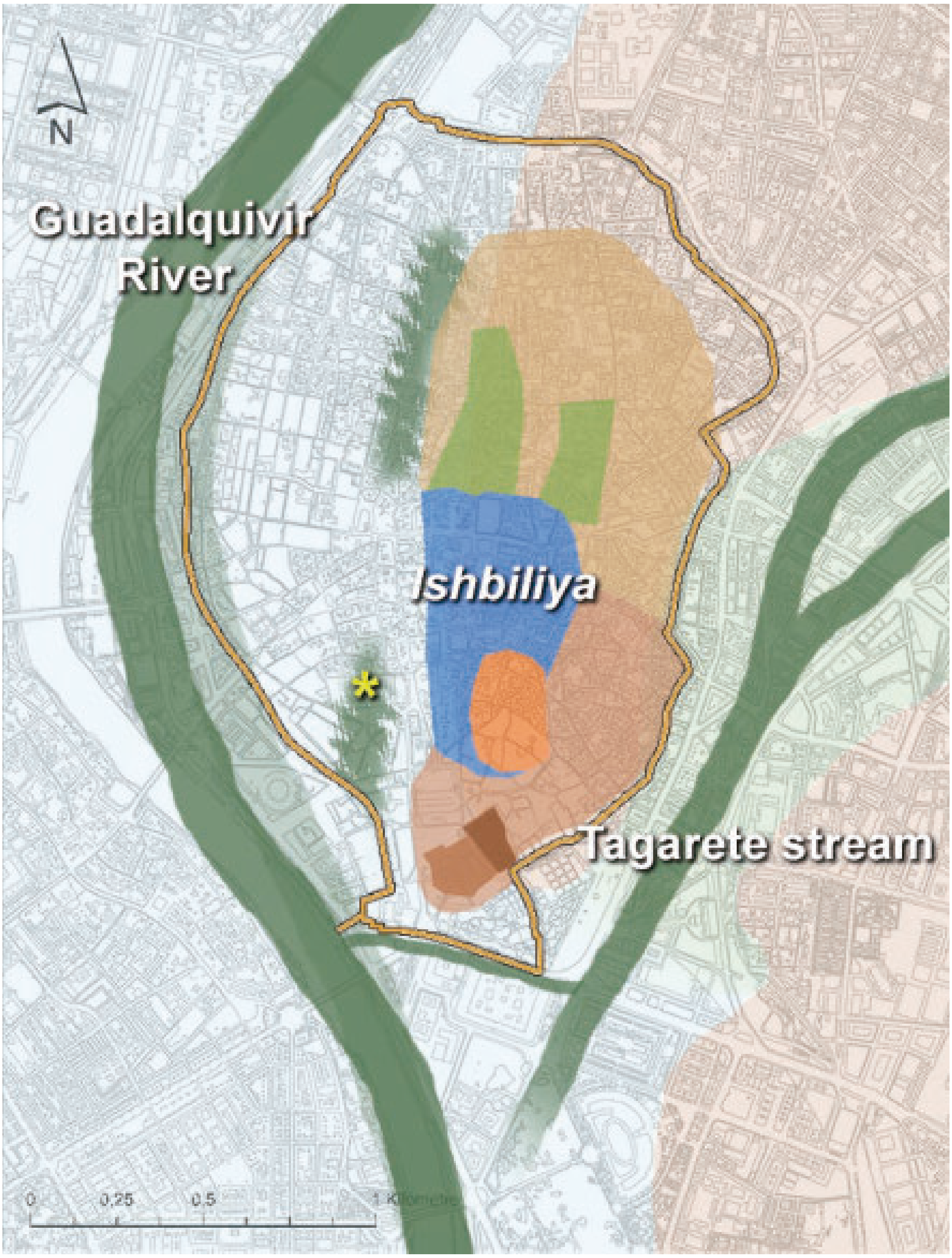


Figure 160: Approximate position of the Guadalquivir River in the 13th century. The Islamic riverbed keeps migrating westwards and the city has a new impressive wall. Note the canal that was excavated connecting the Tagarete stream with the River in order to serve as a defensive moat for the southern wall. Different expansions of the city (after Valor Piechotta, 2008: 180) and those of the Alcázar (after Tabales Rodríguez, 2013). Intramural area of Republican Hispalis (orange), intramural area of Imperial Hispalis (blue) (after González Acuña, 2011: figs. 25

and 27). The faded areas along the river correspond to the position of the meanders during the previous century. The asterisk marks the location of the Plaza Nueva (scale bar 1 km, Author).

5.4.2 The port facilities of Ishbiliyya and its Islamic shipsheds

There is no direct archaeological information on the port of Seville during the Islamic period. There is indirect evidence derived from the historical chronicles, but these predominantly describe events or activities which occurred in the new port that emerged after the avulsion of the river. The new port of Ishbiliyya is not covered in this Thesis, but some of its aspects are relevant to the previous port and, consequently, I would like to comment on it.

The Viking attack which occurred in AD 844 showed a weakness in the maritime defences of the Emirate as well as of the defences of Ishbiliyya. Consequently, Abd al-Rahman II ordered the erection of a city wall in Ishbiliyya; the Emir also ordered the construction of a fleet that was stationed in Ishbiliyya and the ships of which were equipped with apparatus to throw burning *nafta* (i.e. Greek fire). For the purpose of housing the fleet, Abd al-Rahman II also ordered the construction of shipsheds (Levi-Provençal and García Gómez, 1950: 144-150; Bosch Vilá, 1984: 35-50). These measures seem to represent a premeditated naval policy developed by Abd al-Rahman II (Lirola Delgado, 1993: 122-123). According to the chronicler Ibn al-Qūṭiyya, they were a great success, since the fleet from Ishbiliyya completely repelled a second attack by Viking raiders which occurred in AH 244 / AD 858, burning some of the Viking ships (Ibn al-Qūṭiyya, ed. Ribera, 1926: 53).

Ibn al-Qūṭiyya also specified that in order to build the fleet, Abd al-Rahman II hired "seamen" from all the shores of al-Andalus and paid them generously (Ibn al-Qūṭiyya, ed. Rivera, 1926: 53). For the construction of war galleys, naval shipyards are required and Seville had them from at least the time of the Roman Republic (see Chapter 3). The Arabic word to designate a shipyard is *dar al-sina'a* or *dar al-san'a* and occasionally *al-sina'a* from which the Spanish words *dársena*, *atarazana*, and *arsenal* derive (Lirola Delgado, 1993: 344). During the 10th century, the Emir Abd al-Rahman III (AD 912–961) developed a comprehensive naval policy. It included the construction of war galleys and shipsheds, with the objective of protecting al-Andalus from Viking attacks as well as attacks from the Fatimid Califate and the Christian kingdoms (Torres Balbás, 1946: 133).

During the 11th century, it seems that Ishbiliyya had an operational naval shipyard. According to the chronicle *Rawḍ al-Qirṭās*, by Ibn Abī Zarʿ al-Fāsī, al-Mutamid (AD 1069-1091) ordered the construction of an extraordinary large ship able to withstand storms, and it was sent to Tangier on a trade mission (Ibn Abī Zarʿ al-Fāsī, *Rawḍ al-Qirṭās*, ed. Huici Miranda, 1964: 527).

In the 12th century, the chronicle of Ibn Ṣāḥib al-Ṣalāh gives testimony of the numerous and ambitious urban developments undertaken by Caliph Abu Ya'qub (Reign 1163–1184) in Ishbiliyya. He ordered the construction of a bridge of boats (which was in operation until the end of the 19th century), a new impressive Aljama Mosque (later transformed into the Cathedral), a new palace citadel, and new city walls (equipped with a moat on its south flank) (Figure 160), and he also repaired the ancient Roman aqueduct (Ibn Ṣāḥib al-Ṣalāh, ed. Huici Miranda, 1969:

64-65) among other developments. However, of special importance for this Thesis, he also ordered the construction of quays equipped with ramps on both banks of the river (Ibn Abī Zarʿ al-Fāsī, *Rawḍ al-Qirṭās*, ed. Huici Miranda, 1964: 417). Another chronicler, Ibn Ṣāḥib al-Ṣalāh, reports how the same Emir also ordered the construction of shipsheds between the bab al-Qata'i (gate of the Ships) and the bab al-Kuhl (gate of the Alcohol) (Ibn Ṣāḥib al-Ṣalāh, ed. Huici Miranda, 1969: 200). In recent years, the location of these shipsheds from the Almohad period seems to have been identified (Figure 161).

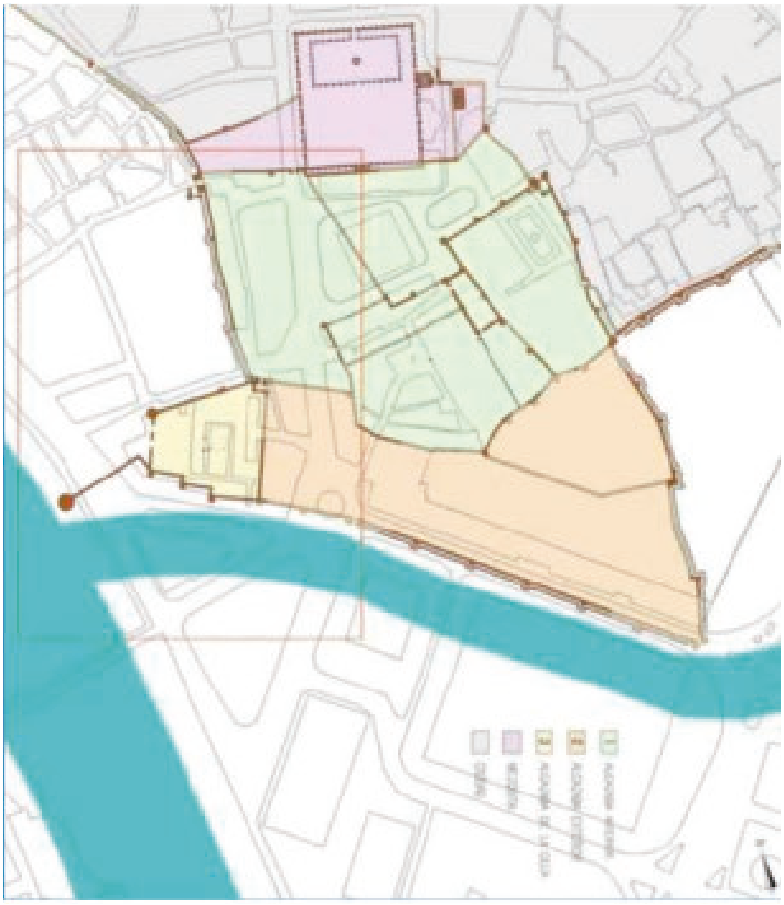


Figure 161: Position of the 12th century shipyard and shipsheds (yellow) at the west end of the southern side of the city wall (after Mora Vicente, 2013: 41, fig. 9).

During excavations conducted in 2001, the remains of a medieval prison assigned exclusively for knights and members of the nobility were unearthed during an excavation at the Casa de la Moneda site (Romo Salas and Ortega Gordillo, 2002).

Figure 162: 2001 excavations at the Casa de la Moneda (after Romo Salas and Ortega Gordillo, 2002: 195).

This prison existed from the second half of the 13th century until the 15th century, and it was generously equipped with a fencing and horse-riding training courtyard, gardens, and a chapel. However, what is relevant for the present Thesis is the name by which the prison was known: "Atarazana de los Caballeros" (Shipyard of the Knights) (Pérez González, 1997: 291-292). The excavation only reached 4.5 m in depth of the strata (Figure 162), unearthing only the 16th century levels (Romo Salas and Ortega Gordillo, 2002: 203) so, unfortunately, the Islamic levels were not reached. This area was later transformed into the Casa de la Moneda (Royal mint)

(Figure 163) that operated from the 16th to the 18th centuries transforming the gold bullion imported from the colonies of the Spanish Empire in the Americas into legal currency (Mora Vicente, 2013).

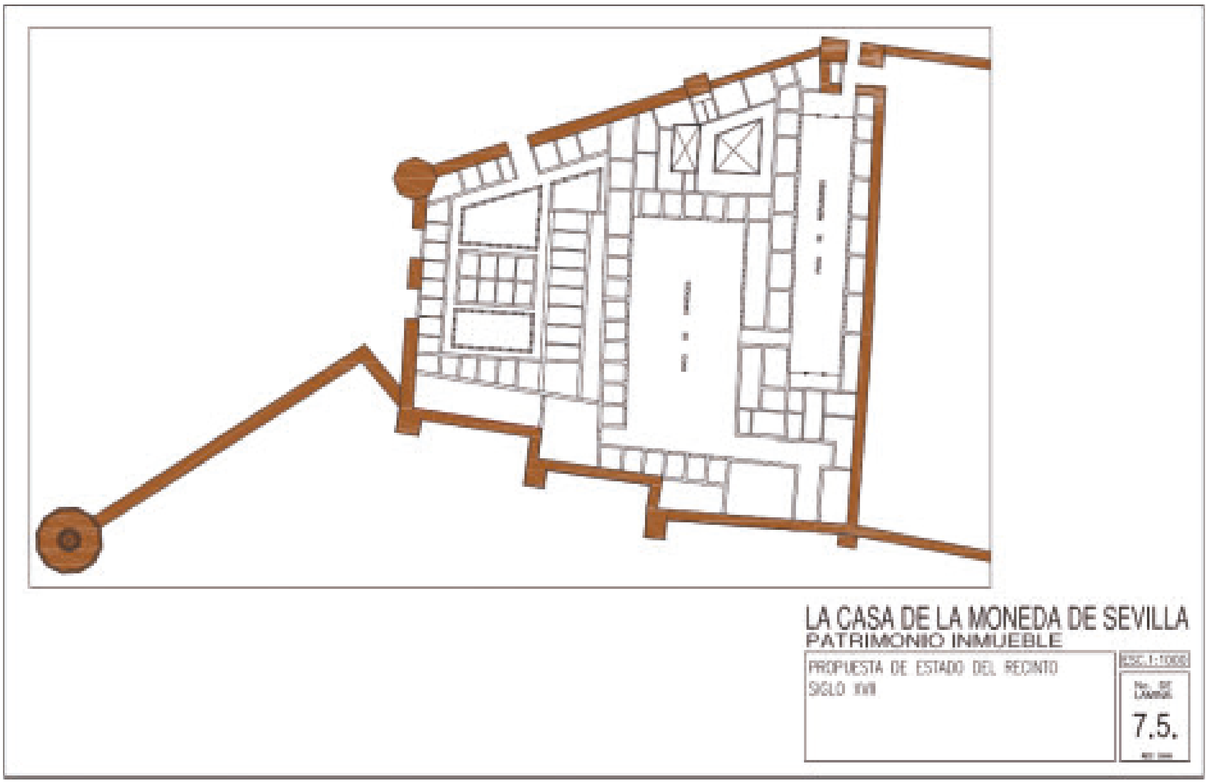


Figure 163: Reconstruction of the plan of the Casa de la Moneda in the 17th century (after Mora Vicente, 2013: vol. 2, 82).

This discovery in connection with another archaeological excavation conducted in the Christian shipyards (Amores Carredano and Quirós Esteban, 1999), led the archaeologist from the University of Seville, Fernando Amores Carredano, to propose the hypothesis that this was the location of the Almohad shipyard built by order of the Caliph Abu Ya'qub at the end of the 12th century.

According to the hypothesis of Amores Carredano (personal comment), the Almohad shipyard would have been heavily fortified with towers and walls equipped with battlements on both sides (i.e. interior and exterior) of the ramparts. One of the towers has an octagonal plan still standing today and it is known as the Torre de la Plata. The fortified shipyard was probably equipped with seven shipsheds of *circa* 7 m x 45 m (Figure 164). Other Islamic shipsheds were built in al-Andalus but there are hardly any surviving archaeological remains (Torres Balbás, 1946). However, there is one preserved archaeological parallel of Islamic 13th century shipsheds in modern day Turkey: the Alanya shipsheds (Torres Balbás, 1946: 207-209), which had five shipsheds or galleries 7.5 m wide and 31 to 40 m long (Johns, 2010: 185). Contemporary 13th century war galleys ordered by the King of Sicily, Charles I of Anjou, in 1275, were 4.45 m wide and 39.3 m long (Johns, 2010). It is probable, therefore, that the seven shipsheds from Seville were able to house an equal number of galleys, which entered the fortified complex through two large gates located in its west wall (Figure 165). During a second phase, and as a result of the continuous migration westwards of the newly formed channel of the river (*vide supra*), the southern wall of the shipyard was extended to reach the river. At its end, an imposing watch tower (known as Torre del Oro) was built in AD 1221-1222 (Bosch Vilá, 1984: 272-273) (Figure 164).

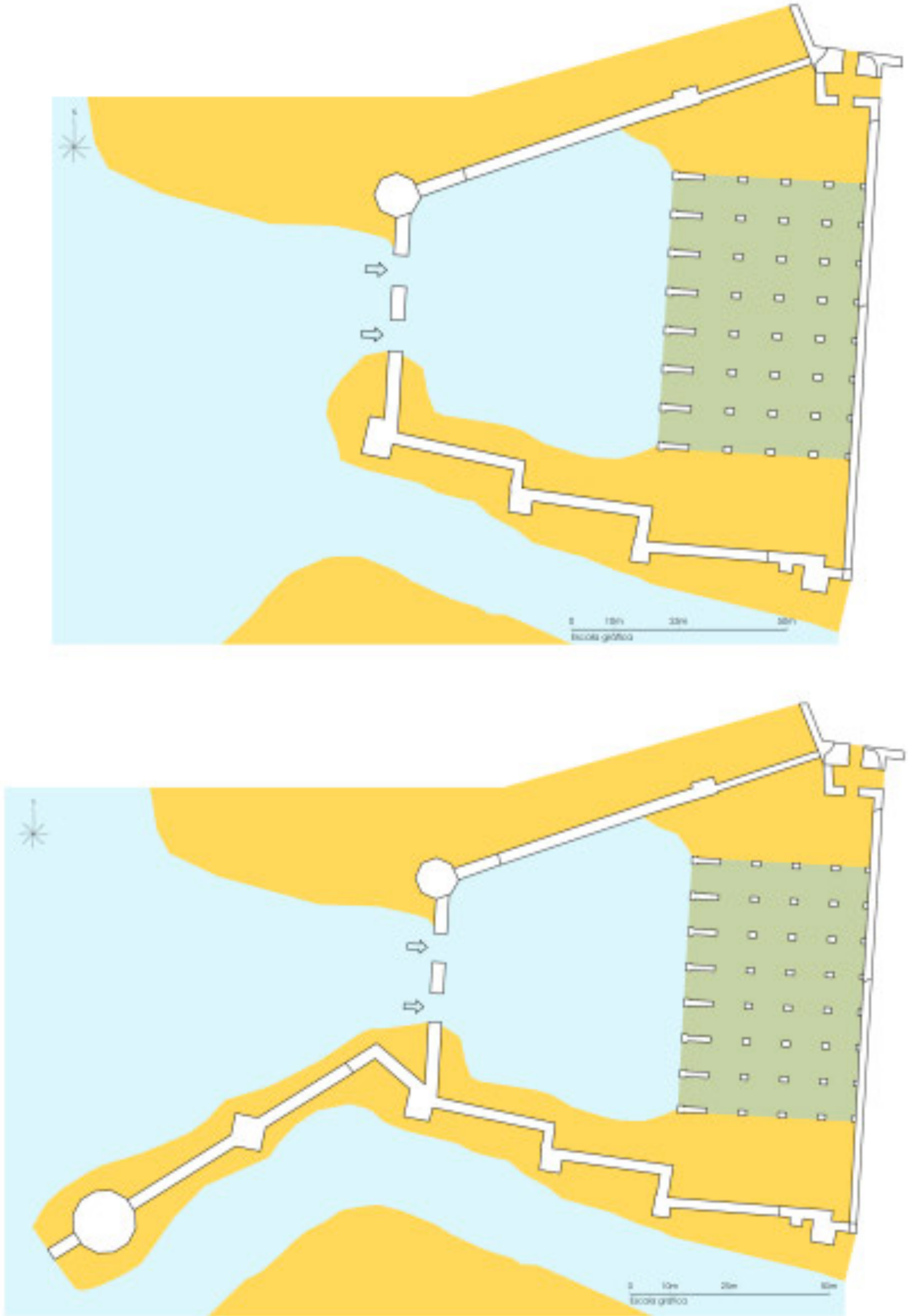


Figure 164: Reconstruction plan of the Almohad shipyard and its estimated seven shipsheds at the time of its construction in AD 1184 (top); second phase of the shipyard around AD 1221, when the southern wall was extended to reach the river (bottom) (courtesy of Fernado Amores Carredano, scale bar 50 m).

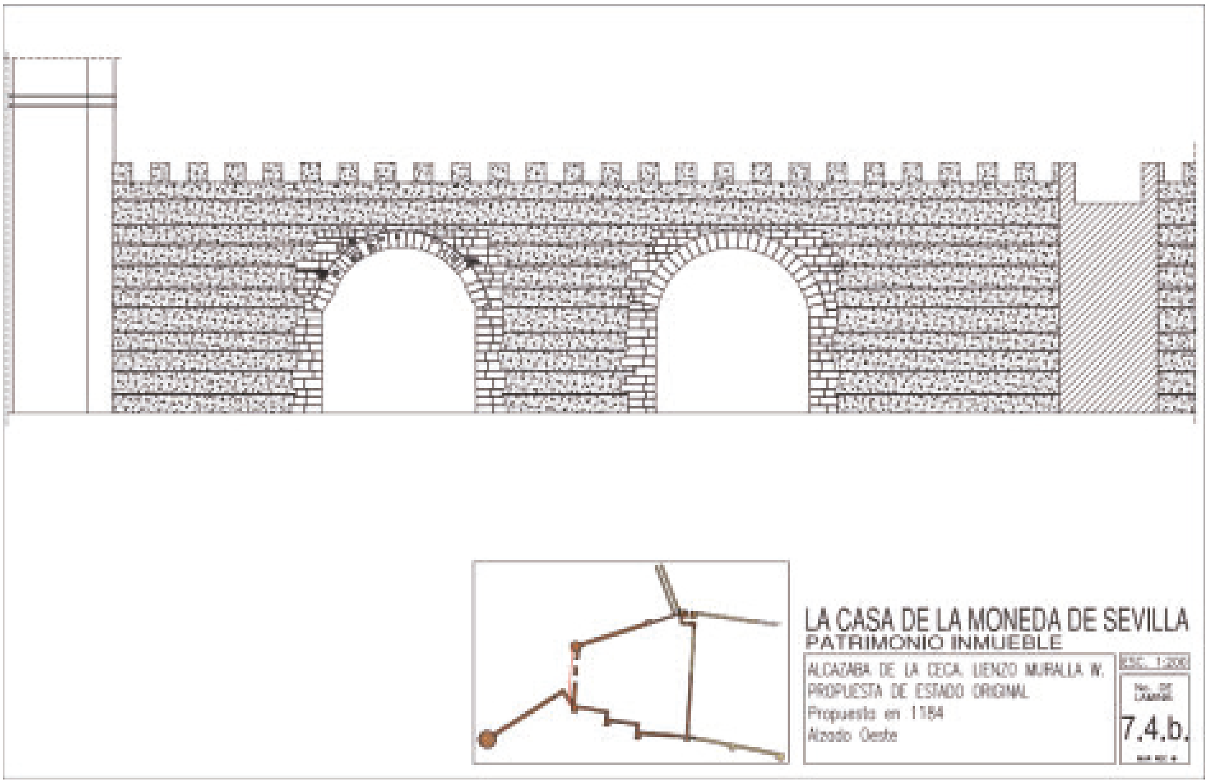


Figure 165: Reconstruction of the west façade (exterior) of the shipyard (after Mora Vicente, 2013: vol. 2, 82).

The remains of the fortified shipyard which still stand today include the impressive Torre del Oro, the Torre de la Plata, and one of the original gates of the shipyard. The top gudgeons for the pintles of the original doors (now lost) of this gate are still visible (Figure 166).

Figure 166: Images of the current state of some of the shipyard remains at Seville. Torre del Oro (top left); western wall and Torre de la Plata (top right); interior of the only remaining gate (bottom left); gudgeon for the original door (bottom right) (Sergio Harillo).

The two gates were preserved until 1988 when the shipyard remains underwent a comprehensive restoration and the south gate of the wall was covered with concrete (Figure 167).

Nevertheless, we will have to wait until Amores Carredano fully presents his hypotheses in a future paper, and we may also look forward to the results of future excavations in this location that may reach the foundations of the structures.

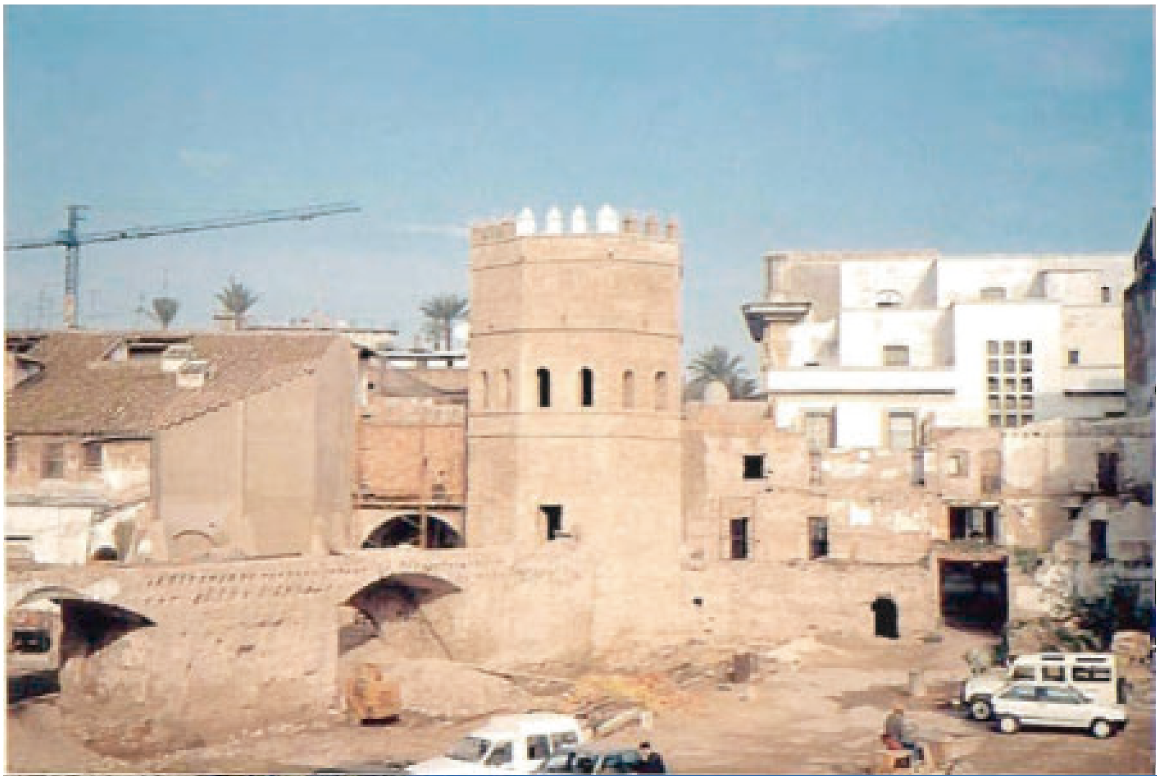


Figure 167: State of the wall in 1988 during the restoration works (top); note that both gates still existed (after Valor Piechotta and Tahiri, 1999: 49). Current state of the west wall of the shipyard remains (bottom)(Sergio Harillo).

We do not have any archaeological remains of the 9th century shipsheds in Seville, but it would be interesting to see if the 12th century ones were built on the same site as those of the 9th century. Perhaps the Caliph Abu Ya'qub, instead of building *ex novo* a dockyard in the 12th century, ordered the restoration of the 9th century dockyard and its shipsheds, as he did with other ancient urban infrastructures in Ishbiliyya such as the Roman aqueduct (*vide supra*). At the moment this hypothesis is just an academic guess derived from the optimal location of this site in relation to the river. In this regard, it is interesting to note that this 12th century dockyard (and perhaps the 9th century one) is in the same area proposed to have had Roman masonry quays at the southern harbour of the Roman port of Hispalis (see Chapter 3). If future archaeological excavations could verify that the 9th century shipsheds were located there, one wonders if the Roman harbour infrastructures and their masonry were reused to build the 9th century Islamic shipsheds. In other words, it would be interesting to see if in the 9th century, the site of a long abandoned Roman harbour, and its associated ancient infrastructures (e.g. quays) originally built with excellent quality Roman construction materials (e.g. ashlars), were reused to erect a new shipyard equipped with shipsheds as the historical chronicles have informed us (Levi-Provençal and García Gómez, 1950: 144-150; Bosch Vilá, 1984: 35-50). After all, the reuse of Roman quay foundations for building subsequent Islamic walls has been attested in the La Campana excavation (see Chapter 3) and the use of Roman *spolia* is well documented in the construction of the 11th century fortification walls of the Alcázar (Tabales Rodríguez, 2013: 100, footnote 25).

Regarding the morphology and facilities of the Islamic port, it can be said that after the avulsion of the ancient channel and the formation of a new riverbed (*vide supra*), the east bank was convex in shape, sloped, and subject to flooding by the daily tides. This convex bank became known as "el Arenal" in the 16th century. Its gentle slope created a natural harbour and shipyard ideal for berthing small flat bottom riverboats and or for the construction and repair of ships. In this sloped natural harbour, wooden jetties were usually constructed to facilitate transhipment. All these operations were carried out and were represented in many 16th century illustrations of Seville (Figure 168).

Figure 168: Picture illustrating Seville and its port in the 16th century. Work attributed to Alonso Sánchez Coello depicting the Guadalquivir River and Seville's natural harbour known as "El Arenal" (Museo de America, Madrid).

Concerning the commercial daily activities of the port around the early 12th century, Ibn ʿAbdūn provided a vivid description of many aspects in his *Hisba* treatise. (Ibn ʿAbdūn, ed. García Gómez and Lévi-Provençal, 1981: *passim*). The port on the west bank of the river was the epicentre of daily life in Ishbiliyya where exports departed carried by merchants and it was also a meeting point for foreigners, merchants, travellers, and people in general. Consequently, the area of the port was the property of the State and strictly for public use. Thus the authorities of the city were bound to prevent, at all costs, the construction of any private building or any other unauthorised use of the area (Ibn ʿAbdūn, ed. García Gómez and Lévi-Provençal, 1981: 103).

Chapter 6: Conclusions

The development of the ancient port of Seville and its city has been intimately tied to that of the Guadalquivir River. Other authors have also noted this; the first study of the ancient port of Hispalis was completed by the ancient historian Salvador Ordóñez Agulla (2003) and his hypotheses remain valid to this day. Later, the archaeologist Daniel González Acuña (2011) built upon the work of Ordóñez Agulla (2003) and produced fundamental work for enabling an understanding of the morphology and urban development of Hispalis, including its port (González Acuña, 2010). However, these and other authors had a terrestrial based approach: they looked at the ancient port from the point of view of the city. For the first time, this Thesis does the reverse; it looks at the port, and the city, from the river. I believe that the maritime archaeology and cultural landscape approach, as proposed by Westerdahl (1992) and applied in this Thesis, offers a more comprehensive picture of the ancient port than those previously obtained from a terrestrial based methodology.

The ancient descriptions of navigation in the Baetis and the tides at Hispalis define the port of Seville as being part of the maritime façade of the Atlantic coast. However, in ancient times this Atlantic port paradoxically played a key role in the broader Mediterranean Maritime Networks. Its unique geographical location was an important factor that allowed the port of Hispalis to become an important commercial hub (i.e. emporium) of the Western Mediterranean Maritime Networks. Additionally, the strategic position of Hispalis as a maritime port of the Atlantic façade suited perfectly within the proposed Atlantic maritime route, for the shipping of goods to Roman legions at the northern frontier of the Empire (Schäfer, 2016; 2017), which seems to have been both faster and less expensive than the traditionally accepted Mediterranean route (i.e. Gades to Arelate). The geomorphology and hydrology of the Baetis River also contributed to this, and these features were similar to those of Central and Northern European rivers as defined by Beaudouin 1994. This Thesis has shown how Hispalis was strategically located as the transit point between its fluvio-maritime transport zone and its fluvial one (Beaudouin, 1994; Rieth, 1998), which helped navigation upstream on the river by using the force of the daily tides as described by Strabo (3.2.4). These were certainly some of the reasons why the original settlement was established there, and why Roman Hispalis was successful in fulfilling the demands of Rome to produce a range of materials needed for the capital and other parts of the Mediterranean, becoming one of the most important commercial ports connecting with the Western Mediterranean Networks during the Roman Era.

This Thesis has shown that the geomorphology and hydrology of the Baetis River during the Roman Era were very similar to those of the Guadalquivir River in the second half of the 20th century. This reflexion, which to my knowledge has never been previously observed, allows a comparative diachronic analysis to be made of different aspects (e.g. navigation) of the river, such as the use of daily tides for navigating upstream (see Chapter 3). We have seen that from the 9th to the early 20th century, the Guadalquivir River underwent important changes that largely affected both its geomorphology and hydrology. The estuary of the river endured a “general process of continentalization” in which the Lacus Ligustinus and the maritime marshes were transformed, by a lengthy proceeds of siltation, into an "interior delta" (Vanney, 1970). Some authors have made comparative analyses of the Guadalquivir River during the 16th century and the Roman Era. However, as shown in this Thesis, both the geomorphology and hydrology of the river, as well as the position of the riverbed in Seville, were very different during each of these periods and, therefore, diachronic comparison between those two eras, regarding navigation, has to be carried out with caution.

Although previous studies have been conducted (Guerrero Misa, 1984; Cabrera Tejedor, 2013, 2014, 2016; 2017; forthcoming), this Thesis has studied all the materials from the 1981 excavation at Plaza Nueva for the first time demonstrating how essential they are for an understanding of the ancient port of Seville. The amphora sherds, the cruciform anchor, and the Islamic boat, all attest that this location was an anchorage area in the ancient port from antiquity until the beginning of the 11th century AD. The detailed study of these materials, conducted in this Thesis, has contributed to the determination of the position of the Guadalquivir River during different historical periods, and has established the exact chronologies, as well as some morphological characteristics of the ancient riverbed and the port (see Chapters 3, 4, and 5).

We have seen that Roman Hispalis was located in the middle of two different, but complementary, commercial networks: the terrestrial network of Baetica, the Via Augusta, and the riverine-maritime network of the Baetis and its connection to the Atlantic Ocean and the Mediterranean. This made Hispalis the central node of regional communications for south-western Roman Baetica. This hypothesis was supported by a network connectivity study (i.e. Urban Connectivity Project) conducted with the aid of GIS models of riverine, maritime and terrestrial networks in Roman Baetica (Earl and Keay, 2007). Hispalis, as the central node of the Baetica trade networks, was also an important node of the larger Western Mediterranean trade network (despite being an Atlantic port). The port of Hispalis acted as a conduit for the import and export trade between the Guadalquivir valley, Rome, and different parts of the Mediterranean (Keay, 2016: 308).

For the Roman Period, the epigraphy found in Seville provides important information about the commercial activities at the port of Hispalis. The inscriptions belong mainly to the 2nd century AD, which with the exportation of foodstuffs bound to the *annona*, seems to have been the most important and prolific period of trade in Roman Seville as attested by amphorae found at Monte Testaccio. The epigraphic evidence from Hispalis provides us with important data about the different associations of boatmen: the *lyntrarii* and the *scapharii*. They were in charge of loading and unloading the *naves onerariae* used to import and export foodstuffs and other cargoes. They also give us information about the officials who oversaw these operations, controlling the boatmen's associations and managing the Baetis River.

The size of this economic endeavour was previously suggested by estimating the annual production of olive oil in Baetica. Remesal Rodríguez (1998: 197) and Blázquez (2001: 41-43) have suggested that the 25 million amphorae found at Monte Testaccio; was equivalent to 7,000,000 litres of olive oil produced in Baetica and shipped to Rome per year (Remesal Rodríguez, 1998: 197). Chic García (2006: 282) estimated the total production of olive oil from Baetica bound to the state was 13,000 metric tons annually, and it was stored and transported inside 185,715 Dressel 20 amphorae. However, this Thesis has been the first to propose the economic value to the oil trade from Hispalis. 13,000 metric tons (i.e. 13,000,000 litres) of olive oil, would have had a market value of 1,248 million *sestertii* (*vide supra*). At that time, this was equal to the total cost of the entire Imperial Roman army in c. AD 215 (i.e. between 1,127 and 1,188 million *sestertii*), which represented approximately three-quarters of the Empire's annual budget (Duncan-Jones, 1994: 45).

This Thesis is the first academic work suggesting that the Roman commercial riverboats and barges from the Baetis River used for transportation were probably similar in characteristics to their Central and Northwest European counterparts (see Chapter 3). We have seen how flat-bottomed barges were the most efficient vessels for inland waterway transport, since their "lidless-box" shaped hull maximised their cargo capacity while keeping a very small draught which rarely exceeded 1 m (Bockius, 2004). Numerous archaeological surveys carried out in the lower Guadalquivir Valley have identified a myriad of villas, rural settlements, and *figlinae* (Ponsich, 1974; 1979; 1987; 1991; Mattingly, 1988a). The Baetica oil was produced and bottled in these places, and many of these *figlinae* are referred to as "ports" in the seals found on the amphorae (Berni Millet, 2008). However, no evidence of port facilities has been found so far in the form of conventional structures such as quays built with ashlars of stone, despite the extensive surveys that have been carried out.

This Thesis has proposed, for the first time, that the use of flat-bottomed riverboats and barges in the Baetis would explain the lack of harbour infrastructures in those production centres. These "ports" were likely to have been simple loading and unloading facilities without complex harbour infrastructures. For transhipment of amphorae to occur, only two elements were necessary: on one hand, a slightly inclined bank where a flat-bottomed barge could be berthed; on the other, a wooden pole or a simple tree nearby which to tie and secure the craft. The loading and stowage of the barge would have been carried out by stevedores, as evidenced by the iconography of the ports of Ostia and Narbone (Tchernia, 1997: 117, 119 and 127).

Chic García (2006: 282) estimated that 200 riverboats were necessary to transport the annual production of 13,000 metric tons of olive oil, or 185,715 Dressel 20 amphorae. In contrast to Chic García, in order to estimate the number of riverboats, I considered several additional factors: the volume of the cargo (not only the weight), the seasonality of the navigation on the Guadalquivir River, the different length of time for navigation (downstream vs. upstream), and the time necessary for loading and unloading, as well as the seasonal and time constraints in relation to the production and commercialization of olive oil (see Chapter 3). By accounting for all these variables, I estimated that a flotilla of between 39 and 72 river barges operating in the Baetis River could transport the annual production of olive oil. These figures are close to the modest flotilla of 20-30 *caudicariae* estimated by Boetto (2016: 282) needed to transport cereal between Ostia and Rome. They are also comparable to the 40 commercial riverboats that operated in the Guadalquivir River from Cordoba to Seville in the 15th century (Collantes de Terán Sánchez, 2001: 160, 178-179).

Strabo reported that the majority of exports from Baetica had destination ports in Italy. Merchant freighters and seafarers sailing from and to Italy preferred the high seas route because of its fair weather and regular winds that blew at a fixed time each year (Strabo 3.2.5). He also commented that the abundance of exports from the Baetica region was attested by the large number of ships, and that the greatest size merchantmen sailed from there towards Dicaerchia (i.e. Puteoli) and Ostia, the seaport of Rome (Strabo 3.2.6).

Strabo's description of maritime trade exports from Baetica emphasised two particular aspects. First, the high seas route was preferred and that was used during a defined and fixed period of the year (i.e. May, June, July[60]). Second, that different sizes of freighters were used, but with the prominent use of merchantmen of the greatest size. In that sense, we have seen (in Chapter 3) that a dozen large (400 tons) Roman freighters or, alternatively, 30 smaller *corbitae* (80 tons) would have been necessary for the Rome oil trade alone. Additionally, considering that Chic García estimates 13,000 metric tons for the total annual production of olive oil, these numbers would increase to 25 large Roman freighters or 60 smaller ships of burden.

[60] Pascal Arnaud personal comment.

The size of ships that the port of Hispalis would have been able to accommodate was unknown. Some authors have proposed that it is likely that large vessels were able to operate there, on the basis that galleons from the Indies were used in Seville during the 15th and 16th century (e.g. Keay, 2016: footnote 82). However, those 16th century galleons sailed through, and anchored in, a different channel of the Guadalquivir at Seville, and not on the ancient channel of the Baetis. Through the study of the Plaza Nueva artefacts, I have been able to reconstruct the approximate stratigraphy of the site (see Chapter 5), which suggests that the ancient Roman channel of the Baetis River had a depth of at least 5 m. The biggest ships used for maritime transport (350-500 tons), such as the Madrague de Giens, had an estimated draught of around 3-3.5 m (Boetto, 2016: 284, footnote 76), and therefore could have sailed through the Roman Baetis and berthed in the docks of Hispalis. Now that it has been demonstrated that large freighters could indeed have been physically employed in Hispalis, it seems plausible that they were used for the transportation of the massive quantities of foodstuffs bound to Rome every year.

Supporting this idea of the use of large merchantmen contracted by the state in relation with the *annona*, we have the testimony by a Roman jurist, Scaevola. He informs us (Dig. 50.5.3) that towards the end of the 2nd century AD, ship-owners who put a seagoing ship of 50,000 *modii* (i.e. *circa* 340 tons) or several ships of 10,000 *modii* (i.e. *circa* 70 tons) at the state's disposal for the *annona* were exempt from compulsory public services (Casson, 1995: 171 footnote 23).

The fact that all the inscriptions pertaining to the port of Hispalis seem to have come from the same area of Seville, in conjunction with the archaeological findings of those areas related to port facilities and warehouses (see Chapter 3), has been interpreted as an indication of the existence of an extramural emporium; the *statio rumulense* mentioned by one of the inscriptions would have been located within the emporium (Ordóñez Agulla, 2003: 71-72). These harbour facilities were located in the south of Hispalis, nearby the confluence of the Baetis River and the Tagarete Stream (see Chapter 3).

This Thesis has examined the harbour infrastructures and facilities of the Roman port and for the first time has considered the nature of the river meander in order to decipher their design. Within the port of Roman Hispalis, three different harbours have been identified on the east bank of the river.

First, during the Republican period, the city seems to have had a natural sloped harbour located on the convex bank of the river where military fleets were built (*Caesar, Bell. Civ.*: 2.18; *Bell. Alex.*: 51, 56). Second, towards the south, on a concave bank, a masonry waterfront equipped with quays seems to have existed from the end of the Republican period until the mid 2nd century AD. Nearby this harbour, a large district of commercial warehouses (*horrea*) was located. This Thesis has suggested that it had warehouse space of around 45,000 m^2, which was similar to the space available at Ostia at the end of the 2nd century AD. From the 2nd century AD, the port was reorganised into a smaller harbour located at the centre of the meander adjacent to the city of Hispalis. The importance of this harbour district is attested mainly by epigraphic evidence. It has been proposed that this harbour would have been primarily concerned with the ships contracted by the state in relation to the Imperial acquisition of Baetican foodstuffs (Garcia Vargas, 2014: 204-205), as well as for the location of a *statio* of the *collegium* of the *olearii* (González Acuña, 2010: 96-101; 2011: 424-430). Third, another harbour area was located at the north of the meander. This district was occupied by commercial facilities and landing stages until the 2nd century AD, when residential areas replaced them.

These three harbours seem to have been connected by a long riverfront on the east bank. The length of the riverfront is of *circa* 1.5 km, which is comparable to the 1.2 km of Lepcis Magna (Wilson *et al.*, 2012: 382) and the one at Ostia, (Keay, 2016: 309). However, the fragmentary nature of the archaeological record does not allow us to get a clear idea of the precise configuration and extent of the harbour facilities (Keay, 2016: 309). Considering the nature and transformation of the meander of the river at Seville, this Thesis has proposed that during the Republican period the port was equipped with wooden jetties, and wharfs as well as stone quays, and/or a combination of both. Because of the straightening of the meander during the Imperial period, the waterfront was likely to be built entirely of masonry and concrete foundations constructed over wooden piles. Unfortunately, nothing is known of possible harbour infrastructures or facilities on the west bank of the river and thus proposing a hypothesis, other than that this area was outside the city walls and possibly had a road leading to the west flanked alongside by Roman cemeteries (Collantes de Terán Delorme, 1977: 78-79, fig. 6), would be purely conjectural.

We have extremely scarce information regarding the port of Hispalis in the Late Antique period, although because of its geopolitical importance, it was at the centre of the political and military events of the 6th century. These include the Vandals possibly embarking in a fleet from Hispalis when they crossed to North Africa (Ordóñez Agulla, 2002: 36), two Visigothic civil wars, and the long-lasting struggle against the occupation of coastal territories by Imperial troops from Byzantium (see Chapter 4). Based on indirect evidence, it appears that the port maintained its connections with the Mediterranean maritime network, certainly during the 6th and perhaps until the early 7th century.

The study of the Plaza Nueva archaeological materials have allowed the hypothesis that large merchantmen were able to navigate the river to be demonstrated. However, the cruciform anchor found in the channel could be interpreted as a sign that these merchantmen no longer berthed on quays, but rather anchored in the river. This suggests the probable disappearance or decline of the Imperial harbour infrastructures. The change in the dynamics of the hydrology of the Baetis river, occurring between the 4th and the 6th century AD, also supports this hypothesis. After the displacement of the channel further away from the city towards the west, it is plausible that the masonry from the Imperial waterfront (at that time useless) was dismantled and reused as *spolia*. Ordóñez Agulla (personal comment) has suggested that the exposed Roman wooden pile foundations, visible in the Late Antique period possibly inspired Saint Isidore when he described, on his Etymologies (XV, 1, 71), that the Roman name of the city of Hispalis developed because it was placed in swampy ground on piles (*palus*; *his palis* = 'on these piles') (cited by García Vargas, 2012c: 884). For the first time this Thesis has also included palaeo-climatic studies for the understanding of Late Antique Seville. They have provide data which support other proxies, and has allowed me to propose a new hypothesis to explain what John of Biclaro meant in his chronicle when he described the blocking, or closing, of the Baetis River (i.e. *Baetis conclusio*) by Leovigild in AD 583 (see Chapter 4).

Palaeo-climate and palaeo-flood studies have proved essential to understand the geomorphological and hydrological changes that the Guadalquivir River underwent during the Islamic Period. Building upon the palaeo-geomorphological hypothesis of Borja Barrera (2014) regarding the transformations of the ancient channel of the river, this Thesis has combined several palaeo-sciences in connection with the archaeological record of Plaza Nueva. In addition to these two sets of information, this Thesis included, for the first time, the historical accounts by Islamic Chroniclers reporting severe floods in the Guadalquivir River which occurred during the Islamic Period. These expand and supplement the essential work of Francisco de Borja Palomo (1878), who compiled a list of the floods happening from AD 1258 until the end of the 19th century. This interdisciplinary approach has allowed this Thesis to decipher the causes, mechanisms, and chronology of the complex transformation of the Guadalquivir River during the Islamic Period. The siltation of the ancient channel led to the demise and eventual disappearance of the ancient port of Seville which was then occupied by the developing city of Ishbiliya during the 12th and 13th centuries (see Chapter 5). This Thesis has shown how an epoch of intense flooding produced an avulsion of the meander (Borja Barrera, 2014: 298-299) in Seville, followed by a progressive yet slow displacement (i.e. 1 m per year) of the newly formed channel towards the

West. Further, it has explained how these events were gradual and occurred over several centuries, which clarifies why there are no historical chronicles describing sudden changes in the river nor the relocation of the port.

We have seen that during the Islamic period, Viking attacks led to the development of a comprehensive naval policy in al-Andalus. This resulted in the construction of war galleys and shipsheds to house them. In Seville the historical chronicles attest that the first shipsheds were built in the 9th century. Other historical chronicles inform us that new shipsheds were constructed during the 12th century and it seems that their archaeological remains have been located. This thesis proposes the tentative hypothesis that the 12th century shipsheds where a reconstruction or restoration of the 9th century shipsheds, rather than a construction *ex novo*, although there is no archaeological evidence to support this proposition as yet (see Chapter 5). What remains unclear is whether these Islamic shipsheds from al-Andalus were constructed as a reflection of contemporary Eastern Mediterranean examples, or if they were inspired by those of the Roman period (Rankov, 2013: 30). Regardless, they were dwarfed by the shipsheds built in Seville by King Alfonso X of Castile in the 13th century (Amores Carredano and Quirós Esteban, 1999).

To conclude, as we have seen from this Thesis, the direct archaeological evidence for the ancient port of Seville is fragmentary and scarce. This is probably the reason why a comprehensive study of this port has never been conducted until now. This Thesis has shown that only with a holistic approach (historical, archaeological and scientific), a maritime archaeology perspective, and a diachronic study of three different historical periods (encompassing thirteen centuries of history), has it been possible to offer a description of the construction, development, and demise of the ancient port of Seville. The resulting picture that has been obtained is far from complete, but the hypotheses presented are firmly based on the existing evidence. I hope this Thesis will constitute a solid foundation for additional studies on the ancient port of Seville, and that we may therefore look forward to future work on this topic.

References

Primary sources

al-Ḥimyarī, I. ʿ. a.-M. 1938. Kitāb al-Rawḍ al-miʿṭār fi k̲h̲abar al-aḳṭār. *In:* Lévi-Provençal, E. (ed.) *La Péninsule Ibérique au Moyen-âge d'après le Kitāb arrawḍ al miʿṭār fī ḫabar al-aḳṭār d'Ibn ʿAbd al Munʿim al-Ḥimyarī : texte arabe des notices relatives à l'Espagne, au Portugal et au sud-ouest de la France.* Leiden: E.J. Brill.

al-Marrākushī, ʿ. a.-W. 1955. Al-Mugrib fī ḥulā al-Magrib. *In:* Huici Miranda, A. (ed.) *Kitāb al-Muʿŷib fī taljīṣ ājbār al-Magrib : lo admirable en el resumen de las noticias del Magrib.* Tetuán: Editora Marroquí.

al-Rāzī, I. b. A. b. M. i. M. 1967. Akhbar muluk al-Andalus. *In:* García Gómez, E. (ed.) *Anales Palatinos del Califa de Córdoba al-Hakam II.* Madrid: Sociedad de Estudios y Publicaciones.

Ammianus Marcellinus 1935. Res Gestae. *In:* Rolfe, J. C. (ed.) *History (3 vols.).* London : Cambridge, Massachusetts: Harvard University Press.

Ausonius, D. M. 1919. Liber XI : Ordo urbinum nobilum. *In:* Evelyn-White, H. G. (ed.) *Ausonius, Volume I: Books 1-17.* London : Cambridge, Massachusetts: Harvard University Press.

Avienus, R. F. 1934. Ora Maritima. *In:* Berthelot, A. (ed.). Paris: Champion.

Avienus, R. F. 1977. Ora Maritima. *In:* Murphy, J. P. (ed.) *Ora maritima : a description of the seacoast from Brittany to Marseilles [Massilia].* Chicago: Ares Publishers.

Caesar, J. & Hirtius, A. 1955. De Bello Alexandrino, De Bello Africo, De Bello Hispaniensi. *In:* Way, A. G. (ed.) *Alexandrian, African and Spanish wars.* London : Cambridge, Massachusetts: Harvard University Press.

Caesar, J. 1917. Commentarii de Bello Gallico. *In:* Edwards, H. J. (ed.) *The Gallic War.* London : Cambridge, Massachusetts: Harvard University Press.

Caesar, J. 2016. Commentarii de Bello Civili. *In:* Damon, C. (ed.) *Civil war.* Cambridge, Massachusetts: Harvard University Press.

Caro, R. 1634. *Antigüedades, y Principado de la Ilustrissima Ciudad de Seuilla. : Y Chorographia de su Conuento Iuridico, o, Antigua Chancilleria. Dirigida al Excelentissimo Señor Don Gaspar de Guzman, Conde Duque de Sanlucar la Mayor.* En Seuilla, Por Andres Grande. Impressor de libros.

Chapman, F. H. a. 1971. *Architectura Navalis Mercatoria.* London, Coles.

Fear, A. T. 1997. *Lives of the Visigothic Fathers.* Liverpool, Liverpool University Press.

Gregory I 1893. Registrum Epistolarum. *In:* Ewald, P. & Hartmann, L. M. (eds.) *Gregorii I Papae Registrum epistolarum.* Berolini: apud Weidmannos.

Gregory of Tours 1974. Historia Francorum. *In:* Thorpe, L. (ed.) *The history of the Franks.* Harmondsworth: Penguin classics.

Hydatius 1894. Chronica. *In:* Mommsen, T. (ed.) *Chronica minora saec. IV. V. VI. VII.* Berolini: apvd Weidmannos.

Hydatius 1993. Chronica. *In:* Burgess, R. W. (ed.) *The Chronicle of Hydatius and the Consularia Constantinopolitana.* Oxford: Clarendon Press.

Ibarra, J. 1782. *Retratos de los Reyes de Espana desde Atanarico hasta Nuestro Católico Monarca Don Cárlos III (que Dios guarde) segun las Noticias y los Originales mas Antiguos que se han Hallado : con sus Correspondiente Inscripciones y el Sumario de la Vida de Cada Rey.* Madrid, J. Ibarra.

Ibn Abī Zarʿ al-Fāsī, ʿ. l.-Ḥ. ʿ. i. ʿ. 1964. Kitāb al-ānīs al-muṭrib bi-rawḍ al-qirṭās fī ākhbār mulūk al-maghrab wa tārīkh madīnah Fās. *In:* Huici Miranda, A. (ed.) *Rawḍ al-Qirṭās.* Valencia: J. Nácher.

Ibn al-Qūṭiyya, M. i. ʿ. i. ʿ. a.-ʿ. i. I. i. ʿ. i. M. 1926. Ta'rikh iftitah al-Andalus. *In:* Ribera, J. (ed.) *Historia de la Conquista de España del Abenalcotía el Cordobés Seguida de Fragmentos Históricos de Abencotaiba.* Madrid: Real Academia de la Historia.

Ibn Ḥayyān, A. M. Ḥ. i. K. 1937. Kitāb al-muqtabis fī ta'rīkh rijāl al-Andalus. *In:* Antuña, M. M. (ed.) *Al-Muḳtabis. Tome Troisième. Chronique du Règne du Calife Umaiyade ʿAbd Allāh à Cordoue.* Paris: P. Geuthner.

Ibn Ḥayyān, A. M. Ḥ. i. K. 1973. Kitāb al-muqtabis fī ta'rīkh rijāl al-Andalus. *In:* Makkī, M. ʿ. (ed.) *al-Muqtabas min anbā' ahl al-Andalus.* Bayrūt: Dār al-Kitāb al-ʿArabī.

Ibn Ṣāḥib al-Ṣalāh, ʿ. a.-M. i. M. 1969. al-Mann bi ʾl-imāma ʿala ʾl-mustaḍʿafīn bi-an d̲jaʿalahum Allāh al-aʾimma wa-d̲jaʿalahum al-wārit̲h̲īn. *In:* Huici Miranda, A. (ed.) *Al-Mann bi ʾl-imāma : Estudio preliminar, traduccion e indices.* Valencia: Valencia.

Ibn ʿAbdūn, M. i. A. A.-T. 1981. Risala fi-l-qada wa-l-muhtasib. *In:* Lévi-Provençal, E. & García Gómez, E. (eds.) *Sevilla a comienzos del siglo XII.* Seville: Ayuntamiento de Sevilla.

Ibn ʿIdhārī, M. 1904. Kitāb al-Bayān al-Mughrib fī ākhbār mulūk al-Andalus wa'l-Maghrib. *In:* Fagnan, E. (ed.) *Histoire de l'Afrique et de l'Espagne intitulée Al-Bayano' l-mogrib.* Alger: P. Fontana.

Ibn ʿIdhārī, M. 1953. Kitāb al-Bayān al-Mughrib fī ākhbār mulūk al-Andalus wa'l-Maghrib. *In:* Huici Miranda, A. (ed.) *Al-Bayān al-Mugrib fi ijtiṣār ajbār muluk al-Andalus wa al-Magrib : los Almohades.* Tetuán: Editora Marroquí.

Isidore of Seville 1964. De Viris Illustribus. *In:* Codoñer Merino, C. (ed.) *El "De viris illustribus" de Isidoro de Sevilla.* Salamanca: Consejo Superior de Investigaciones Científicas, Instituto "Antonio de Nebrija", Colegio Trilingüe de la Universidad.

Isidore of Seville 1975. Historia de regibus Gothorum, Vandalorum et Suevorum. *In:* Rodríguez Alonso, C. (ed.) *Las Historias de los godos, vándalos y suevos de Isidoro de Sevilla : estudio, edición crítica y traducción.* León: Centro de Estudios e Investigación "San Isidro".

Isidore of Seville 1999. Historia de regibus Gothorum, Vandalorum et Suevorum. In Wolf, K. B. (ed.) *History of the Kings of the Goths.* Liverpool: Liverpool University Press, pp. 67-90.

Isidore of Seville 2006. Etymologiae. *In:* Barney, S. A. (ed.) *The etymologies of Isidore of Seville.* Cambridge: Cambridge University Press.

Jiménez de Rada, R. 1987. Roderici Ximenii de Rada Historia de Rebus Hispanie, sive, Historia Gothica. *In:* Fernández Valverde, J. (ed.) *Historia de los hechos de España.* Turnholti: Typographi Brepols Editores Pontificii

John of Biclaro 1999. Chronica. In Wolf, K. B. (ed.) *Conquerors and Chroniclers of Early Medieval Spain.* Liverpool: Liverpool University Press, pp. 51-66.

John of Biclaro 2001. Chronica. *In:* Cardelle de Hartmann, C. & Collins, R. (eds.) *Victoris Tunnunensis Chronicon : cum reliquiis ex Consularibus Caesaraugustanis et Iohannis Biclarensis Chronicon.* Turnhout: Brepols.

Jordanes 1882. Romana, Getica. *In:* Mommsen, T. (ed.) *Iordanis Romana et Getica.* Berolini: apud Weidmannos.

Lafuente y Alcántara, E. (ed.) 1867. *Akhbar Majmu'a : Ajbar machmuâ : (Colección de Tradiciones) : Crónica Anónima del Siglo XI, dada á luz por primera vez,* Madrid: Rivadeneyra.

Maqqarī, A. i. M. 1855. l-Qism al-awwal min kitāb nafḥ al-ṭīb, min ghuṣn al-Andalus al-raṭīb, wa-dhikr wazīrihā Lisān al-Dīn ibn al-Khaṭīb li-Abī al-ʻAbbās Aḥmad ibn Muḥammad al-Maqarrī. *In:* Dozy, R. P. A. (ed.) *Analectes sur l'Histoire et la Littérature des Arabes d'Espagne.* Leyde: E.J. Brill.

Philostratus, Apollonius & Eusebius 2005. Apollonius of Tyana. *In:* Jones, C. P. (ed.) *Apollonius of Tyana, Volume I Life of Apollonius of Tyana, Books 1-4.* Cambridge, Mass.: Harvard University Press.

Pliny the Elder 1938. Naturalis Historia. *In:* Rackham, H. & Jones, W. H. S. (eds.) *Natural History.* London : Cambridge, Massachusetts: Harvard University Press.

Procopius of Caesarea 1914. De Bellis. *In:* Dewing, H. B. (ed.) *Procopius : History of the Wars, Volume I Books 1-2.* London: W. Harvard University Press.

Silius Italicus, T. C. 1934. Punica. *In:* Duff, J. D. (ed.) *Punica, Volume I: Books 1-8.* Cambridge, Massachusetts : London: Harvard University Press.

Strabo 1923. Geographica. *In:* Jones, H. L. (ed.) *Geography, Volume II Books 3-5.* London : Cambridge, Massachusetts: Harvard University Press.

Symmachus, Q. A. 1972. Epistolarum. *In:* Callu, J.-P. (ed.) *Lettres [de] Symmaque: Livres III-V (Vol. 2).* Collectio ed. Paris: Les Belles Lettres.

Valencia Rodríguez, R. 1986. La cora de Sevilla en el Tarsi al-ajbar de Ahmad B. Umar al-Udri. In Bosch Vilá, J. & Hoenerbach, W. (eds.) *Andalucía Islámica. Textos y Estudios IV-V (1983-1986)* Granada: Anejo de Cuadernos de Historia del Islam, pp. 107-143.

Valerius of El Bierzo 1997. Vita Fructuosi. In Fear, A. T. (ed.) *Lives of the Visigothic Fathers.* Liverpool: Liverpool University Press, pp. 123-144.

Vegetius Renatus, F. 2004. Epitoma rei militaris. *In:* Reeve, M. D. (ed.) *Vegetius: Epitoma rei militaris.* Oxford: Oxford University Press.

Velázquez, I. 2008. *Vidas de los Santos Padres de Mérida.* Madrid, Trotta.

Vitruvius Pollio, M. 1931. De Architectura. *In:* Granger, F. (ed.) *On Architecture, Volume I: Books 1-5.* London : Cambridge, Massachusetts: Harvard University Press.

Wolf, K. B. 1999. *Conquerors and Chroniclers of Early Medieval Spain.* Liverpool, Liverpool University Press.

Secondary sources

Aa.Vv. 1985. *El Río. El Bajo Guadalquivir.* Madrid, Equipo 28, Ayuntamiento de Sevilla.

Abad Casal, L. 1975. *El Guadalquivir, Vía Fluvial Romana.* Seville, Diputación Provincial de Sevilla.

Abulafia, D. 2011. *The Great Sea : a Human History of the Mediterranean.* London, Allen Lane.

Adam, J. P. & Mathews, A. 1994. *Roman Building : Materials and Techniques.* London, Batsford.

Adams, C. 2012. Transport. In Scheidel, W. (ed.) *The Cambridge Companion to the Roman Economy.* Cambridge: Cambridge University Press, pp. 218-240.

Aguarod Otal, C. & Erice Lacabe, R. 2003. El puerto de Caesaraugusta. In Pascual Berlanga, G. & Pérez Ballester, J. (eds.) *Puertos Fluviales Antiguos: Ciudad, Desarrollo e Infraestructuras.* Valencia: Universitat de València, pp. 143-156.

Aguarod Otal, C. & Erice Lacabe, R. 2008. El port de Caesaraugusta. *Citerior: arqueologia i ciències de l'Antiguitats,* 4**,** pp. 97-117.

Almagro, A. 1987. Planimetría de las ciudades hispanomusulmanas. *Al-Qantara,* 8**,** pp. 421-421.

Almagro Basch, M. 1940. El hallazgo de la ría de Huelva y el final de la Edad del Bronce en el Occidente de Europa. *Ampurias,* 2**,** pp. 85-143.

Almagro Basch, M. 1958. *Depósito de la Ría de Huelva.* Madrid, Inventaria Archaeologica, Instituto de Prehistoria y Dirección General de Bellas Artes.

Almagro Basch, M. 1962. El muelle griego en Ampurias. *Boletín de Información del Ministerio de Obras Públicas,* 57**,** pp. 22-23.

Alonso Villalobos, C. & Garcia Vargas, E. 2003. Geopolítica imperial romana en el Estrecho de Gibraltar: el análisis geoarqueológico del puerto de “Baelo Claudia” y el emplazamiento de “Mellaria”(Tarifa, Cádiz). *Habis,* 34**,** pp. 187-200.

Alonso Villalobos, C., Menanteau, L., Gracia, F. J. & Ojeda, R. 2007. Geoarqueología y paleomorfología litoral de la ensenada de Bolonia (Tarifa, Cádiz). Primeros resultados y nuevas propuestas. In Arévalo González, A. & Bernal Casasola, D. (eds.) *Las cetariae de Baelo Claudia. Avance de las investigaciones arqueológicas en el barrio meridional (2000-2004).* Cádiz: Universidad de Cádiz, pp. 521-538.

Alvarez Marti-Aguilar, M. 2011. *Fenicios en Tartesos : Nuevas Perspectivas.* Oxford, Archaeopress.

Amores Carredano, F., García Vargas, E. & González Acuña, D. 2007. Ánforas tardoantiguas en Hispalis (Sevilla, España) y el comercio mediterráneo. In Traglia, M. & Bonifay, M. (eds.) *LRCW 2. Late Roman Coarse Wares, Cooking Wares and Amphorae in the Mediterranean: Archaeology and Archaeometry*. Oxford: Archaeopress, pp. 133-146.

Amores Carredano, F. & González Acuña, D. 2006. V fase de intervención arqueológica en el mercado de la Encarnación (Sevilla). Contextos tardoantiguos. *Anuario Arqueológico de Andalucía 2003 III Actividades de Urgencia Volumen 2.* Seville: Junta de Andalucía. Consejería de Cultura, pp. 197-206.

Amores Carredano, F. & Quirós Esteban, C. A. 1999. Las atarazanas: el tiempo y los usos. *Recuperando las Atarazanas: Un Monumento para la Cultura.* Seville: Junta de Andalucía. Consejería de Cultura y Medio Ambiente.

Amores, F. & Keay, S. 1999. Las sigillatas de imitación tipo Peñaflor o una serie de hispánicas precoces. In Roca Roumens, M. & Fernández García, M. I. (eds.) *Terra Sigillata Hispánica. Centros de Fabricación y Producciones Altoimperiales.* Málaga: Universidad de Málaga, pp. 235-252.

Anuario Arqueológico de Andalucía. 2016. Available: http://www.juntadeandalucia.es/organismos/cultura/areas/bienes-culturales/actividades-arqueologicas/paginas/anuario-arqueologico.html [Accessed 15 December 2016].

Aranegui Gascó, C. (ed.) 1991a. *Saguntum y el Mar,* Valencia: Conselleria de Cultura Educació i Ciencia.

Aranegui Gascó, C. 1991b. Puerto de Arse-Saguntum. In Aranegui Gascó, C. (ed.) *Saguntum y el Mar.* Valencia: Conselleria de Cultura Educació i Ciencia.

Aranegui Gascó, C., De Juan Fuertes, C. & Fernández, A. 2004. Saguntum como puerto principal, una aproximación náutica. In Gallina Zevi, A. & Turchetti, R. (eds.) *Méditerranée Occidentale Antique : les Échanges : III Seminario, Auditorium du Musée d'histoire, Marseille, 14-15 Mai 2004.* Soveria Mannelli: Rubbettino, pp. 75-100.

Aranegui Gascó, C., Ruiz Pérez, J. M. & Carmona González, P. 2005. El humedal del puerto de Arse-Saguntum. Estudio geomorfológico y sedimentológico. *Saguntum: Papeles del Laboratorio de Arqueología de Valencia,* 37, pp. 153-163.

Arce Martínez, J. 2002. ¿Hispalis o Emerita? A propósito de la capital de la Diocesis Hispaniarum en el siglo IV dC. *Habis,* 33, pp. 501-506.

Arcelin, P., Arnaud-Fassetta, G., Heijmans, M. & Valentin, F. 1999. Le Rhône à Arles: Données archéologiques et sédimentologiques. *Gallia,* 56, pp. 121-129.

Arias Solís, F. & Pérez Camacho, B. (eds.) 1990. *El tiempo detenido : Cantillana 1857-1963. Fotografías,* Seville: Ayuntamiento de Cantillana.

Arias Vilas, F., Fernández Ochoa, C. & Morillo Cerdán, Á. (eds.) 2009. *Torre de Hércules : "Finis Terrae Lux" : Simposio sobre os faros romanos e a navegación occidental na antigüedade, A Coruña, xuño de 2008 = Simposio sobre los faros romanos y la navegación occidental en la antigüedad, A Coruña, junio de 2008,* A Coruña: Museo Arqueolóxico e Histórico.

Arnaud, P. 2005. *Les Routes de la Navigation Antique : Itinéraires en Méditerranée.* Paris, Errance.

Arnaud, P. 2007. Diocletian's Prices Edict: the prices of seaborne transport and the average duration of maritime travel. *Journal of Roman archaeology,* 20, pp. 321-336.

Arnold, B. 1992. *Batellerie Gallo-Romaine sur le Lac de Neuchâtel (2 vols.).* Saint-Blaise, Editions du Ruau.

ARQVA. 2016. *Bibliografía de Arqueología Náutica y Subacuática Española* [Online]. Available: http://www.mecd.gob.es/mnarqua/investigacion/biblioteca/repertorios.html [Accessed 15 December 2016].

Arteaga Matute, O. & Hoffman, G. 1987. Investigaciones geológicas y arqueológicas sobre los cambios de la línea costera en el litoral de la Andalucía Mediterránea. *Anuario arqueológico de Andalucía 1986,* 2, pp. 194-195.

Arteaga Matute, O., Schulz, H. D. & Roos, A. M. 2008. Gades y su bahía en la Antigüedad. Reflexiones geoarqueológicas y asignaturas pendientes. *Revista Atlántica-Mediterránea de Prehistoria y Arqueología Social,* 10, pp. 267-308.

Aubet, M. E. & Turton, M. 1993. *The Phoenicians and the West : Politics, Colonies and Trade.* Cambridge, Cambridge University Press.

Baldoni, L. & Belaj, A. 2010. Olive. *In:* Vollmann, J. & Rajcan, I. (eds.) *Oil crops.* New York; London: Springer.

Bandera Romero, M. L. d. l. & Ferrer Albelda, E. 2010. *El Carambolo : 50 Años de un Tesoro.* Seville, Universidad de Sevilla.

Barral Muñoz, M. A. n. 2009. *Estudio Geoarqueológico de la Ciudad de Sevilla : Antropización y Reconstrucción Paleogeográfica durante el Holoceno Reciente.* Seville, Secretariado de Publicaciones, Universidad de Sevilla : Fundación Focus-Abengoa.

Barraud, D. 2003. Burdigala y su puerto. In Fernández Ochoa, C. (ed.) *Gijón, Puerto Romano: Navegación y Comercio en el Cantábrico durante la Antigüedad.* Barcelona: Lunwerg, pp. 212-221.

Bass, G. F. 1966. *Archaeology Under Water.* London, Thames & Hudson.

Bass, G. F. 1967. *Cape Gelidonya: a Bronze Age Shipwreck.* Philadelphia, American Philosophical Society.

Beaudouin, F. 1989. *Paris / Seine.* Paris, Nathan.

Beaudouin, F. 1994. L'économie motrice pré-mécanique. Les chemins qui marchent. *Neptunia (réédition, Cahiers du Musée de la Batellerie, 32, 1994),* 193**,** pp. 1-13.

Beltrán Fortes, J., Acuña, D. G. & Agulla, S. M. O. 2005. Acerca del urbanismo de "Hispalis": estado de la cuestión y perspectivas. *Mainake***,** pp. 61-88.

Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) 2012. *Hispaniae Urbes : Investigaciones Arqueológicas en Ciudades Históricas,* Seville: Universidad de Sevilla.

Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) 2014. *Sevilla Arqueológica. La Ciudad en Época Protohistórica, Antigua y Andalusí,* Seville: Universidad de Sevilla.

Beltrán Fortes, J. & Rodríguez Gutiérrez, O. 2014a. Hispalis republicana y alto imperial a través de los datos arqueológicos. In Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) *Sevilla Arqueológica. La Ciudad en Época Protohistórica, Antigua y Andalusí.* Seville: Universidad de Sevilla, pp. 140-181.

Bendala Galán, M. & Negueruela Martínez, I. 1980. Baptisterio paleocristiano y visigodo en los Reales Alcázares de Sevilla. *Noticiario Arqueológico Hispánico* 10, pp. 335-380.

Benito, G., Díez-Herrero, A. & De Villalta, M. F. 2003. Magnitude and frequency of flooding in the Tagus basin (Central Spain) over the last millennium. *Climatic Change,* 58**,** pp. 171-192.

Benito, G., Macklin, M. G., Zielhofer, C., Jones, A. F. & Machado, M. J. 2015. Holocene flooding and climate change in the Mediterranean. *Catena,* 130**,** pp. 13-33.

Benito, G., Sopeña, A., Sánchez-Moya, Y., Machado, M. a. J. & Pérez-González, A. 2003. Palaeoflood record of the Tagus River (central Spain) during the late Pleistocene and Holocene. *Quaternary Science Reviews,* 22**,** pp. 1737-1756.

Benito, G., Thorndycraft, V. R., Rico, M., Sánchez-Moya, Y. & Sopeña, A. 2008. Palaeoflood and floodplain records from Spain: evidence for long-term climate variability and environmental changes. *Geomorphology,* 101**,** pp. 68-77.

Benoit, F. 1956. Epaves de la Cote de Provence Typologie des Amphores. *Gallia,* XIV, pp. 23-34.

Benoit, F. 1958. Nouvelles épaves de Provence. *Gallia,* XVI, pp. 5-39.

Beresford, J. 2013. *The Ancient Sailing Season.* Leiden : Biggleswade, Brill.

Bernal, A. M. & Collantes de Terán Sánchez, A. 1988. El puerto de Sevilla, de puerto fluvial medieval a centro portuario mundial (siglo XIV-XVII). In Cavaciocchi, S. (ed.) *I porti come impresa economica : atti della "Diciannovesima Settimana di studi," 2-6 maggio 1987*. Firenze: Le Monnier, pp. 779-824.

Bernal Casasola, D. 2001. Las ánforas béticas en los confines del Imperio. Primera aproximación a las exportaciones a la Pars Orientalis. In Chic García, G. (ed.) *Congreso Internacional ex Baetica Amphorae : conservas, aceite y vino de la Bética en el Imperio Romano; (Écija y Sevilla, 17 al 20 de Diciembre de 1998); actas Vol. 3*. Écija: Graficas Sol, pp. 935-988.

Bernal Casasola, D. 2008. Gades y su bahía en la Antigüedad. Reflexiones geoarqueológicas y asignaturas pendientes. *Revista Atlántica-Mediterránea de Prehistoria y Arqueología Social,* 10, pp. 267-308.

Bernal Casasola, D. 2009. El faro romano de Gades y el papel de los thynnoskopeia en el Fretum Gaditanum. In Arias Vilas, F., Fernández Ochoa, C. & Morillo Cerdán, Á. (eds.) *Torre de Hércules : "Finis Terrae Lux" : Simposio sobre os faros romanos e a navegación occidental na antigüedade, A Coruña, xuño de 2008 = Simposio sobre los faros romanos y la navegación occidental en la antigüedad, A Coruña, junio de 2008.* A Coruña: Museo Arqueolóxico e Histórico, pp. 225-244.

Bernal Casasola, D. 2010. Arqueología de los puertos romanos del Fretum Gaditanum: nuevos datos, nuevas perspectivas. In Keay, S. J. & Boetto, G. (eds.) *Bollettino di Archeologica on-line I 2010, Volume speciale B, B7. Roma 2008 International Congress of Classical Archaeology, Meetings between Cultures in the Ancient Mediterreanean*. Bullettino di Archeologia On-Line, pp. 69-82.

Bernal Casasola, D. 2012. El Puerto romano de Gades. Novedades arqueológicas. In Keay, S. J. (ed.) *Rome, Portus and the Mediterranean.* London: British School at Rome, pp. 225-244.

Bernal Casasola, D., García Vargas, E. & Sáez Romero, A. 2013. Ánforas itálicas en la Hispania meridional. In Olcese, G. (ed.) *Immensa aequora : workshop : ricerche archeologiche, archeometriche e informatiche per la ricostruzione dell'economia e dei commerci nel bacino occidentale del Mediterraneo (metà IV sec. a. C. - I sec. d. C.) : atti del convegno, Roma 24-26 gennaio 2011*. Rome: Quasar, pp. 351-372.

Berni Millet, P. 2008. *Epigrafía Anfórica de la Bética : Nuevas Perspectivas de Análisis.* Barcelona, Universitat de Barcelona, Publicacions i Edicions.

Berni Millet, P. & García Vargas, E. 2012. Dressel 20 (Valle del Guadalquivir). Available: http://amphorae.icac.cat/tipol/view/1 [Accessed 15/12/2016].

Berni Millet, P. & Moros Díaz, J. 2012. Dressel 23 (Valle del Guadalquivir). Available: http://amphorae.icac.cat/tipol/view/2 [Accessed 15/12/2016].

Berrocal Caparrós, M. d. C. 1998. Instalaciones portuarias en Carthago Nova: la evidencia arqueológica. In Pérez Ballester, J. & Pascual Berlanga, G. (eds.) *III Jornadas de Arqueología Subacuática : Puertos Antiguos y Comercio Marítimo : Facultat de Geografía i Història de Valencia, 13, 14, y 15 de noviembre de 1997.* Valencia: Universitat de València, pp. 99-114.

Berrocal Caparrós, M. d. C. 2008. El puerto de Cartagena y los fondeaderos desde Cabo de Palos a Cabo Tiñoso. In Pérez Ballester, J. & Pascual Berlanga, G. (eds.) *Comercio, redistribución y fondeadores la navegación a vela en el Mediterráneo : [V Jornadas de Arqueología Subacuática : actas].* Valencia: Universitat de València, pp. 337-348.

Bianchi, G. G. & McCave, I. N. 1999. Holocene periodicity in North Atlantic climate and deep-ocean flow south of Iceland. *Nature,* 397**,** pp. 515-517.

Blackman, D. J. 1972. Rhodes: survey of ancient shipsheds. *Arkhaiologikon Deltion,* 27**,** pp. 686-687.

Blackman, D. J. 1973a. Evidence of Sea Level Change in Ancient Harbours and Coastal Installations. In Blackman, D. J. (ed.) *Marine archaeology : proceedings of the Twentythird Symposium of the Colston research society held in the University of Bristol, April 4th to 8th, 1971*. London: Butterworths, pp. 115-139.

Blackman, D. J. 1973b. The harbours of Phaselis. *International Journal of Nautical Archaeology,* 2**,** pp. 355-364.

Blackman, D. J. 1982a. Ancient harbours in the Mediterranean. Part 1. *International Journal of Nautical Archaeology,* 11**,** pp. 79-104.

Blackman, D. J. 1982b. Ancient harbours in the Mediterranean. Part 2. *International Journal of Nautical Archaeology,* 11**,** pp. 185-211.

Blackman, D. J. 1988. Bollards and men. *Mediterranean Historical Review,* 3**,** pp. 7-20.

Blackman, D. J. 1990. Ancient Harbours in Spain. In Hackens, T. & Miró, M. (eds.) *Le commerce maritime romain en Méditerranée occidentale: El comercio marítimo romano en el Mediterráneo occidental : Colloque international tenu à Barcelone du 16 au 18 mai 1988*. Strasbourg: Conseil de l'Europe, pp. 123-127.

Blackman, D. J. 1995. Some problems of ship operation in harbour. In Tzalas, H. (ed.) *3rd International Symposium on Ship Construction in Antiquity, Tropis III,* *Evgenidou Foundation, Athens, 24, 25, 26, 27 August 1989*. Athens: Hellenic Institute for the Preservation of Nautical Tradition, pp. 73-81.

Blackman, D. J. 1996. New evidence for ancient ship dimensions. In Tzalas, H. (ed.) *4th international symposium on ship construction in antiquity, Tropis IV, Center for the Acropolis Studies Athens 28, 29, 30, 31 August 1991*. Athens: Hellenic Institute for the Preservation of Nautical Tradition, pp. 113-125.

Blackman, D. J. 1999. Double shipsheds? In Tzalas, H. (ed.) *5th international symposium on ship construction in antiquity, Tropis V, Nauplia 26, 27, 28 August 1993*. Athens: Hellenic Institute for the Preservation of Nautical Tradition, pp. 65-78.

Blackman, D. J. 2008. Sea Transport, Part 2: Harbors. In Oleson, J. P. (ed.) *The Oxford Handbook of Engineering and Technology in the Classical World.* Oxford: Oxford University Press, pp. 638-670.

Blackman, D. J. & Lentini, M. C. 2003. The shipsheds of Sicilian Naxos, researches 1998-2001: a preliminary report. *The Annual of the British School at Athens,* 98, pp. 387-435.

Blackman, D. J., Rankov, B., Baika, K., Gerding, H. & Pakkanen, J. 2013. *Ship Sheds of the Ancient Mediterranean.* Cambridge, Cambridge University Press.

Blanco Frejeiro, A. 1992. La Sevilla Antigua. In Morales Padrón, J. (ed.) *Historia de Sevilla.* Seville: Universidad de Sevilla, pp. 19-90.

Blázquez, J. M., Remesal Rodríguez, J. & Rodríguez Almeida, E. 1992. *Excavaciones Arqueológicas en el Monte Testaccio (Roma) : Memoria campañia 1989.* Madrid, Ministerio de Cultura, Dirección General de Bellas Artes y Archivos, Instituto de Conservación y Restauración de Bienes Culturales.

Blázquez Martínez, J. M. 2001. La excavaciones españolas en el Monte Testaccio. In Chic García, G. (ed.) *Congreso internacional Ex Baetica Amphorae : conservas, aceite y vino de la Bética en el Imperio Romano (Écija y Sevilla, 17 al 20 de diciembre de 1998)*. Écija: Graficas Sol, pp. 29-56.

Blázquez Martínez, J. M. 2007. Puertos de la España romana. *Lugares de encuentro. Puertos, estaciones y aeropuertos.* Madrid: Fomento de Construcciones y Contratas, pp. 39-49.

Blázquez Martínez, J. M. & Remesal Rodríguez, J. 1999. *Estudios sobre el Monte Testaccio (Roma) 1.* Barcelona, Universitat de Barcelona.

Blázquez Martínez, J. M. & Remesal Rodríguez, J. 2001. *Estudios sobre el Monte Testaccio (Roma) 2.* Barcelona, Universitat de Barcelona.

Blázquez Martínez, J. M. & Remesal Rodríguez, J. 2003. *Estudios sobre el Monte Testaccio (Roma) 3.* Barcelona, Universitat de Barcelona.

Blázquez Martínez, J. M. & Remesal Rodríguez, J. 2007. *Estudios sobre el Monte Testaccio (Roma) 4.* Barcelona, Universitat de Barcelona.

Blázquez Martínez, J. M. & Remesal Rodríguez, J. 2010. *Estudios sobre el Monte Testaccio (Roma) 5.* Barcelona, Universitat de Barcelona.

Blázquez Martínez, J. M. & Remesal Rodríguez, J. 2016. *Estudios sobre el Monte Testaccio (Roma) 6.* Barcelona, Universitat de Barcelona.

Blue, L. K. 1995. *A topographical analysis of the location of harbours and anchorages of the eastern Mediterranean in the middle and late Bronze Ages, and their relation to routes of trade.* Doctoral Thesis, University of Oxford.

Bockius, R. 1996. Zur Rekonstruktion des römerzeitlichen Plattbodenschiffes aus Woerden. *Jahrbuch des RGZM,* 43**,** pp. 511-530.

Bockius, R. 2002. Die Prähme von Woerden. In Mees, A. & Pferdehirt, B. (eds.) *Römerzeitliche Schiffsfunde in der Datenbank »Navis 1«.* Mainz: Verlag des Römisch- Germanischen Zentralmuseums, pp. 30-35.

Bockius, R. 2002. Modell von Schiff Mainz 6. In Mees, A. & Pferdehirt, B. (eds.) *Römerzeitliche Schiffsfunde in der Datenbank »Navis 1«.* Mainz: Verlag des Römisch- Germanischen Zentralmuseums, pp. 200-205.

Bockius, R. 2004. Ancient riverborne transport of heavy loads. In Pasquinucci, M. & Weski, T. (eds.) *Close encounters : sea- and riverborne trade, ports and hinterlands, ship construction and navigation in antiquity, the middle ages and in modern time*. Oxford: BAR international series, Archaeopress, pp. 105-116.

Bockius, R. 2011. Technological Transfer From the Mediterranean to the Northern Provinces. In Boetto, G., Pomey, P. & Tchernia, A. (eds.) *Batellerie Gallo-Romaine Pratiques Régionales et Influences Maritimes Méditerranéennes.* Paris : Aix-en-Provence: Bibliothèque d'archéologie méditerranéenne et africaine 9, pp. 47-59.

Boetto, G. 1997. New technological and historical observations on the Fiumicino 1 wreck from Portus Claudius (Fiumicino, Rome). In Litwin, J. (ed.) *Down the river to the sea : proceedings of the Eighth International Symposium on Boat and Ship Archaeology, Gdańsk 1997*. Gdańsk: Polish Maritime Museum, pp. 99-102.

Boetto, G. 2000. The Late-Roman Fiumicino 1 Wreck: Reconstructing the Hull. In Beltrame, C. (ed.) *Boats, ships and shipyards : proceedings of the Ninth International Symposium on Boat and Ship Archaeology, Venice 2000*. Oxford: Oxbow Books, pp. 66-70.

Boetto, G. 2001. Les navires de Fiumicino. In Descœudres, J. P. (ed.) *Ostia port et porte de la Rome antique : Musée Rath, Genève : 23 février - 22 juillet 2001*. Genève: Musées d'art et d'histoire, pp. 121-130.

Boetto, G. 2002. Fiumicino 1, 2, 3, 4, 5. In Mees, A. & Pferdehirt, B. (eds.) *Römerzeitliche Schiffsfunde in der Datenbank »Navis 1«.* Mainz: Verlag des Römisch- Germanischen Zentralmuseums, pp. 134-159.

Boetto, G. 2006a. *Les navires de Fiumicino (Italie): architecture, matériaux, types et fonctions: contribution à l'étude du système portuaire de Rome à l'époque impériale.* Doctoral Thesis, Université d'Aix-Marseille.

Boetto, G. 2006b. Roman techniques for the transport and conservation of fish: the case of the Fiumicino 5 wreck. In Blue, L., Hocker, F. & Englert, A. (eds.) *Connected by the sea : proceedings of the Tenth International Symposium on Boat and Ship Archaeology, Roskilde 2003*. Oxford: Oxbow Books, pp. 123-129.

Boetto, G. 2008. L'épave de l'Antiquité tardive Fiumicino 1: analyse de la structure et étude fonctionnelle. *Archaeonautica,* 15**,** pp. 29-62.

Boetto, G. 2010. Les navires de Fiumicino: Influences fluviales et maritimes. In Pomey, P. (ed.) *Transferts technologiques en architecture navale méditerranéenne de l'antiquité aux temps modernes : identité technique et identité culturelle ; actes de la table ronde d'Istanbul, 19 - 22 mai 2007*. Paris: De Boccard, pp. 137-150.

Boetto, G. 2011. Tra il fiume e il mare: le caudicariae di Fiumicino. In Harris, W. & Iara, K. (eds.) *Maritime Technology in the Ancient Economy: Ship Design and Navigation.* Portsmouth (Rhode Island): Journal of Roman archaeology, pp. 103-112.

Boetto, G. 2016. Portus, Ostia and Rome: a transport zone in the maritime/land interface. In Höghammer, K., Alroth, B. & Lindhagen, A. (eds.) *Ancient ports - The geography of connections, International conference at the department of Archaeology and ancient history, Uppsala University, 23-25 September, 2010*. Uppsala: Uppsala Universitet; Acta Universitatis Upsaliensis, pp. 269-289.

Boetto, G., Carsana, V. & Giampaola, D. 2009. Il porto di Neapolis e i suoi relitti. In Cau Ontiveros, M. A. & Nieto Prieto, F. X. (eds.) *Arqueología Nautica Mediterránea*. Girona: Monografies del CASC, 8, pp. 457-470.

Boetto, G., Pomey, P. & Tchernia, A. 2011. *Batellerie Gallo-Romaine : Pratiques Régionales et Influences Maritimes Méditerranéennes.* Paris : Aix-en-Provence, Editions Errance.

Boetto, G. & Rousse, C. 2011. Le chaland de Lipe (Ljubljana, Slovénie) et la tradition de construction « sur sole » de l'Europe sud-orientale: quelles influences méditerranéennes? In Boetto, G., Pomey, P. & Tchernia, A. (eds.) *Batellerie Gallo-Romaine : Pratiques Régionales et Influences Maritimes Méditerranéennes.* Paris : Aix-en-Provence: Editions Errance, pp. 177-191.

Bonifay, M. 2004. *Études sur la Céramique Romaine Tardive d'Afrique.* Oxford, Archaeopress.

Bonsor, J. E. 1931. *The Archaeological Expedition along the Guadalquivir : 1889-1901.* New York, The Hispanic Society of America.

Borja Barrera, F. 2014. Sevilla (1500 AC-1500 AD) Estudio de geoarqueología urbana. In Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) *Sevilla Arqueológica. La Ciudad en Época Protohistórica, Antigua y Andalusí.* Seville: Universidad de Sevilla, pp. 276-305.

Borja Palomo, F. d. 1878. *Historia Critica de las Riadas o Grandes Avenidas del Guadalquivir en Sevilla : desde su Reconquista hasta Nuestros Dias.* Seville, Ayuntamiento de Sevilla, Francisco Álvarez.

Bosch Vilá, J. 1984. *La Sevilla Islámica, 712-1248.* Seville, Universidad de Sevilla.

Bosch Vilá, J. 1992. La Sevilla islámica. In Morales Padrón, F. (ed.) *Historia de Sevilla.* Seville: Universidad de Sevilla, pp. 93-157.

Bouzas Abad, A., de Castro Romero, J. M. & Zambrano Valdivia, L. C. 2008. Tratamiento de la madera arqueológica saturada de humedad por el método denominado plastinación. *PH: boletín del Instituto Andaluz del Patrimonio Histórico,* 65**,** pp. 108-119.

Bowman, A. & Wilson, A. 2009. *Quantifying the Roman Economy : Methods and Problems.* Oxford, Oxford University Press.

Brandon, C., Hohlfelder, R. L., Jackson, M. D., Oleson, J. P. & Bottalico, L. 2014. *Building for Eternity : the History and Technology of Roman Concrete Engineering in the Sea.* Oxford, Oxbow Books.

Brandon, C., Hohlfelder, R. L. & Oleson, J. P. 2008. The concrete construction of the roman harbours of Baiae and Portus Iulius, Italy: The ROMACONS 2006 field season. *International Journal of Nautical Archaeology,* 37**,** pp. 374-379.

Brandon, C., Hohlfelder, R. L., Oleson, J. P. & Rauh, N. 2010. Geology, materials, and the design of the Roman harbour of Soli-Pompeiopolis, Turkey: the ROMACONS field campaign of August 2009. *International Journal of Nautical Archaeology,* 39**,** pp. 390-399.

Brandon, C., Hohlfelder, R. L., Oleson, J. P. & Stern, C. 2005. The Roman Maritime Concrete Study (ROMACONS): the harbour of Chersonisos in Crete and its Italian connection. *Méditerranée***,** pp. 25-29.

Braudel, F. 1995. *The Mediterranean and the Mediterranean World in the Age of Philip II.* Berkeley, University of California Press.

Broodbank, C. 2013. *The Making of the Middle Sea : a History of the Mediterranean from the Beginning to the Emergence of the Classical World.* New York, Oxford University Press.

Brown, P. 2012. *Through the Eye of a Needle : Wealth, the Fall of Rome, and the Making of Christianity in the West, 350-550 AD.* Princeton, Princeton University Press.

Brückner, H. 1986. Man's impact on the evolution of the physical environment in the Mediterranean region in historical times. *GeoJournal,* 13**,** pp. 7-17.

Bruni, S. (ed.) 2000. *Le navi antiche di Pisa : ad un anno dall'inizio delle ricerche = The ancient ships of Pisa : after a year of work,* Firenze: Polistampa.

Büntgen, U., Myglan, V. S., Ljungqvist, F. C., McCormick, M., Di Cosmo, N., Sigl, M., Jungclaus, J., Wagner, S., Krusic, P. J., Esper, J. & Kaplan, J. O. 2016. Cooling and societal change during the Late Antique Little Ice Age from 536 to around 660 AD. *Nature Geoscience,* 9**,** pp. 231-236.

Büntgen, U., Tegel, W., Nicolussi, K., McCormick, M., Frank, D., Trouet, V., Kaplan, J. O., Herzig, F., Heussner, K.-U., Wanner, H., Luterbacher, J. & Esper, J. 2011. 2500 years of European climate variability and human susceptibility. *Science,* 331**,** pp. 578-582.

Burriel, J. M., Ribera i Lacomba, A. & Serrano, M. L. 2003. Un área portuaria romana al norte de Valentia. In Pérez Ballester, J. & Pascual Berlanga, G. (eds.) *Puertos Fluviales Antiguos: Ciudad, Desarrollo e Infraestructuras*. Universitat de València, pp. 29-39.

Butzer, K. W. 2005. Environmental history in the Mediterranean world: cross-disciplinary investigation of cause-and-effect for degradation and soil erosion. *Journal of Archaeological Science,* 32**,** pp. 1773-1800.

Butzer, K. W., Butzer, E. K., Mateu, J. F. & Kraus, P. 1985. Irrigation agrosystems in eastern Spain: Roman or Islamic origins? *Annals of the Association of American Geographers,* 75**,** pp. 479-522.

Caballos Rufino, A. 2001. Latinidad y municipalización de Hispania bajo los flavios. Estatuto y normativa. *Mainake (Las leyes municipales en Hispania, 150 Aniversario del descubrimiento de la Lex Flavia Malacitana),* 23**,** pp. 101-120.

Caballos Rufino, A. & Lefebvre, S. 2011. *Roma Generadora de Indentidades : la Experiencia Hispana.* Madrid, Casa de Velázquez.

Cabrera Bonet, P. & Sánchez, C. 2000. *Els Grecs a Ibèria : Seguint les Passes d'Hèracles : Museu d'Arqueologia de Catalunya.* Madrid, Ministerio de Educación y Cultura, Dirección General de Bellas Artes y Bienes Culturales, Subdirección General de Promoción de las Bellas Artes : Museu d'Arqueologia de Catalunya : Caja de Ahorros del Mediterráneo.

Cabrera Muñoz, E. 2008. Córdoba y el río en época califal. In Rubiales Torrejón, J. (ed.) *El Río Guadalquivir.* Seville: Consejería de Obras Públicas y Transportes, pp. 203-212.

Cabrera Tejedor, C. 2007. Finds from Hispalis. In Romey, K. (ed.) *The INA Annual 2007.* College Station: Institute of Nautical Archaeology (INA) at Texas A&M University, pp. 16-21.

Cabrera Tejedor, C. 2013. El fondeadero de la Plaza Nueva de Sevilla: un ancla y una barca procedentes del antiguo puerto de Hispalis. In Nieto, X., Ramírez, A. & Recio, P. (eds.) *I Congreso de Arqueología Náutica y Subacuática Española. Cartagena, 14, 15 y 16 de marzo de 2013* Madrid: Ministerio de Educación, Cultura y Deporte, pp. 397-408.

Cabrera Tejedor, C. 2014. La caracterización del antiguo y desaparecido puerto de Sevilla a través de los hallazgos náuticos de la Plaza Nueva. In Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) *Sevilla Arqueológica. La Ciudad en Época Protohistórica, Antigua y Andalusí.* Seville: Universidad de Sevilla, pp. 242-244.

Cabrera Tejedor, C. 2016. The antique port of Seville: transformations from Roman Times to the Islamic Period. In Castillo, R., Ramírez, A. & Torres, L. Á. (eds.) *Proceedings of the 5th International Congress on Underwater Archaeology (IKUWA V), A heritage for humankind, Cartagena, October 15th-18th, 2014*. Madrid: Ministerio de Educación, Cultura y Deporte, pp. 684-703.

Cabrera Tejedor, C. 2017. The Plaza Nueva Boat: Preliminary Notes on Hull Details. In Gawronski, J., van Holk, A. & Schokkenbroek, J. (eds.) *Ships And Maritime Landscapes : Proceedings of the Tirteenth International Symposium on Boat and Ship Archaeology, Amsterdam 2012 (ISBSA 13)*. Amsterdam: Dutch Maritime Museum, pp. 347-348.

Cabrera Tejedor, C. (forthcoming). Una barca de época califal hallada en el desaparecido puerto de la Isbiliya islámica. In Callegarin, L. & Valérian, D. (eds.) *Le détroit de Gibraltar, à la croisée des mers et des continents (époques ancienne et médiévale)*.

Cameron, A. 1993. *The Mediterranean World in Late Antiquity, AD 395-600.* London, Routledge.

Cameron, A., Ward-Perkins, B. & Whitby, M. 2000. *The Cambridge Ancient History Vol 14: Late Antiquity Empire and Successors.* Cambridge, Cambridge University Press.

Camilli, A. (ed.) 2002. *Cantiere delle navi di Pisa. La nave C "Giuditta" dallo scavo al laboratorio,* Firenze.

Camilli, A., De Laurenzi, A. & Setari, E. (eds.) 2006a. *Pisa: Un viaggio nel mare dell'Antichità. Catalogo della mostra (Roma, 3 aprile-31 maggio 2006),* Milano: Mondadori Electa.

Camilli, A., De Laurenzi, A. & Setari, E. (eds.) 2006b. *Alkedo. Navi e commerci della Pisa romana,* Pontedera: Bandecchi & Vivaldi.

Camilli, A. & Setari, E. (eds.) 2005. *Le navi antiche di Pisa. Guida archeologica,* Milano: Electa.

Camiña, N. & Gamarra, F. 2004. *Memoria Final de la Intervención: Excavación Arqueológica de Urgencia en Avenida de Roma y Calle General Sanjurjo.* (Unpublished report) Delegación Provincial de la Consejería de Cultura en Sevilla.

Campbell, B. 2012. *Rivers and the Power of Ancient Rome.* Chapel Hill, University of North Carolina Press.

Campos Carrasco, J. M. 1986. *Excavaciones Arqueológicas en la Ciudad de Sevilla : el Origen Prerromano y la Hispalis Romana.* Seville, Monte de Piedad y Caja de Ahorros de Sevilla.

Campos Carrasco, J. M. 1989. La estructura urbana en la colonia Iulia Romula Hispalis en época Republicana. *Habis,* 20**,** pp. 245-262.

Campos Carrasco, J. M. 1993. La estructura urbana en la colonia Iulia Romula Hispalis en época Imperial. *Anales de Arqueología Cordobesa,* 4**,** pp. 181-220.

Carayon, N. 2008. *Les ports phéniciens et puniques. Géomorphologie et infrastructures.* Doctoral Thesis, Universite Strasbourg II.

Carayon, N. & Keay, S. J. Forthcoming. Micro-regions, connectivity and "port-systems": Ongoing research by the ERC Portuslimen project. *Harbours-Cities-Microregions, 3rd meeting of the « Hafengruppe » of Cluster 6 « Connecting Cultures », DAI Istanbul 26th-27th May 2017*.

Carmona González, P. & Pérez Ballester, J. 2011. Geomorphology, geoarchaeology and ancient settlement in the Valencian Gulf (Spain). *Méditerranée,* 117**,** pp. 61-72.

Carpenter, D. 1986. Alfonso el Sabio y los moros: algunas precisiones legales, históricas y textuales con respecto a Siete Partidas 7.25. *Al-Qantara,* 7**,** pp. 229-252.

Carr, K. E. 2002. *Vandals to Visigoths : Rural Settlement Patterns in Early Medieval Spain.* Ann Arbor, University of Michigan Press.

Carreras, C. & Morais, R. 2012. The Atlantic Roman Trade During the Principate: New Evidence from the Western Façade. *Oxford Journal of Archaeology,* 31**,** pp. 419-441.

Carreras Monfort, C. 2000. *Economía de la Britannia Romana : la Importación de Alimentos.* Barcelona, Universitat de Barcelona.

Carriazo Arroquia, J. M. 1974. Una zanja en el suelo de Sevilla. *Cuadernos de la Alhambra***,** pp. 91-97.

Casson, L. 1951. Speed under sail of ancient ships. *Transactions and Proceedings of the American Philological Association,* 82**,** pp. 136-148.

Casson, L. 1991. *The Ancient Mariners: Seafarers and Sea Fighters of the Mediterranean in Ancient Times.* Princeton; Oxford, Princeton University Press.

Casson, L. 1995. *Ships and Seamanship in the Ancient World.* Baltimore; London, Johns Hopkins University Press.

Castillo Utrilla, M. J. 1988. *El Convento de San Francisco, Casa Grande de Sevilla.* Seville, Diputación provincial de Sevilla.

Celestino Pérez, S. & Jiménez Avila, F. J. 2005. *El Periodo Orientalizante : Actas del III Simposio Internacional de Arqueología de Mérida, Protohistoria del Mediterráneo Occidental.* Mérida, Consejo Superior de Investigaciones Científicas, Instituto de Arqueología.

Celestino Pérez, S. & López-Ruiz, C. 2016. *Tartessos and the Phoenicians in Iberia.* Oxford, Oxford University Press.

Cerezo Andreo, F. 2016. *Los puertos antiguos de Cartagena. Geoarqueología, Arqueología Portuaria y Paisaje Marítimo. Un estudio desde la Arqueología Náutica.* Doctoral Thesis, Universidad de Murcia.

Chaunu, P. & Chaunu, H. 1977. *Séville et l'Amérique aux XVIe et XVIIe siècles.* Paris, Flammarion.

Chic García, G. 1990. *La Navegación por el Guadalquivir entre Cordoba y Sevilla en Época Romana.* Écija, Gráficas Sol.

Chic García, G. 1992-1993. Los Aelii en la producción y difusión del aceite bético. *Münstersche Beiträge zur antiken Handelsgeschichte,* 11**,** pp. 1-22.

Chic García, G. 1997. *Breve Historia Economica de la Bética Romana (siglos I-III D.C.).* Seville, Padilla.

Chic García, G. 2006. Movimiento de personas en relación con el aceite bético. In Caballos Rufino, A. & Demougin, S. (eds.) *Migrare : la Formation des Élites dans l'Hispanie Romaine.* Bordeaux: Ausonius, pp. 273-299.

Chic García, G. 1985. *Epigrafía Anfórica de la Bética. II, Los Rótulos Pintados Sobre Ánforas Olearias. Consideraciones sobre la Annona.* Écija, Departamento de Historia Antigua, Universidad de Sevilla. Gráficas Sol.

Chic García, G., García Vargas, E. A., Romo Salas, A. S. & Tabales Rodríguez, M. Á. 2001. Una nueva inscripción annonaria de Sevilla: M. Iulius Hermesianus, diffusor olei ad annonam Urbis. *Habis,* 32**,** pp. 353-374.

Chic García, G. & García-Vargas, E. 2004. Alfares y producciones cerámicas en la provincia de Sevilla. Balance y perspectivas. In Bernal Casasola, D. & Lagóstena Barrios, L. (eds.) *Figlinae Baeticae. Talleres alfareros y producciones cerámicas en la Bética romana (s. II aC–VII dC), Actas del Congreso Internacional*. Oxford: BAR International series 1266, pp. 279-348.

Cisneros Cunchillos, M. 1998. Santoña y los puertos de la Cantabria romana: un estado de la cuestión. *Monte Buciero,* 2**,** pp. 137-150.

Collantes de Terán Delorme, F. 1957. La Sevilla que vio Guzmán el Bueno. *Archivo Hispaliense, Revista Histórica, Literaria y Artística,* 84**,** pp. 9-44.

Collantes de Terán Delorme, F. 1977. *Contribución al Estudio de la Topografía Sevillana en la Antigüedad y en la Edad Media.* Seville, Real Academia de Bellas Artes de Santa Isabel de Hungría.

Collantes de Terán Sánchez, A. 1977. *Sevilla en la Baja Edad Media: la Ciudad y sus Hombres.* Seville, Ayuntamiento de Sevilla.

Collantes de Terán Sánchez, A. 1992. La Ishbilia andalusí. In García-Baquero, A. (ed.) *Sevilla.* Madrid: Editorial Mafre, pp. 33-51.

Collantes de Terán Sánchez, A. 2001. De Betis a Guadalquivir: la victoria de Mercurio. In Ferreira Priegue, E. (ed.) *Itinerarios medievales e identidad hispánica: XXVII Semana de Estudios Medievales, Estella 17 a 21 de julio de 2000*. Pamplona: Gobierno de Navarra, Departamento de Educación y Cultura, pp. 159-188.

Collantes de Terán Sánchez, A. & Cortés José, J. n. 1993. *Diccionario Histórico de las Calles de Sevilla.* Seville, Consejería de Obras Públicas y Transportes, Dirección General de Ordenación del Territorio : Excmo. Ayuntamiento de Sevilla, Delegación de Cultura, Gerencia Municipal de Urbanismo.

Collins, R. 2000. The western kingdoms. In Cameron, A., Ward-Perkins, B. & Whitby, M. (eds.) *The Cambridge Ancient History. Volume 14, Late Antiquity : Empire and Successors, A.D. 425-600* Cambridge: Cambridge University Press, pp. 112-134.

Collins, R. 2004. *Visigothic Spain 409-711.* Oxford, Blackwell.

Corzo, R. 1997. Sobre la topografía de Hispalis. *Boletín de la Real Academia de Bellas Artes de Santa Isabel de Hungría,* 25**,** pp. 195-211.

Cumont, F. 1927. Les syriens en Espagne et les Adonies à Séville. *Syria,* 8**,** pp. 330-341.

Cunliffe, B. 2001. *Facing the Ocean: The Atlantic and its Peoples, 8000 BC-AD 1500.* Oxford, Oxford University Press.

Cunliffe, B. 2017. *On the Ocean: The Mediterranean and the Atlantic from Prehistory to AD 1500.* Oxford, Oxford University Press.

D'Angremond, K. & der Velden, E. 2001. *Introduction to Coastal Engineering.* Delft, Delft University of Technology.

D'Arms, J. H. & Kopff, E. C. 1980. *The Seaborne Commerce of Ancient Rome : Studies in Archaeology and History.* Rome, American Academy in Rome.

D'Ors, Á. 1958. Los transmarini negotiatores en la legislación visigótica. *Estudios de Derecho Internacional. Homenaje al Profesor Camilo Barcía Trelles.* Santiago de Compostela: Universidad de Santiago de Compostela, pp. 467-483.

De Boe, G. 1978. Roman boats from a small river harbour at Pommeroeul, Belgium. In du Plat Taylor, J. & Cleere, H. (eds.) *Roman Shipping and Trade: Britain and the Rhine provinces*. London: The Council for British Archaeology, pp. 22-30.

De Boe, G. & Hubert, F. 1977. Une installation portuaire d'époque romaine à Pommeroeul. *Archaeologia Belgica*, pp. 5-57.

De Coetlogon Williams, P. 1976. Roman harbours. *International Journal of Nautical Archaeology,* 5, pp. 79-104.

De Graauw, A. 2016. *A catalogue of Ancient Ports and Harbours* [Online]. Available: http://www.ancientportsantiques.com/ [Accessed 15 December 2016].

De Juan Fuertes, C. 2002. Primera aproximación a la infraestructura portuaria saguntina. *Saguntum: Papeles del Laboratorio de Arqueología de Valencia,* 34, pp. 115-126.

De Juan Fuertes, C. 2003. El puerto de Sagunto (Valencia). Estudio y gestión del impacto arqueológico subacuático. In Pérez Ballester, J. & Pascual Berlanga, G. (eds.) *Puertos Fluviales Antiguos: Ciudad, Desarrollo e Infraestructuras.* Valencia: Universitat de València, pp. 363-370.

De Juan Fuertes, C. 2009. La bahía de l'Albufereta (Alicante). Una "statio" náutica en el levante peninsular. *Saguntum: Papeles del Laboratorio de Arqueología de Valencia,* 41, pp. 129-147.

De la Peña Olivas, J. M. 2001. Tecnología portuaria romana. *OP ingeniería y territorio: revista del Colegio de Ingenieros de Caminos, Canales y Puertos,* 56, pp. 16-23.

De la Peña Olivas, J. M. 2007. Avance y desarrollo portuario en la Roma antigua. *Ingeniería Civil,* 147, pp. 55-73.

De la Peña Olivas, J. M. & Prada Espada, J. M. 1996. Ingenieria romana a comienzos de nuestra era. *Revista de Obras Públicas,* 3351, pp. 55-73.

De Laet, S. J. 1949. *Portorium : Étude sur l'Organisation Douanière chez les Romains, surtout à l'Époque du Haut-Empire.* Brugge, De Tempel.

De Maria, L. & Turchetti, R. 2004a. *Evolución Paleoambiental de los Puertos y Fondeaderos Antiguos en el Mediterráneo Occidental: I Seminario: El Patrimonio Arqueológico Submarino y los Puertos Antiguos: Alicante, 14-15 noviembre 2003.* Soveria Mannelli, Rubbettino.

De Maria, L. & Turchetti, R. 2004b. *Rotte e Porti del Mediterraneo dopo la Caduta dell'Imperio Romano d'Occidente: Continuità e Innovazioni Tecnologiche e Funzionali, Atti del IV Seminario ANSER, Genoa 18-19 Giugno 2004.* Soveria Mannelli, Rubbettino.

De Weerd, M. D. 1978. Ships of the Roman period at Zwammerdam/Nigrum Pullum, Germania Inferior. In du Plat Taylor, J. & Cleere, H. (eds.) *Roman Shipping and Trade: Britain and the Rhine provinces*. London: The Council for British Archaeology, pp. 15-21.

De Weerd, M. D. 1990. Barges of the Zwammerdam type and their building procedures. In McGrail, S. (ed.) *Maritime Celts, Frisians and Saxons: papers presented to a conference at Oxford in November 1988*. London: The Council for British Archaeology, pp. 75-76.

De Weerd, M. D. 2001. Römische Schiffsfunde von Zwammerdam: Lehren aus einer alten Grabung. *Skyllis: Zeitschrift für Unterwasserarchäologie,* 4**,** pp. 96-110.

Delestre, X. & Marchesi, H. 2010. *Archéologie des Rivages Méditerranéens: 50 ans de Recherche Actes du Collque Arles, 28-29-30 octobre 2009.* Paris, Errance.

Demetriou, D. 2011. What is an emporion? A reassessment. *Historia: Zeitschrift für Alte Geschichte,* 60**,** pp. 255-272.

Domergue, C. 1990. *Les mines de la Péninsule Ibérique dans l'antiquité romaine* Rome, École française de Rome.

Domergue, C. 1998. A view of Baetica's external commerce in the 1st c. AD based on its trade in metals. In Keay, S. J. (ed.) *The Archaeology of Early Roman Baetica, .* Portsmouth: Journal of Roman Archaeology supplementary series 29, pp. 201-216.

Drain, M. & Le Roux, P. 1972. Note sur l'évolution des rapports entre la terre et les hommes dans la vallée inférieure du Guadalquivir. *Mélanges de la Casa de Velázquez,* 8**,** pp. 595-603.

Drain, M., Lhénaff, R. & Vanney, J.-R. 1971. *Le Bas Guadalquivir.* Paris, E. de Boccard.

Dumas, F. 1962. *Deep-Water Archaeology.* London, Routledge and Kegan Paul.

Duncan-Jones, R. 1974. *The Economy of the Roman Empire : Quantitative Studies.* Cambridge, Cambridge University Press.

Duncan-Jones, R. 1994. *Money and Government in the Roman Empire.* Cambridge, Cambridge University Press.

Duncan-Jones, R. 2006. Roman Customs Dues : a Comparative View. *Latomus,* 65, pp. 3-16.

Earl, G. & Keay, S. 2007. Urban Connectivity of Iberian and Roman Towns in Southern Spain: A Network Analysis Approach. In Clark, J. T. & Hagemeister, E. M. (eds.) *Digital Discovery. Exploring New Frontiers in Human Heritage. CAA2006. Computer Applications and Quantitative Methods in Archaeology. Proceedings of the 34th Conference, Fargo, United States, April 2006*. Budapest: Archaeolingua, pp. 89-98.

Eliyahu, M., Barkai, O., Goren, Y., Eliaz, N., Kahanov, Y. & Ashkenazi, D. 2011. The iron anchors from the Tantura F shipwreck: typological and metallurgical analyses. *Journal of Archaeological Science,* 38, pp. 233-245.

Erice Lacabe, R. 2011. El puerto fluvial de Caesaraugusta. In Arce Martínez, J. (ed.) *Horrea d'Hispanie et de la Méditerranée Romaine.* pp. 143-158.

Escacena Carrasco, J. L. 2014. Sevilla fenicia. In Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) *Sevilla Arqueológica. La Ciudad en Época Protohistórica, Antigua y Andalusí.* Seville: Universidad de Sevilla, pp. 28-65.

Escacena Carrasco, J. L. & García Fernández, J. F. 2012. La Sevilla protohistórica. In Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) *Hispaniae Urbes. Investigaciones Arqueológicas en Ciudades Históricas.* Seville: Universidad de Sevilla, pp. 761-812.

Espinosa Ruiz, A. & Castillo Belinchón, R. 1996. Fondeaderos de época antigua en la costa mediterranea de la Tarraconense. *Comercio y tráfico marítimo en la Antigüedad Aula de arqueología subacuática II / Aulas del Mar.* Murcia: Universidad de Murcia, pp. 55-85.

Espinosa Ruiz, A., Sáez Lara, F. & Castillo, R. 2006. *Puertos y Navegación en las Costas Valencianas Meridionales (s. I-X d. C.).* Oxford, BAR International Series.

Evelpidou, N., Pirazzoli, P., Vassilopoulos, A., Spada, G., Ruggieri, G. & Tomasin, A. 2012. Late Holocene Sea Level Reconstructions Based on Observations of Roman Fish Tanks, Tyrrhenian Coast of Italy. *Geoarchaeology,* 27, pp. 259-277.

Fernández de Paz, E. 1991. *El Bajo Guadalquivir, Carpintería de Ribera.* Seville, Junta de Andalucía, Consejería de Cultura y Medio Ambiente.

Fernández Gómez, F. 2007. Museo y Arqueología. Las excavaciones del Museo Arqueológico de Sevilla. In Deamos, M. B. & Beltrán Fortes, J. (eds.) *Las*

Instituciones en el Origen y Desarrollo de la Arqueología en España. Seville: Spal Monografías;Universidad de Sevilla, pp. 143-173.

Fernández Izquierdo, A. 2008. El port i els ancoratges de Arse-Saguntum. *Citerior: arqueologia i ciències de l'Antiguitat,* 4, pp. 119-147.

Fernández Ochoa, C. & Camino Mayor, J. (eds.) 2003. *Gijón Puerto Romano : Navegación y Comercio en el Cantábrico durante la Antigüedad,* Barcelona: Lunwerg.

Fernández Ochoa, C. & Morillo Cerdán, Á. 1994. *De Brigantium a Oiasso : Una Aproximación al Estudio de los Enclaves Marítimos Cantábricos en Época Romana.* Madrid, Foro Arqueología, Proyectos y Publicaciones S.L.

Fernández Rodríguez, J. M. 2014. Los depósitos de la ría de Huelva: en busca del barco perdido. *Revista Onova,* 2, pp. 3-26.

Fernández-Flores, Á., Pliego-Vázquez, R. & Carvajal-Mateos, G. 2013. Nuevos hallazgos de bronces visigodos en la provincia de Sevilla: una aproximación metrológica y de composición metálica. *The Journal of Archaeological Numismatics,* 3, pp. 275-304.

Ferreira Priegue, E. M. 2001. *Itinerarios Medievales e Identidad Hispánica : XXVII Semana de Estudios Medievales, Estella, 17 a 21 de julio de 2000.* Pamplona, Gobierno de Navarra, Departamento de Educación y Cultura.

Ferrer Albelda, E. 2012. Confusiones contemporáneas sobre geografía antigua. A propósito del Sinus Tartesii y del Lacus Ligustinus. *SPAL: Revista de prehistoria y arqueología de la Universidad de Sevilla,* 21, pp. 57-67.

Ferrer Albelda, E. 2013. Confusiones contemporáneas sobre geografía antigua. A propósito del sinus Tartesii y del lacus Ligustinus. Addenda et corrigenda. *SPAL: Revista de prehistoria y arqueología de la Universidad de Sevilla,* 22, pp. 17-18.

Ferrer García, C. 2005. Asentamientos portuarios históricos del litoral meridional valenciano. *Méditerranée*, pp. 119-128.

Finley, M. I. 1985. *The Ancient Economy.* London, Hogarth.

Flemming, N. C. 1969. Archaeological evidence for eustatic change of sea level and earth movements in the western Mediterranean during the last 2,000 years. *Geological Society of America Special Papers,* 109, pp. 1-98.

Flemming, N. C. 1971. *Cities in the Sea.* New Tork, Doubleday & Co.

Flemming, N. C. 1978. Holocene eustatic changes and coastal tectonics in the northeast Mediterranean: implications for models of crustal consumption.

Philosophical Transactions of the Royal Society of London A: Mathematical, Physical and Engineering Sciences, 289**,** pp. 405-458.

Flemming, N. C. 1979. Archaeological indicators of sea level. *Oceanis,,* 5**,** pp. 149-166.

Flores Escobosa, I. & Muñoz Martín, M. d. M. 1993. *Vivir en Al-Andalus : Exposición de Cerámica (s. IX-XV).* Almería, Instituto de Estudios Almerienses.

Flórez de Setién y Huidobro, E. 1752. *España Sagrada : theatro geografico-historico de la Iglesia de España : Origen, divisiones, límites de todas fus provincias. Antigüedad, traslaciones, y eftado antiguo y prefente de fus Sillas, con varias Differtaciones criticas. : Tomo IX. : de la provincia antigua de la Betica en comun, y de la Santa Iglefia de Sevilla en Particular. Dedicado à los Santos de efta Diecefi.* Madrid, En la oficina de Pedro Marín.

Fontaine, J. 2000. *Isidore de Séville : Genèse et Originalité de la Culture Hispanique au Temps des Wisigoths.* Turnhout, Brepols.

Ford, B. (ed.) 2011. *The Archaeology of Maritime Landscapes,* New York: Springer.

Franconi, T. V. 2013. Rome and the power of ancient rivers. *Journal of Roman Archaeology,* 26**,** pp. 705-711.

Frankopan, P. 2015. *The Silk Roads : a New History of the World.* London, Bloomsbury.

Frost, H. 1963. *Under the Mediterranean. Marine Antiquities.* London, Routledge and Regan Paul.

Frost, H. 1972. Ancient harbours and anchorages in the Eastern Mediterranean. *Museum and Monuments,* 13**,** pp. 95-114.

Galili, E., Dahari, U. & Sharvit, J. 1991. Underwater Survey along the Coast of Israel. Sea of Galilee. *Excavations and Surveys in Israel,* 10**,** pp. 160-162.

Gallina Zevi, A. & Turchetti, R. (eds.) 2004a. *Le Strutture dei Porti e Degli Approdi Antichi : II Seminario, Roma-Ostia antica, 16-17 Aprile 2004,* Soveria Mannelli: Rubbettino.

Gallina Zevi, A. & Turchetti, R. (eds.) 2004b. *Méditerranée Occidentale Antique : les Échanges : III Seminario, Auditorium du Musée d'histoire, Marseille, 14-15 Mai 2004,* Soveria Mannelli: Rubbettino.

Gamarra, F. & Camiña, N. 2006. Excavación arqueológica de urgencia en Avenida de Roma y Calle General Sanjurjo de Sevilla. *Anuario Arqueológico de Andalucía 2003 III Actividades de Urgencia Volumen 2.* Seville: Junta de Andalucía. Consejería de Cultura, pp. 488-502.

García de Cortázar, F. 1995. *Breve Historia de España.* Madrid, Alianza Editorial.

García Fernández, F. J. & Ferrer Albelda, E. 2010. Das turdetanische Emporion Spal. Der punische Handelsverkehr im vorrömischen Sevilla (5.--2. Jahrhundert v. Chr.). *Madrider Mitteilungen,* 52**,** pp. 335-374.

García García, M. A. 2014. La cisterna de la Plaza de la Pescadería. In Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) *Sevilla Arqueológica. La Ciudad en Época Protohistórica, Antigua y Andalusí.* Seville: Universidad de Sevilla, pp. 172-173.

García Iglesias, L. 1978. *Los Judíos en la España Antigua.* Madrid, Cristiandad.

García Moreno, L. A. 1972. Colonias de comerciantes orientales en la Península Ibérica: S. V-VII. *Habis,* 3**,** pp. 127-154.

García Moreno, L. A. 1993. *Los Judíos de la España Antigua : del Primer Encuentro al Primer Repudio.* Madrid, Ediciones Rialp.

García Moreno, L. A. & Suárez Fernández, L. 2008. *Leovigildo : Unidad y Diversidad de un Reinado.* Madrid, Real Academia de la Historia.

García Sanjuán, A. 1999. Los bienes habices y la repoblación de Andalucía en el siglo XIII: el caso de Sevilla. *Historia. Instituciones. Documentos,* 26**,** pp. 211-231.

García Vargas, E. 2009. Las ánforas republicanas de Hispalis (Sevilla) y la "cristalización" del repertorio anfórico provincial. In Cruz-Auñon Briones, R. & Ferrer Albelda, E. (eds.) *Estudios de Prehistoria y Arqueología en Homenaje a Pilar Acosta Martínez.* Seville: Universidad de Sevilla, pp. 437-464.

García Vargas, E. 2012a. Hispalis (Sevilla, España) y el comercio mediterráneo en el Alto Imperio Romano. El testimonio de las ánforas. In Keay, S. J. (ed.) *Rome, Portus and the Mediterranean.* The British School at Rome, London: Archaeological Monographs of the British School at Rome 21, pp. 245-266.

García Vargas, E. 2012b. Producciones anfóricas tardorrepublicanas y tempranoaugusteas del valle del Guadalquivir. Formas y ritmos de la romanización en Turdetania a través del artesanado cerámico. In Bernal Casasola, D. & Ribera i Lacomba, A. (eds.) *Cerámicas Hispanorromanas II : Producciones Regionales.* Cádiz: Universidad de Cádiz, pp. 177-205.

García Vargas, E. 2012c. La Sevilla tardoantigua. Diez años después (2000-2010). In Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) *Hispaniae Urbes. Investigaciones Arqueológicas en Ciudades Históricas.* Seville: Universidad de Sevilla, pp. 881-925.

García Vargas, E. 2014. La Sevilla tardoantigua. In Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) *Sevilla Arqueológica. La Ciudad en Época Protohistórica, Antigua y Andalusí.* Seville: Universidad de Sevilla, pp. 182-205.

García Vargas, E. 2016. Amphorae circulation in the Lower Guadalquivir Valley in the mid imperial period: the Lusitana 3 type. In Vaz Pinto, I., De Almeida, R. R. & Martin, A. (eds.) *Lusitanian Amphorae: Production and Distribution.* Oxford: Archaeopress, pp. 285-298.

García Vargas, E., Alonso Villalobos, C., Jiménez Melero, M. & Maclino Navarro, I. 2004. Perspectivas de investigation sobre puertos y fondeaderos en el sur de Hispania. In Gallina Zevi, A. & Turchetti, R. (eds.) *Le Strutture dei Porti e Degli Approdi Antichi : II Seminario, Roma-Ostia antica, 16-17 Aprile 2004.* Soveria Mannelli: Rubbettino, pp. 3-22.

García Vargas, E. & Chic García, G. 2004. Alfares y producciones cerámicas en la provincia de Sevilla: balance y perspectivas. In Bernal Casasola, D. & Lagóstena Barrios, L. (eds.) *Figlinae Baeticae : talleres alfareros y producciones cerámicas en la Bética romana (ss. II a.C.-VII d.C.) : actas del Congreso Internacional, Cádiz, 12-14 de noviembre de 2003*. Oxford: BAR International Series, pp. 279-348.

García Vargas, E., De Almeida, R. R. & González Cesteros, H. 2011. Los tipos anfóricos del Guadalquivir en el marco de los envases hispanos del siglo I a. C. Un universo heterogéneo entre la imitación y la estandarización. *SPAL: Revista de prehistoria y arqueología de la Universidad de Sevilla*, pp. 185-284.

García Vargas, E., García Fernández, F. J., Garrido González, P., Vázquez Paz, J., Escudero Carrillo, J. & Hunt Ortiz, M. 2013. El Bajo Guadalquivir durante la Antigüedad Tardía (siglos III-VII dC). Ensayo de una tipología de asentamientos. In Álvarez Jiménez, D., Sanz Serrano, R. M. & Hernández de la Fuente, D. A. (eds.) *El Espejismo del Bárbaro. Ciudadanos y Extranjeros al Final de la Antigüedad Coloquio Internacional Nuevas Perspectivas sobre la Antigüedad Tardía (3rd : 2011 : Segovia, Spain)*. Castelló de la Plana: Universitat Jaume I, pp. 329-389.

García Vargas, E., Vázquez Paz, J. & Maestre Borge, C. 2015. Estudio de los materiales cerámicos romanos. In Tabales Rodríguez, M. Á. (ed.) *Excavaciones Arqueológicas en el Patio de Banderas, Alcázar de Sevilla : Memoria de Investigación 2009-2014.* Seville: Real Alcazar de Sevilla, pp.

García-Baquero López, G. 1990. *Geografía Física y Humana de Andalucía.* Madrid, Sintesis.

García-Sanjuán, A. 1999. Los bienes habices y la repoblación de andalucía en el siglo XIII: el caso de Sevilla. *Historia. Instituciones. Documentos,* 26, pp. 211-231.

Gassend, J.-M. & Cuomo, J.-P. 1982. La construction alternée des navires antiques et l'épave de la Bourse à Marseille. *Revue archéologique de Narbonnaise,* 15, pp. 263-272.

Goiran, J.-P. & Morhange, C. 2001. Géoarchéologie des ports antiques de Méditerranée. Problématiques et études de cas. *Topoi Orient–Occident,* 11, pp. 647-669.

Gómez Toscano, F. 2009. Huelva en el año 1000 a. C.: un puerto cosmopolita entre el Atlántico y el Mediterráneo. *Gerión,* 27, pp. 33-65.

González Acuña, D. 2010. Hispalis, puerto romano de la Bética. Aproximación urbanística. *Bollettino di Archeologica on-line I 2010, Volume speciale B, B7. Roma 2008 International Congress of Classical Archaeology, Meetings between Cultures in the Ancient Mediterreanean*. pp. 83-111.

González Acuña, D. 2011. *Forma Urbis Hispalensis : el Urbanismo de la Ciudad Romana de Hispalis a Través de los Testimonios Arqueológicos.* Seville, Universidad de Sevilla, Fundación Focus-Abengoa.

González Jiménez, M. & Alfonso, X. 1991. *Diplomatario Andaluz de Alfonso X.* Seville, El Monte, Caja de Huelva y Sevilla.

González Román, C. & Padilla Arroba, Á. (eds.) 2002. *Estudios sobre las ciudades de la Bética,* Granada: Editorial Universidad de Granada.

Graser, E. R. 1940. A text and translation of the Edict of Diocletian. In Frank, T. (ed.) *An Economic Survey of Ancient Rome, Volume 5.* Baltimore, pp. 307-421.

Grattan, D. W. 1987. Waterlogged Wood. In Pearson, C. (ed.) *Conservation of Marine Archaeological Objects.* London: Butterworth, pp. 55-67.

Grattan, D. W. & Clarke, R. 1987. Conservation of Waterlogged Wood. In Pearson, C. (ed.) *Conservation of Marine Archaeological Objects.* London: Butterworth, pp. 164-206.

Gravina, F., Cibecchini, F., Hesnard, A., Anser, P., Berard, C. J. & Jullian, C. C. 2007. *Comunicare la Memoria del Mediterraneo : Strumenti, Esperienze e Progetti di Valorizzazione del Patrimonio Culturale Marittimo : Atti del Convegno Internazionale, Pisa, 29-30 Ottobre 2004.* Naples : Aix-en-Provence, Centre Jean Bérard.

Greene, K. 1986. *The Archaeology of the Roman Economy.* London, Batsford.

Groen-Vallinga, M. J. & Tacoma, L. E. (forthcoming). The value of labour: Diocletian's Prices Edict. In Laes, C. & Verboten, K. (eds.) *Work, Labor and Professions in the Roman World*.

Guerrero Misa, L. J. 1984. Un ancla bizantina hallada en la Plaza Nueva de Sevilla. *Museos,* 2, pp. 95-98.

Gutiérrez Lloret, S. 1996. *La Cora de Tudmīr, de la Antigüedad Tardía al Mundo Islámico : Poblamiento y Cultura Material.* Madrid, Casa de Velázquez.

Gutiérrez Lloret, S. 1998. Eastern Spain in the sixth century in the light of archaeology. In Hodges, R. & Bowden, W. (eds.) *The Sixth Century: Production, Distribution and Demand.* Leiden: Brill, pp. 161-202.

Guyon, M. & Rieth, E. 2011. Les chalands gallo-romains du Parc Saint-Georges. In Boetto, G., Pomey, P. & Tchernia, A. (eds.) *Batellerie Gallo-Romaine : Pratiques Régionales et Influences Maritimes Méditerranéennes.* Paris : Aix-en-Provence: Editions Errance, pp. 89-102.

Hansen, M. H. 1997. Emporion: A Study of the Use and Meaning of the Term in the Archaic and Classical Periods. In Nielsen, T. H. (ed.) *Yet More Studies in the Ancient Greek Polis.* Stuttgart: Franz Steiner, pp. 83-105.

Heather, P. J. 2005. *The Fall of the Roman Empire : a New History of Rome and the Barbarians.* Oxford; New York, Oxford University Press.

Hesnard, A. 1994. Une nouvelle fouille du port de Marseille, place Jules-Verne. *Comptes rendus des séances de l'Académie des Inscriptions et Belles-Lettres,* 138**,** pp. 195-217.

Hesnard, A. 1995. Les ports antiques de Marseille, Place Jules-Verne. *Journal of Roman Archaeology,* 8**,** pp. 65-77.

Hesnard, A. 2004a. Terre submergée, mer enterrée: una "géoarchéologie" du port antique de Marseille. In Gallina Zevi, A. & Turchetti, R. (eds.) *Le Strutture dei Porti e Degli Approdi Antichi : II Seminario, Roma-Ostia antica, 16-17 Aprile 2004* Soveria Mannelli: Rubbettino, pp. 3-30.

Hesnard, A. 2004b. Vitruve, De architectura, V, 12 et le port romain de Marseille. In Gallina Zevi, A. & Turchetti, R. (eds.) *Le Strutture dei Porti e Degli Approdi Antichi : II Seminario, Roma-Ostia antica, 16-17 Aprile 2004* Soveria Mannelli: Rubbettino, pp. 175-205.

Hohlfelder, R. L. 1976. The ports of Roman Baetica: A preliminary reconnaissance. *Journal of Field Archaeology,* 3**,** pp. 465-474.

Hohlfelder, R. L. (ed.) 2008. *The Maritime World of Ancient Rome. Proceedings of "The Maritime World of Ancient Rome' Conference Held at the American Academy in Rome 27–29 March 2003,* Ann Arbor: Published for the American Academy in Rome by the University of Michigan Press.

Hohlfelder, R. L., Brandon, C. & Oleson, J. P. 2008. The Roman Maritime Concrete Study: A Brief Summary of Fieldwork from 2002 to 2005. In Hohlfelder, R. L. (ed.) *The Maritime World of Ancient Rome.* Ann Arbor: Published for the American Academy in Rome by the University of Michigan Press, pp. 297-304.

Hopkins, K. 1983. Models, ships and staples. In Garnsey, P. & Whittaker, C. (eds.) *Trade and Famine in Classical Antiquity.* Cambridge: Cambridge Philological Society, pp. 84-109.

Horden, P. & Purcell, N. 2000. *The Corrupting Sea : a Study of Mediterranean History.* Oxford, Blackwell.

Houston, G. W. 1980. The Administration of Italian Seaports during the First Three Centuries of the Roman Empire. *Memoirs of the American Academy in Rome,* 36**,** pp. 157-171.

Houston, G. W. 1988. Ports in perspective: some comparative materials on Roman merchant ships and ports. *American Journal of Archaeology,* 92**,** pp. 553-564.

Hunt, M. 2008. *Informe Preliminar y Memoria Científica Final Intervención Arqueológica Preventiva "metro ligero-centro" (Metrocentro). Fase 1: Plaza Nueva-Prado de San Sebastián.* (Unpublished report) Delegación Provincial de la Consejería de Cultura en Sevilla.

Hunt, M. & Pozo, F. 2004. *Memoria Preliminar. Fase IA. Intervención Arqueológica Preventiva "Estación Puerta de Jerez" (Calle San Fernando, Sevilla).* (Unpublished report) Delegación Provincial de la Consejería de Cultura en Sevilla.

INRAP. 2016. *Boulevard Henri-Henrot (Zac Du Vieux Port): A Reims, Marne, les aménagements des bords de Vesle dans la capitale de la Gaule Belgique* [Online]. Available: http://www.inrap.fr/boulevard-henri-henrot-zac-du-vieux-port-4352 [Accessed 15 December 2016].

Institut Català d'Arqueologia Clàssica (ICAC). 2016. *Amphorae ex Hispania* [Online]. Available: http://amphorae.icac.cat/ [Accessed 15 December 2016].

Instituto de Estudios, A. 1993. *Vivir en al-Andalus : Exposición de Cerámica (s. IX-XV).* Almería, Instituto de Estudios Almerienses.

Izquierdo i Tugas, P. 2008. Tarragona dins la xarxa portuària romana. Una aproximació. *Citerior: arqueologia i ciències de l'Antiguitats,* 4**,** pp. 55-77.

Izquierdo i Tugas, P. 2009. Introducció a l'arqueologia portuària romana de la Tarraconense. In Cau Ontiveros, M. A. & Nieto Prieto, F. X. (eds.) *Arqueología Nàutica Mediterrània.* Girona: Monografies del CASC 8, pp. 443-456.

Járrega Domínguez, R. 2013. El puerto romano de Barcino y su inserción en la red portuaria del conventus Tarraconensis (Hispania Citerior). In Nieto, X., Ramírez, A. & Recio, P. (eds.) *I Congreso de Arqueología Náutica y Subacuática Española. Cartagena, 14, 15 y 16 de marzo de 2013*. Madrid: Ministerio de Educación, Cultura y Deporte, pp. 659-670.

Jiménez Maqueda, D. 2011. *Sevilla amurallada. Ensayo de reconstrucción del trazado y las características arquitectónicas de los recintos defensivos de la Colonia Iulia Romula Hispalis y Madīnat Išbīlia (siglo I a.c.-siglo XIII).* Doctoral Thesis, Universidad de Sevilla.

Jiménez Maqueda, D., Pérez Quesada, P. & others 2012. La muralla huérfana: a vueltas con el último recinto amurallado de Madnat Išblia. *ROMVLA,* 11**,** pp. 273-347.

Jiménez Sancho, A. 2014. Un ejemplo de excavación preventiva en el casco histórico: calle Cuna, 10. In Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) *Sevilla Arqueológica. La Ciudad en Época Protohistórica, Antigua y Andalusí.* Seville: Universidad de Sevilla, pp. 242-244.

Jiménez Sancho, A., Borja Barrera, F. & Oliva, P. 2014. La orilla de Sevilla desde época altoimperial al periodo califal. In Fortes Beltrán, J. (ed.) *Sevilla Arqueológica. La Ciudad en Época Protohistórica, Antigua y Andalusí.* Seville: Universidad de Sevilla, pp. 304-305.

Jirikowic, J. L. & Damon, P. E. 1994. The medieval solar activity maximum. *Climatic change,* 26**,** pp. 309-316.

Johns, J. 2010. The *tersāne* at Alanya and the galleys of Charles d'Anjou. In Blackman, D. J. & Lentini, M. C. (eds.) *Ricoveri per navi militari nei porti del Mediterraneo antico e medievale : atti del Workshop, Ravello, 4-5 novembre 2005*. Bari: Edipuglia, pp. 185-188.

Joncheray, J. P. & Brandon, C. 2007. L'Epave Sarrasine Agay A: Campagne 1996. *Cahiers d'archéologie subaquatique,* 16**,** pp. 223-249.

Jones, A. H. M. 1964. *The Later Roman Empire, 284-602; a Social Economic and Administrative survey. Vol. 1-3.* Oxford, Blackwell.

Jones, A. H. M. 1974. *The Roman Economy : Studies in Ancient Economic and Administrative History.* Oxford, Blackwell.

Julià Brugués, R. & Riera Mora, S. 2012. Proposta d'evolució del front marítim de Barcelona durant l'holocè, a partir de la integració de dades geotècniques, intervencions arqueològiques i cronologies absolutes. *Quarhis: Quaderns d'Arqueologia i Història de la Ciutat de Barcelona,* 8**,** pp. 16-37.

Kapitan, G. 1984. Ancient anchors—technology and classification. *International Journal of Nautical Archaeology,* 13**,** pp. 33-44.

Keay, S. J. 1984. *Late Roman Amphorae in the Western Mediterranean : a Typology and Economic Study : the Catalan Evidence, 2 Vols.* Oxford, B.A.R international series.

Keay, S. J. 1988. *Roman Spain.* London, British Museum Publications.

Keay, S. J. (ed.) 1998a. *The Archaeology of Early Roman Baetica,* Portsmouth: Journal of Roman Archaeology.

Keay, S. J. 1998b. Introduction. The Archaeology of Early Roman Baetica. In Keay, S. J. (ed.) *The Archaeology of Early Roman Baetica.* Portsmouth: Journal of Roman Archaeology, pp. 11-22.

Keay, S. J. 2010. Portus and the Alexandrian Grain Trade Revisited. In Keay, S. J. & Boetto, G. (eds.) *Bollettino di Archeologica on-line I 2010, Volume speciale B, B7. Roma 2008 International Congress of Classical Archaeology, Meetings between Cultures in the Ancient Mediterreanean*. pp. 11-22.

Keay, S. J. (ed.) 2012. *Rome, Portus and the Mediterranean,* London: British School at Rome.

Keay, S. J. 2012a. Introduction. In Keay, S. J. (ed.) *Rome, Portus and the Mediterranean.* London: British School at Rome, pp. 1-29.

Keay, S. J. 2012b. The port system of Imperial Rome. In Keay, S. J. (ed.) *Rome, Portus and the Mediterranean.* London: British School at Rome, pp. 33-67.

Keay, S. J. 2016. Portus in its Mediterranean context. In Höghammer, K., Alroth, B. & Lindhagen, A. (eds.) *Ancient ports - The geography of connections, International conference at the department of Archaeology and ancient history, Uppsala University, 23-25 September, 2010*. Uppsala: Uppsala Universitet, pp. 291-322.

Keay, S. J. & Boetto, G. (eds.) 2010a. *Bollettino di Archeologica on-line I 2010, Volume speciale B, B7. Roma 2008 International Congress of Classical Archaeology, Meetings between Cultures in the Ancient Mediterreanean*: Bollettino di Archeologia On-Line.

Keay, S. J. & Boetto, G. 2010b. Introduction: Portus, Ostia and the ports of the Roman Mediterranean. Contributions from Archaeology and history. In Keay, S. J. & Boetto, G. (eds.) *Bollettino di Archeologica on-line I 2010, Volume speciale B, B7. Roma 2008 International Congress of Classical Archaeology, Meetings between Cultures in the Ancient Mediterreanean*. Bullettino di Archeologia On-Line, pp. 1-4.

Keay, S. J., Creighton, J. & Remesal Rodríguez, J. 2000. *Celti (Peñaflor) : the Archaeology of a Hispano-Roman Town in Baetica : Survey and Excavations, 1987-1992.* Oxford, Oxbow Books.

Keay, S. J. & Earl, G. 2007. Structuring of the provincial landscape: the towns in central and western Baetica in their geographical context. In Cruz Andreotti, G., Le Roux, P. & Moret, P. (eds.) *Invention D'une Géographie de la Péninsule Ibérique II: L'époque Impériale (Actas del Coloquio Internacional celebrado en la Casa de Velázquez de Madrid entre el 3 y el 4 de abril de 2006)*. Madrid: Casa de Velázquez, pp. 305-358.

Keay, S. J., Earl, G. & Felici, F. 2011a. Excavation and survey at the Palazzo Imperiale 2007-9. *Portus and its Hinterland : Recent Archaeological Research* London: The British School at Rome, pp. 67-91.

Keay, S. J., Earl, G., Felici, F., Copeland, P., Cascino, R., Kay, S. & Triantafillou, C. 2012. Interim Report on an enigmatic new Trajanic building at Portus. *Journal of Roman Archaeology,* 25**,** pp. 486-512.

Keay, S. J., Millett, M., Paroli, L. & Strutt, K. 2005. *Portus : an Archaeological Survey of the Port of Imperial Rome.* London, The British School at Rome.

Keay, S. J. & Paroli, L. (eds.) 2011. *Portus and its Hinterland: Recent Archaeological Research,* London: The British School at Rome.

Kerchove, R. d. 1961. *International Maritime Dictionary : an Encyclopedic Dictionary of Useful Maritime Terms and Phrases, together with Equivalents in French and German.* Princeton, D. Van Nostrand Company.

Kızıltan, Z. & Baran Çelik, G. (eds.) 2013. *Stories from the Hidden Harbor : the Shipwrecks of Yenikapi,* Istanbul: Istanbul Archaeological Museums Press.

Knapp, A. B. 1997. Mediterranean maritime landscapes: transport, trade and society on Late Bronze Age Cyprus. In Swinny, S., Hohlfelder, R. L. & Wylde Swiny, H. (eds.) *Res maritimae : Cyprus and the eastern Mediterranean from prehistory to late antiquity : proceedings of the Second International Symposium "Cities on the Sea", Nicosia, Cyprus, October 18-22, 1994*. Atlanta: Scholars Press, pp. 153-162.

Kocabaş, U. 2008. *The 'Old Ships' of the 'New Gate'.* Cihangir-Istanbul, Ege Yayınları.

Kraft, J. C., Aschenbrenner, S. E. & Rapp, G. 1977. Paleogeographic reconstructions of coastal Aegean archaeological sites. *Science,* 195**,** pp. 941-947.

Kraft, J. C., Kayan, I. & Erol, O. 1980. Geomorphic reconstructions in the environs of ancient Troy. *Science,* 209**,** pp. 776-782.

Kulikowski, M. 2004. *Late Roman Spain and its Cities.* Baltimore ; London, Johns Hopkins University Press.

Ladstätter, S., Pirson, F. & Schmidts, T. (eds.) 2014. *Häfen und Hafenstädte im östlichen Mittelmeerraum von der Antike bis in byzantinische Zeit : neue Entdeckungen und aktuelle Forschungsansätze : Istanbul, 30.05.-01.06.2011 = Harbors and harbor cities in the eastern Mediterranean from antiquity to the Byzantine period : recent discoveries and current approaches,* Istanbul: Ege Yayınları.

Lamb, H. H. 1972. *Climate : Present, Past and Future.* London, Methuen.

Lamboglia, N. 1952. La nave romana di Albenga. *Rivista di studi liguri,* 18**,** pp. 131-236.

Lamboglia, N. 1961. Il rilevamento della Nave Romana di Albenga. *Atti del II Congresso Internazionale di Archeologia Sottomarina, Albenga, 1958*. Bordighera: Istituto Internazionale di Studi Liguri, pp. 213-239.

Lamboglia, N. 1971. Il rilievo totale della Nave Romana di Albenga. *In Atti del III Congresso Internazionale di Atrheologia Sottomarina, Barcelona, 1961*. Bordighera: Istituto Internazionale di Studi Liguri, pp. 167-175.

Le Roux, P. 1995. *Romains d'Espagne : Cités et Politique dans les Provinces :IIe siècle av. J.-C. - IIIe siècle ap. J.-C.* Paris, A. Colin.

LEGOS. 2016. *Laboratoire d'Études en Géophysique et Océanographie Spatiales, "Tides around the World"* [Online]. Available: http://www.legos.obs-mip.fr/legos/Presentation [Accessed 15 December 2016].

Lehmann, L. 1978. The flat-bottomed Roman boat from Druten, Netherlands. *International Journal of Nautical Archaeology,* 7**,** pp. 259-267.

Lehmann, L. 1990. The Romano-Celtic boats from Druten and Kapel Avezaath. In McGrail, S. (ed.) *Maritime Celts, Frisians and Saxons: papers presented to a conference at Oxford in November 1988*. London: The Council for British Archaeology, pp. 77-81.

Lehmann-Hartleben, K. 1923. *Die antiken Hafenanlagen des Mittelmeeres : Beiträge zur Geschichte des Städtebaues im Altertum.* Leipzig, Dieterich.

Lévi-Provençal, E. 1931. *Inscriptions Arabes d'Espagne : avec 44 Planches Phototypie.* Leyde : Paris, Brill.

Lévi-Provençal, E. & García Gómez, E. 1950. *España Musulmana : Hasta la Caída del Califato de Córdoba (711-1031 de J.C.).* Madrid, Espasa-Calpe.

Lewis, A. R. 1951. *Naval Power and Trade in the Mediterranean : A.D. 500-1100.* Princeton, Princeton University Press.

Lewis, A. R. 1978. Mediterranean maritime commerce: AD 300-1100 shipping and trade. *La navigazione mediterranea nell'Alto Medioevo: settimane di studio del Centro Italiano di Studi sull'Alto Medioevo XXV, 14-20 aprile 1977, 2 Vols.* Spoleto: Centro Italiano di Studi sull'Alto Medioevo, pp. 481-501.

Liou, B., Gassend, J.-M. & Roman, R. 1990. L'épave Saint-Gervais 3 à Fos-sur-Mer (milieu du II e siècle ap. J.-C)[Inscriptions peintes sur amphores de Bétique. Vestiges de la coque]. *Archaeonautica,* 10**,** pp. 157-264.

Liphschitz, N. & Pulak, C. 2009. Shipwrecks of Portus Theodisiacus: Type of wood used in some Byzantine Roundships and Longships at Yenikapi, Istanbul. *Skyllis: Zeitschrift für Unterwasserarchäologie,* 9**,** pp. 164-171.

Lipinski, E. 1984. Vestiges phéniciens d'Andalousie. *Orientalia lovaniensia periodica*, pp. 81-132.

Lirola Delgado, J. 1993. *El Poder Naval de Al-Andalus en la Época del Califato Omeya.* Granada, Universidad de Granada.

Lonchambon, C. 2011. Le chaland du pont romain de Chalon-sur-Saône: réflexions sur le système d'étanchéité. In Boetto, G., Pomey, P. & Tchernia, A. (eds.) *Batellerie Gallo-Romaine : Pratiques Régionales et Influences Maritimes Méditerranéennes.* Paris : Aix-en-Provence: Editions Errance, pp. 119-128.

Lonchambon, C., Bonnamour, L., Connan, J., Thômé, P. & Michel, C. 2009. Les bateaux du pont romain de Chalon-sur-Saône (Saône-et-Loire): Des témoins de l'évolution des techniques de construction navale au I er s. apr. J.-C. *Gallia,* 66, pp. 59-112.

López de la Orden, D. & García Alfonso, E. 2010. *Cádiz y Huelva : Puertos Fenicios del Atlántico.* Seville, Junta de Andalucía, Consejería de Cultura : Cajasol.

Loseby, S. T. 1992. Marseille: a late antique success story? *Journal of Roman Studies,* 82, pp. 165-185.

Loseby, S. T. 1996. Arles in late antiquity: Gallula Roma Arelas and urbs Genesii. In Christie, N. & Loseby, S. T. (eds.) *Towns in Transition: Urban Evolution in Late Antiquity and the Early Middle Ages.* Aldershot: Ashgate, pp. 45-69.

Lovén, B. (ed.) 2011. *The Ancient Harbours of the Piraeus, Volume I.1, The Zea Shipsheds and Slipways: Architecture and Topography,* Athens: Danish Institute at Athens.

Lovén, B. & Sapountzis, I. (eds.) 2016. *The Ancient Harbours of the Piraeus, Volume II, Zea Harbour: the Group 1 and 2 Shipsheds and Slipways – Architecture, Topography and Finds,* Athens: Danish Institute at Athens.

Lovén, B. & Schaldemose, M. (eds.) 2011. *The Ancient Harbours of the Piraeus, Volume I.2, The Zea Shipsheds and Slipways: Finds, Area 1 Shipshed Roof Reconstructions and Feature Catalogue,* Athens: Danish Institute at Athens.

Luterbacher, J., García-Herrera, R., Akcer-On, S., Allan, R., Alvarez-Castro, M. C., Benito, G., Booth, J., Büntgen, U., Cagatay, N., Colombaroli, D., Davis, B., Esper, J., Felis, T., Fleitmann, D., Frank, D., Gallego, D., Garcia-Bustamante, E., Glaser, R., Gonzalez-Rouco, F. J., Goosse, H., Kiefer, T., Macklin, M. G., Manning, S. W., Montagna, P., Newman, L., Power, M. J., Rath, V., Ribera, P., Riemann, D., Roberts, N., Sicre, M. A., Silenzi, S., Tinner, W., Tzedakis, P. C., Valero-Garcés, B., van der Schrier, G., Vannière, B., Vogt, S., Wanner, H., Werner, J. P., Willett, G., Williams, M. H., Xoplaki, E., Zerefos, C. S. & Zorita, E. 2012. A review of 2000 years of paleoclimatic evidence in the mediterranean. In Lionello, P. (ed.) *The Climate of the Mediterranean Region: From the Past to the Future.* Amsterdam: Elsevier, pp. 87-185.

Macias i Solé, J. M. 2011. Horrea y estructuras de almacenamiento en la ciudad y teritorio de Tarraco: una primera aproximación. In Arce Martínez, J. & Goffaux, B. (eds.) *Horrea d'Hispanie et de la Méditerranée Romaine.* Madrid: Casa de Velázquez, pp. 185-200.

Macias i Solé, J. M. & Remolà Vallverdú, J. A. 2010. Portus Tarraconensis (Hispania Citerior). In Keay, S. J. & Boetto, G. (eds.) *Bollettino di Archeologica on-line I 2010, Volume speciale B, B7. Roma 2008 International Congress of Classical Archaeology, Meetings between Cultures in the Ancient Mediterreanean*. Bullettino di Archeologia On-Line, pp. 129-140.

Macklin, M. G., Benito, G., Gregory, K. J., Johnstone, E., Lewin, J., Michczyńska, D. J., Soja, R., Starkel, L. & Thorndycraft, V. R. 2006. Past hydrological events reflected in the Holocene fluvial record of Europe. *Catena,* 66**,** pp. 145-154.

Macklin, M. G. & Woodward, J. C. 2009. River systems and environmental change. In Woodward, J. C. (ed.) *The Physical Geography of the Mediterranean.* Oxford University Press, pp. 319-352.

Maestre Borge, C., García Vargas, E., García García, M. A. & Vázquez Paz, J. 2010. Contextos cerámicos de mediados del siglo VI d. C. procedentes de la colmatación de un cisterna romana de Hispalis (Sevilla, España). *LRCW3. Late Roman Coarse Wares, Cooking Wares and Amphorae in the Mediterranean. Archaeology and archaeometry. Comparison between western and eastern Mediterranean*. Oxford: Archaeopress, pp. 183-192.

Manera, E. 1946. Los arsenales de Cartagena púnico-romanos. *Boletín Arqueológico del Sudeste Español,* 4-7**,** pp. 303-305.

Mango, C. A. 1980. *Byzantium : the Empire of New Rome.* London, Weidenfeld and Nicolson.

Mango, M. M. 2009a. Byzantine trade: local, regional, interregional and international. In Mango, M. M. (ed.) *Byzantine trade, 4th-12th centuries : The archaeology of local, regional and international exchange : Papers of the thirty-eighth Spring Symposium of Byzantine Studies, St John's College, University of Oxford, March 2004*. Farnham: Ashgate, pp. 3-14.

Mango, M. M. 2009b. Tracking Byzantine silver and copper metalware, 4th-12th centuries. In Mango, M. M. (ed.) *Byzantine trade, 4th-12th centuries : The archaeology of local, regional and international exchange : Papers of the thirty-eighth Spring Symposium of Byzantine Studies, St John's College, University of Oxford, March 2004.* Farnham: Ashgate, pp. 221-236.

Mann, M. E., Zhang, Z., Rutherford, S., Bradley, R. S., Hughes, M. K., Shindell, D., Ammann, C., Faluvegi, G. & Ni, F. 2009. Global signatures and dynamical origins of the Little Ice Age and Medieval Climate Anomaly. *Science,* 326**,** pp. 1256-1260.

Marlier, S. (ed.) 2014. *Arles-Rhône 3 : un chaland gallo-romain du Ier siècle après Jésus-Christ,* Paris: Archaeonautica 18, CNRS.

Marriner, N. & Morhange, C. 2006. The 'Ancient Harbour Parasequence': anthropogenic forcing of the stratigraphic highstand record. *Sedimentary Geology,* 186**,** pp. 13-17.

Marriner, N. & Morhange, C. 2007. Geoscience of ancient Mediterranean harbours. *Earth-Science Reviews,* 80**,** pp. 137-194.

Marriner, N., Morhange, C. & Goiran, J.-P. 2010. Coastal and ancient harbour geoarchaeology. *Geology Today,* 26**,** pp. 21-27.

Marsden, P. 1967. *A Ship of the Roman Period, from Blackfriars, in the City of London.* London, Guildhall Museum.

Marsden, P. 1994. *Ships of the Port of London : First to Eleventh Centuries AD.* London, English Heritage.

Marsden, P. 1996. *Ships of The Port of London (12th to 17th Centuries AD).* London, English Heritage.

Martín-Puertas, C., Jiménez-Espejo, F., Martínez-Ruiz, F., Nieto-Moreno, V., Rodrigo, M., Mata, M. P. & Valero-Garcés, B. L. 2010. Late Holocene climate variability in the southwestern Mediterranean region: an integrated marine and terrestrial geochemical approach. *Climate of the Past,* 6**,** pp. 807-816.

Martínez Andreu, M. 2004. La topografía de Carthago Nova. Estado de la cuestión. *Mastia: Revista del Museo Arqueológico Municipal de Cartagena,* 3**,** pp. 11-30.

Martínez López, M. D. & Pozo, F. 2007. *Memoria de Intervención Arqueológica Preventiva en Redes de EMASESA de Plaza Nueva, Avda. de la Constitución, Plaza de Puerta de Jerez, Calle San Fernando, Avda. Carlos V y Calle Diego de Riaño. Sevilla 2007.* (Unpublished report) Delegación Provincial de la Consejería de Cultura en Sevilla.

Mas García, J. 1979. *El Puerto de Cartagena. Rasgos Geográficos e Históricos. Su tráfico marítimo en la antigüedad.* Cartagena, Athenas Ediciones.

Mattingly, D. J. 1988a. Oil for export? A comparison of Libyan, Spanish and Tunisian olive oil production in the Roman empire. *Journal of Roman Archaeology,* 1**,** pp. 33-56.

Mattingly, D. J. 1988b. The Olive Boom. Oil Surpluses, Wealth and Power in Roman Tripolitania. *Libyan Studies,* 19**,** pp. 21-41.

Mazzarino, S. 1951. *Aspetti Sociali del Quarto Secolo : Ricerche di Storia Tardoromano.* Roma, "L'Erma" di Bretschneider.

McCormick, M. 2001. *Origins of the European Economy : Communications and Commerce, A.D. 300-900.* Cambridge, Cambridge University Press.

McCormick, M., Büntgen, U., Cane, M., Cook, E., Harper, K., Huybers, P., Litt, T., Manning, S. W., Mayewski, P. A., More, A. M. & Nicolussi, K. 2012. Climate Change under the Roman Empire and its Successors, 100bc--800ad. A First Synthesis Based on Multi-Proxy Natural Scientific and Historical Evidence. *Journal of Interdisciplinary History,* 43**,** pp. 169-220.

McCormick, M., Büntgen, U., Cane, M. a., Cook, E. R., Harper, K., Huybers, P., Litt, T., Manning, S. W., Mayewski, P. A., More, A. F. M., Nicolussi, K. & Tegel, W. 2012. Climate Change during and after the Roman Empire: Reconstructing the Past from Scientific and Historical Evidence. *Journal of Interdisciplinary History,* 43**,** pp. 169-220.

McGrail, S. 1987. *Ancient Boats in N.W. Europe : the Archaeology of Water Transport to AD 1500.* London, Longman.

McGrail, S. 1995. Romano-Celtic boats and ships: characteristic features. *The International journal of nautical archaeology,* 24**,** pp. 139-145.

McGrail, S. 2001. *Boats of the World : from the Stone Age to Medieval Times.* Oxford, Oxford University Press.

Meeks, E., Scheidel, W., Weiland, J. & Arcenas, S. 2016. *ORBIS: the Stanford Geospatial Network Model of the Roman World* [Online]. Available: http://orbis.stanford.edu/ [Accessed 15 December 2016].

Meiggs, R. 1960. *Roman Ostia.* Oxford, Clarendon Press.

Mellor, G. L. 1996. *Introduction to Physical Oceanography.* New York, American Institute of Physics.

Ménanteau, L. 1982. *Les Marismas du Guadalquivir exemple de transformation d'un paysage alluvial au cours du quaternaire récent.* Doctoral Thesis, Paris-Sorbonne.

Ménanteau, L. 2007. L'influence des facteurs naturels et anthropiques sur l'évolution des ports de Basse-Andalousie (XIIIe-XVIe siècles): études de cas (Palos de la Frontera, Séville et Sanlúcar de Barrameda. In Bochaca, M. & Sarrazin, J.-L. (eds.) *Ports et Littoraux de l'Europe Atlantique. Transformations Naturelles et Aménagements Humains (XIVe-XVIe siècles).* Rennes: Presses universitaires de Rennes, pp. 167-187.

Ménanteau, L. 2008. Morfología y evolución histórica del cauce bajo del Guadalquivir: el ejemplo de Sevilla. In Rubiales Torrejón, J. (ed.) *El Río Guadalquivir.* Seville: Junta de Andalucía. Consejería de Obras Públicas y Transportes, pp. 55-63.

Ménanteau, L. & Clemente, L. 1977. Variaciones de la influencia marina y su incidencia en la transformación del paisaje aluvial del delta del Guadalquivir durante los dos últimos milenios. In Alberdi, M. T. (ed.) *Actas de la II Reunión Nacional del Grupo Español de Trabajo del Cuaternario: Jaca 15-20 Septiembre 1975.* pp. 167-176.

Ménanteau, L. & Vanney, J. R. 1985. El cauce del Bajo Guadalquivir: morfología, hidrología y evolución histórica. In Rubiales, J., Menanteau, L., Martín, Á. & Carrasco, D. (eds.) *El Río: El Bajo Guadalquivir.* Madrid: Equipo 28, Ayuntamiento de Sevilla, pp. 116-136.

Menéndez Argüín, A. R. 2001. *El abastecimiento del ejército romano en las provincias de Germania (siglos II-III): las legiones.* Doctoral Thesis, Univesidad de Sevilla.

Millán León, J. 1989. *Ilipa Magna.* Alcalá del Río, Editorial Gráficas Sol.

Milne, G. 1985. *The Port of Roman London.* London, B.T. Batsford.

Mocchegiani Carpano, C. 1982. Tevere. Premesse per una archeologia fluviale. *Bullettino d'Arte del Ministerio per i beni culturali e ambientali,* 4**,** pp. 151-165.

Moorhead, J. 1994. *Justinian.* London, Longman.

Mora Vicente, G. 2013. *La Casa de la Moneda de Sevilla: Patrimonio Inmueble y Relación con el Entorno.* Doctoral Thesis, Universidad de Sevilla.

Moral Ituarte, L. d. 1991. *La Obra Hidráulica en la Cuenca Baja del Guadalquivir (Siglos XVIII-XX) : Gestión del Agua y Organización del Territorio.* Seville, Universidad, Secretariado de Publicaciones Consejería de Obras Públicas y Transportes.

Morales Belda, F. 1969. *La Marina Vándala.* Barcelona, Ediciones Ariel.

Moreno, A., Pérez, A., Frigola, J., Nieto-Moreno, V., Rodrigo-Gámiz, M., Martrat, B., González-Sampériz, P., Morellón, M., Martín-Puertas, C., Corella, J. P., Belmonte, Á., Sancho, C., Cacho, I., Herrera, G., Canals, M., Grimalt, J. O., Jiménez-Espejo, F., Martínez-Ruiz, F., Vegas-Vilarrúbia, T. & Valero-Garcés, B. L. 2012. The Medieval Climate Anomaly in the Iberian Peninsula reconstructed from marine and lake records. *Quaternary Science Reviews,* 43**,** pp. 16-32.

Morhange, C., Hesnard, A. & Marriner, N. 2011. La géoarchéologie littorale écartelée entre géo- et archéo-sciences?/Coastal geoarchaeology: between the geo- and archaeosciences. *Méditerranée,* 117**,** pp. 55-60.

Morhange, C., Marriner, N. & Bony, G. 2013a. Coastal geo-archaeology in the Mediterranean: a French perspective. In Keay, S. (ed.) *Rome, Portus and the Mediterranean.* London: British School at Rome, pp. 403-409.

Morhange, C., Marriner, N. & Carayon, N. 2014a. The geoarchaeology of ancient Mediterranean harbours. In Carcaud, N. & Arnaud-Fassetta, G. (eds.) *La Géoarchéologie Française au XXIe siècle.* Paris: CNRS Editions, pp. 245-253.

Morhange, C., Marriner, N., Excoffon, P., Bonnet, S., Flaux, C., Zibrowius, H., Goiran, J.-P. & Amouri, M. E. 2013b. Relative Sea-Level Changes During Roman Times in the Northwest Mediterranean: The 1st Century A.D. Fish Tank of Forum Julii, Fréjus, France. *Geoarchaeology,* 28, pp. 363-372.

Morhange, C., Marriner, N. & Liuzza, V. 2014b. Introduction à une étude géomorphologique des ports antiques en Méditerranée. *Geochronique,* 130, pp. 12-14.

Morley, N. 2007. The Early Roman Empire: Distribution. In Scheidel, W., Morris, I. & Saller, R. P. (eds.) *The Cambridge Economic History of the Greco-Roman World.* Cambridge: Cambridge University Press, pp. 570-591.

Muckelroy, K. 1978. *Maritime Archaeology.* Cambridge ; New York, Cambridge University Press.

Museo Arqueológico Nacional 2002. *Artifex : Ingeniería Romana en España.* Madrid, Ministerio de Cultura, Ministerio de Fomento.

Museo Nacional de Arqueología Maritima y Centro Nacional de Investigaciones Arqueológicas Submarinas 1985. *VI Congreso Internacional de Arqueología Submarina : Cartagena 1982.* Madrid, Ministerio de Cultura. Dirección General de Bellas Artes y Archivos.

Museo Nacional de Arqueología Maritima y Centro Nacional de Investigaciones Arqueológicas Submarinas 1988. *La Arqueología Subacuática en España.* Murcia, Ministerio de Cultura. Dirección General de Bellas Artes y Archivos.

Nieto, J. 1988. Cargamento principal y cargamento secundario. *Cahiers d'Historie,* XXXIII, pp. 379-395.

Nieto, X. 1997. Le commerce de cabotage et de redistribution. In Pomey, P. (ed.) *La Navigation dans l'Antiquité.* Aix-en-Provence: Édisud, pp. 146-159.

Nieto, X. & Raurich i Santaló, X. 1998. La infraestructura portuaria emporitana. In Pérez Ballester, J. & Pascual Berlanga, G. (eds.) *III Jornadas de Arqueología Subacuática : Puertos Antiguos y Comercio Marítimo : Facultat de Geografía i Història de Valencia, 13, 14, y 15 de noviembre de 1997.* Valencia: Universitat de València, pp. 55-76.

Nieto, X., Raurich i Santaló, X. & De Barberà, J. 2003. Els treballs arqueològics subaquàtics al port romà d' Empúries (l' Escala, Alt Empordà). *Tribuna d' arqueologia,* 1999-2000, pp. 165-178.

Nieto, X., Revil, A., Morhange, C., Vivar, G., Rizzo, E. & Aguelo, X. 2005. La fachada marítima de Ampurias: estudios geofísicos y datos arqueológicos. *Empúries: revista de món clàssic i antiguitat tardana,* 54, pp. 71-102.

Nieto-Moreno, V., Martinez-Ruiz, F., Giralt, S., Gallego-Torres, D., García-Orellana, J., Masqué, P. & Ortega-Huertas, M. 2013. Climate imprints during the 'Medieval Climate Anomaly' and the 'Little Ice Age' in marine records from the Alboran Sea basin. *The Holocene,* 23, pp. 1227-1237.

Noguera Celdrán, J. M. 2012. *Carthago Nova*: *Vrbs* privilegiada del Mediterráneo occidental. In Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) *Hispaniae Urbes : Investigaciones Arqueológicas en Ciudades Históricas.* Seville: Universidad de Sevilla, pp. 121-190.

Oleson, J. P. 1988. The technology of Roman harbours. *International Journal of Nautical Archaeology,* 17, pp. 147-157.

Oleson, J. P., Bottalico, L., Brandon, C., Cucitore, R., Gotti, E. & Hohlfelder, R. L. 2006. Reproducing a Roman Maritime Structure with Vitruvian Pozzolanic Concrete. *Journal of Roman Archaeology,* 19.1, pp. 29-52.

Oleson, J. P., Brandon, C., Cramer, S. M., Cucitore, R., Gotti, E. & Hohlfelder, R. L. 2004. The ROMACONS project: A contribution to the historical and engineering analysis of hydraulic concrete in Roman maritime structures. *International Journal of Nautical Archaeology,* 33, pp. 199-229.

Oliva Alonso, D. 2007. Los cementerios de Sevilla. In Jiménez Sancho, Á. (ed.) *La Catedral en la Ciudad (III) Los Caños y los Difuntos.* Seville: Catedral de Sevilla : Aula Hernán Ruiz, pp. 187-235.

Ordóñez Agulla, S. 1993. Cantillana, antigua *Naeva*. Aproximación a su historia en la Antigüedad romana. *Cantillana. Cuadernos de Historia Local,* 1, pp. 45-61.

Ordóñez Agulla, S. 1998. *Primeros Pasos de la Sevilla Romana : Siglos I A.C.-I D.C.* Seville, Area de Cultura, Ayuntamiento de Sevilla.

Ordóñez Agulla, S. 2002. Sevilla Romana. In Valor Piechotta, M. (ed.) *Edades de Sevilla: Hispalis, Isbiliya, Sevilla.* Seville: Ayuntamiento de Sevilla, pp. 11-38.

Ordóñez Agulla, S. 2003. El puerto romano de Hispalis. In Pérez Ballester, J. & Pascual Berlanga, G. (eds.) *Puertos Fluviales Antiguos: Ciudad, Desarrollo e Infraestructuras.* Valencia: Universitat de València, pp. 59-80.

Ordóñez Agulla, S. 2014. Marco histórico de la ciudad de Hispalis. In Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) *Sevilla Arqueológica. La Ciudad en Época Protohistórica, Antigua y Andalusí.* Seville: Universidad de Sevilla, pp. 90-115.

Ordóñez Agulla, S. & González Acuña, D. 2009. Colonia Romula Hispalis: Nuevas perspectivas a partir de los recientes hallazgos arqueológicos. In González, J. &

Pavón Torrejón, P. (eds.) *Andalucía Romana y Visigoda. Ordenación y Vertebración del Territorio.* Rome: "L'Erma" di Bretschneider, pp. 65-98.

Ordóñez Agulla, S. & González Acuña, D. 2011. Horrea y almacenes en Hispalis evidencias arqueológicas y evolución de la actividad portuaria. In Arce Martínez, J. & Goffaux, B. (eds.) *Horrea d'Hispanie et de la Méditerranée Romaine.* Madrid: Casa de Velázquez, pp. 159-184.

Orengo, H. A., Fiz Fernández, J. I. & Macias Solé, J. M. 2011. Restitución 3D de la topografía de la antigua ciudad de Tarraco en un entorno SIG: propuestas metodológicas y primeros resultados. In Mayoral Herrera, V. & Celestino Pérez, S. (eds.) *Tecnologías de información Geográfica y Análisis Arqueológico del Territorio: Actas del V Simposio Internacional de Arqueología de Mérida.* Mérida: Consejo Superior de Investigaciones Científicas, pp. 717-726.

Ortega Pérez, J. R., Esquembre, M. A., Molina López, E., Moltó, F. J. & Molina-Bruguera, G. 2004. Instalaciones portuarias del Barranco de La Albufereta (Alicante) en la Antigüedad. In Gallina Zevi, A. & Turchetti, R. (eds.) *Le Strutture dei Porti e Degli Approdi Antichi : II Seminario, Roma-Ostia antica, 16-17 Aprile 2004.* Roma, pp. 87-111.

Ortiz de Urbina, E. & Santos Yanguas, J. (eds.) 1996. *Teoría y práctica del ordenamiento municipal en Hispania : actas del Symposium de Vitoria-Gasteiz (22 a 24 de Noviembre de 1993),* Vitoria: Universidad del País Vasco.

Padilla Monge, A. 1989. *La Provincia Romana de la Betica (253-422).* Ecija, Graficas Sol.

Palancar Penella, M. (ed.) 1977. *Guadalquivires : cincuenta aniversario de la Confederación Hidrográfica del Guadalquivir,* Seville: Confederación Hidrográfica del Guadalquivir.

Pallarés, F. 1977. Dalla nave romana di Albenga a quelle di Porto Veneree Diano. *Rivista di attualità economiche e culturali dell'Istituto Bancario San Paolo di Torino,* 5**,** pp. 31-36.

Pallarés, F. 1983. La nave romana di Albenga (Savona). *Navigia Fundo Emergunt, Catalogo della Mostra di Archeologia Sottomarina in Liguria, Genova.* pp. 45-54.

Parker, A. J. 1992. *Ancient Shipwrecks of the Mediterranean & the Roman Provinces.* Oxford, Tempus Reparatum.

Parodi Álvarez, M. J. 2001. *Ríos y Lagunas de Hispania como Vías de Comunicación : la Navegación Interior en la Hispania Romana.* Écija, Gráficas Sol.

Patella, E. & Di Manzano, P. 2016. *La valorizzazione della riva sinistra del Tevere tra ponte Sublicio e ponte della ferrovia* [Online]. Available: http://romatevere.hypotheses.org/821 [Accessed 15 Decemeber 2016].

Pecero, J. C., Romo Salas, A. S. & Vargas Jiménez, J. M. 1998. *Intervención Arqueológica de Urgencia en C/ Pedro Parias nº 4, Sevilla.* (Unpublished report) Delegación Provincial de la Consejería de Cultura en Sevilla.

Peraza, L. d. 1997. *Historia de la Imperial Ciudad de Sevilla.* Seville, Ayuntamiento de Sevilla, Colección Clásicos sevillanos.

Perea, A. 2006. Visigothic filigree in the Guarrazar (Toledo) and Torredonjimeno (Jaén) treasures. *Historical metallurgy,* 40**,** pp. 1-11.

Perea, A. 2009. *El Tesoro Visigodo de Torredonjimeno.* Madrid, Consejo Superior de Investigaciones Científicas (Ediciones Polifemo).

Pérez Ballester, J. 1998. El portus de Carthago Nova. Sociedad y comercio tardohelenísticos. *III Jornadas de Arqueología Subacuática : Puertos Antiguos y Comercio Marítimo : Facultat de Geografía i Història de Valencia, 13, 14, y 15 de noviembre de 1997.* Valencia: Universitat de València, pp. 250-261.

Pérez Ballester, J., Carmona González, P., Ribera, A. & Pascual Berlanga, G. 2010. Puertos y fondeaderos en la costa valenciana: dinámica costera, tipologiá de asentamientos e interacciones económicas y culturales. *Bollettino di Archeologica on-line I 2010, Volume speciale B, B6/4. Roma 2008 International Congress of Classical Archaeology, Meetings between Cultures in the Ancient Mediterreanean.* Bullettino di Archeologia On-Line, pp. 14-35.

Pérez Ballester, J. & Pascual Berlanga, G. (eds.) 1998. *III Jornadas de Arqueología Subacuática : Puertos Antiguos y Comercio Marítimo : Facultat de Geografía i Història de Valencia, 13, 14, y 15 de noviembre de 1997,* Valencia: Universitat de València.

Pérez Ballester, J. & Pascual Berlanga, G. (eds.) 2003. *Puertos Fluviales Antiguos: Ciudad, Desarrollo e Infraestructuras,* Valencia: Universitat de València.

Pérez Ballester, J. & Pascual Berlanga, G. (eds.) 2008. *Comercio, redistribución y fondeadores la navegación a vela en el Mediterráneo : [V Jornadas de Arqueología Subacuática : actas],* Valencia: Universitat de València.

Pérez González, S. M. 1997. *Luís de Perazza. Historia de la Ciudad de Sevilla.* Seville, Ayuntamiento de Sevilla.

Pérez-Mallaína Bueno, P. E. 1998. *Spain's Men of the Sea : Daily Life on the Indies Fleets in the Sixteenth Century.* Trans. by Rahn Phillips C. Baltimore ; London, The Johns Hopkins University Press.

Petts, G. E. & Foster, I. 1985. *Rivers and Landscape.* London, Edward Arnold.

Petts, G. E., Möller, H. & Roux, A. L. 1989. *Historical Change of Large Alluvial Rivers: Western Europe.*

Pharr, C., Davidson, T. S. & Pharr, M. B. (eds.) 1952. *The Theodosian Code and Novels : and the Sirmondian Constitutions,* Princeton: Princeton University Press.

Phillips, W. D. & Phillips Rahn, C. 2010. *A Concise History of Spain.* Cambridge, Cambridge University Press.

Pizarro Berengena, G. 2013. Agua y Ciudad. In Fernández-Palacios Carmona, J. M. (ed.) *Córdoba Califal. Año 1000.* Seville: Consejería de Agricultura, Pesca y Medio Ambiente, pp. 73-84.

Pliego Vázquez, R. 2009. *La Moneda Visigoda.* Seville, Secretariado de Publicaciones, Universidad de Sevilla.

Pomey, P. 1982. Le navire romain de la Madrague de Giens. *Comptes rendus des séances de l'Académie des Inscriptions et Belles-Lettres,* 126**,** pp. 133-154.

Pomey, P. 1995. Les épaves grecques et romaines de la place Jules-Verne à Marseille. *Comptes rendus des séances de l'Académie des Inscriptions et Belles-Lettres,* 139**,** pp. 459-484.

Pomey, P. 1999. Les épaves romaines de la place Jules-Verne a Marseille: des bateaux dragues? In Tzalas, H. (ed.) *5th international symposium on ship construction in antiquity, Tropis V, Nauplia 26, 27, 28 August 1993*. Athens: Hellenic Institute for the Preservation of Nautical Tradition, pp. 321-328.

Pomey, P. 2009. A new approach of Mediterranean nautical archaeology: harbour, river and river-sea boats. In Bockius, R. (ed.) *Between the seas : transfer and exchange in nautical technology : proceedings of the Eleventh International Symposium on Boat and Ship Archaeology, Mainz 2006, hosted by Römisch-Germanisches Zentralmuseum, Forschungsbereich Antike Schiffahrt, Mainz, with support from Gesellschaft der Freunde des Römisch-Germanischen Zentralmuseum*. Mainz: Römisch-Germanisches Zentralmuseum Mainz. Forschungsbereich Antike Schiffahrt, pp. 267-276.

Pomey, P. & Hesnard, A. 2005. Les navires du port grec archaïque de Marseille : de la fouille archéologique aux maquettes d'étude et aux images de synthèse. *Archaeologia Maritima Mediterranea,* 1 (2004)**,** pp. 187-191.

Pomey, P., Kahanov, Y. & Rieth, E. 2012. Transition from Shell to Skeleton in Ancient Mediterranean Ship-Construction: analysis, problems, and future research. *International Journal of Nautical Archaeology,* 41**,** pp. 235-314.

Pomey, P., Rieth, E. & Rival, M. 2005. *L'Archéologie Navale.* Paris, Errance.

Pomey, P. & Tchernia, A. 1978. Le tonnage maximum des navires de commerce romains. *Archaeonautica,* 2**,** pp. 233-251.

Ponsich, M. 1974. *Implantation Rurale Antique sur le Bas-Guadalquivir.* Madrid, Casa de Velázquez.

Ponsich, M. 1979. *Implantation Rurale Antique sur le Bas Guadalquivir 2. La Campana, Palma del Río, Posadas.* Madrid, Casa de Velázquez.

Ponsich, M. 1987. *Implantation Rurale Antique sur le Bas Guadalquivir 3. Bujalance, Montoro, Andújar.* Madrid, Colleción de la Casa de Velázquez.

Ponsich, M. 1991. *Implantation Rurale Antique sur le Bas-Guadalquivir, 4. Écija, Dos Hermanas, Los Palacios y Villafranca, Lebrija, Sanlúcar de Barrameda.* Madrid, Colleción de la Casa de Velázquez.

Ponsich, M. 1998. The Rural Economy of Western Baetica. In Keay, S. J. (ed.) *The Archaeology of Early Roman Baetica.* Portsmouth: Journal of Roman Archaeology Supplementary Series 29, pp. 171-182.

Prag, J. R. W. & Quinn, J. C. 2013. *The Hellenistic West : Rethinking the Ancient Mediterranean.* Cambridge, Cambridge University Press.

Presedo Velo, F. 2003. *La España Bizantina.* Seville, Universidad de Sevilla, Secretariado de Publicaciones.

Provansal, M. 2000. Introduction. Environnements portuaires antiques en Méditerranée. *Méditerranée,* 94**,** pp. 3-6.

Provansal, M., Berger, J.-F., Bravard, J.-P., Salvador, P.-G., Arnaud-Fassetta, G., Bruneton, H. & Vérot-Bourrély, A. 1999. Le régime du Rhône dans l'Antiquité et au Haut Moyen Age. *Gallia,* 56**,** pp. 13-32.

Pryor, J. H. 1988. *Geography, Technology, and War : Studies in the Maritime History of the Mediterranean, 649-1571.* Cambridge, Cambridge University Press.

Puerto de Sevilla. 2016. *El Puerto de Sevilla* [Online]. Available: http://portal.apsevilla.com/wps/portal/puerto_es/datosTecnicos_es?WCM_GLOBAL_CONTEXT=/APS/puertosevilla/elpuertosevilla/datostecnicos/contDT2 [Accessed 15 December 2016].

Pulak, C., Ingram, R., Jones, M. & Matthews, S. 2013. The Shipwrecks of Yenikapi and Their Contribution to the Study of Ship Construction. In Kızıltan, Z. & Baran Çelik, G. (eds.) *Stories from the Hidden Harbor: Shipwrecks of Yenikapı.* Istanbul: İstanbul Archeological Museums Press, pp. 22-34.

Purcell, N. 1996. The Ports of Rome: Evolution of a “façade maritime”. In Zevi, A. G. & Claridge, A. (eds.) *Roman Ostia’ Revisited. Archaeological and Historical Papers in Memory of Russell Meiggs.* London: The British School at Rome, pp. 267-279.

Raban, A. 1980. The Siting and Development of Mediterranean Harbors in Antiquity. In Sears, M. & Merriman, D. (eds.) *Oceanography: The past. Proceedings of the Third International Congress on the History of Oceanography, held September 22-26, 1980.* New York: Springer, pp. 750-764.

Raban, A. (ed.) 1985. *Harbour Archaeology : Proceedings of the First International Workshop on ancient mediterranean harbours, Caesarea Maritima, 24–28.6.83,* Oxford: Archaeopress.

Raban, A. (ed.) 1986. *Cities on the Sea-Past and Present: 1st International Symposium on Harbours, Port Cities and Coastal Topography,* Haifa: University of Haifa.

Raban, A. 1992. Sebastos: the royal harbour at Caesarea Maritima—a shortlived giant. *International Journal of Nautical Archaeology,* 21**,** pp. 111-124.

Raban, A. & Hohlfelder, R. L. 1981. The Ancient Harbors of Caesarea Maritima. *Archaeology,* 34**,** pp. 56-60.

Ramallo Asensio, S. F. 2006. Carthago de Hispania. Puerto privilegiado de la costa mediterránea. *Civilización : Un Viaje a las Ciudades de la España Antigua.* Alcalá de Henares: Ayuntamiento de Alcalá de Henares, pp. 97-122.

Ramallo Asensio, S. F. 2011. *Carthago Nova. Puerto Mediterráneo de Hispania.* Murcia, Fundación Cajamurcia.

Ramallo Asensio, S. F. & Martínez Andreu, M. 2010. El puerto de Cartago Nova: eje de vertebración de la actividad comercial en el sureste de la Península Ibérica. In Keay, S. J. & Boetto, G. (eds.) *Bollettino di Archeologica on-line I 2010, Volume speciale B, B7. Roma 2008 International Congress of Classical Archaeology, Meetings between Cultures in the Ancient Mediterreanean*. Bullettino di Archeologia On-Line, pp. 141-159.

Ramallo Asensio, S. F. & Ruiz Valderas, E. 2010. El puerto de Cartago Nova: eje de vertebración de la actividad comercial en el sureste de la Península Ibérica. In González Villaescusa, R. (ed.) *Simulacra Romae II: Rome, les capitales de province (capita provinciarum) et la création d'un espace commun européen : une approce archéologique.* Société Archéologique Champenoise, pp. 95-110.

Rankov, B. 2013. Roman shipsheds. In Blackman, D. J. & Rankov, B. (eds.) *Shipsheds of the Ancient Mediterranean.* Cambridge: Cambridge University Press, pp. 30-54.

Rathbone, D. 2009. Earnings and costs: living standards and the Roman economy (first to third centuries AD). In Bowman, A. & Wilson, A. (eds.) *Quantifying the Roman Economy : Methods and Problems.* Oxford: Oxford University Press, pp. 299-326.

Rein Duffau, J. A. 1994. Infraestructura construida del Metro de Sevilla. In De Justo Alpañes, J. L. (ed.) *Pasado y Futuro del Metro de Sevilla.* Seville: Universidad de Sevilla, pp. 21-54.

Remesal Rodríguez, J. 1977-78. Economía oleicola bética Nuevas formas de análisis. *Archivo Español de Arqueología,* 50-51**,** pp. 87-142.

Remesal Rodríguez, J. 1978. Gerion, Habis et Anganthonius. Le peuplement protohistorique d'Andalousie. *Caesarodunum,* 13, pp. 194-205.

Remesal Rodríguez, J. 1986. *La Annona Militaris y la Exportación de Aceite Bético a Germania.* Madrid, Universidad Complutense.

Remesal Rodríguez, J. 1991. Sextus Iulius Possessor en la Bética. *Gerión*, pp. 281-296.

Remesal Rodríguez, J. 1998. Baetican olive oil and the Roman economy. *The Archaeology of Early Roman Baetica.* Portsmouth: Journal of Roman Archaeology Supplementary Series 29, pp. 183-200.

Remesal Rodríguez, J. 2008. Olearii. *Tituli 9. Atti della XIV rencontre sur l'epigraphie in onore di Silvia Panciera*. Rome: Quasar, pp. 349-373.

Remolà Vallverdú, J. A. & Pociña López, C. A. 2001. Nuevas aportaciones al conocimiento del puerto de Tarraco (Hispania Tarraconensis). *Saguntum: Papeles del Laboratorio de Arqueología de Valencia,* 33, pp. 85-96.

Reynolds, P. 1995. *Trade in the Western Mediterranean, AD 400-700 : the Ceramic Evidence.* Oxford, Tempus Reparatum.

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

Ribera i Lacomba, A. 2007. Valencia romana, puerto fluvial y marítimo instalaciones portuarias y vocación comercial. In Hermosilla Pla, J. (ed.) *Historia del puerto de Valencia: [Proyecto de investigación de la Facultat de Geografia i Història].* Valencia: Colegio Oficial de Arquitectos de la Comunidad Valenciana, Colegio Territorial de Arquitectos de Valencia (CTAV), pp. 29-39.

Ribera i Lacomba, A. 2008. Puertos y arquitectura comercial en la Valentia antigua: los orígenes de una larga tradición. *Historia de la ciudad. V Tradición y progreso.* Valencia: Colegio Oficial de Arquitectos de la Comunidad Valenciana, Colegio Territorial de Arquitectos de Valencia (CTAV), pp. 29-39.

Rice, C. M. 2013. *Port economies and maritime trade in the Roman Mediterranean : 166 BC to AD 300.* Doctoral Thesis, University of Oxford.

Richards, N. 2008. *Ships' Graveyards : Abandoned Watercraft and the Archaeological Site Formation Process.* Gainesville, University Press of Florida.

Richardson, J. 1996. *The Romans in Spain.* Oxford, Blackwell.

Rickman, G. 1971. *Roman Granaries and Store Buildings.* Cambridge, Cambridge University Press.

Rickman, G. 1980. *The Corn Supply of Ancient Rome.* Oxford, Clarendon Press : Oxford University Press.

Rickman, G. 1985. Towards a study of Roman ports. In Raban, A. (ed.) *Harbour Archaeology. Proceedings of the first international workshop on ancient Mediterranean harbours, Caesarea Maritima*. Oxford: BAR, International series 257, pp. 105-114.

Rickman, G. 1988. The archaeology and history of Roman ports. *International Journal of Nautical Archaeology,* 17**,** pp. 257-267.

Rickman, G. 1996. Portus in perspective. In Gallina Zevi, A. & Claridge, A. (eds.) *'Roman Ostia' Revisited. Archaeological and Historical Papers in Memory of Russell Meiggs.* London: British School at Rome, pp. 281-291.

Rickman, G. 1998. Problems of transport and storage of goods for distribution : les traces oubliées *La Mémoire Perdue : Recherches sur l'Administration Romaine.* Rome: Ecole française de Rome, pp. 317-324.

Rickman, G. 2002. Rome, Ostia and Portus: The Problem of Storage. *Mélanges de l'Ecole française de Rome. Antiquité,* 114**,** pp. 353-362.

Rickman, G. 2003. The creation of Mare Nostrum: 300 BC - 500 AD. In Abulafia, D. (ed.) *The Mediterranean in History.* London: Thames & Hudson, pp.

Rickman, G. 2005. Portus Romae? In Pollini, J. (ed.) *Terra Marique: Studies in Art History and Marine Archaeology in Honor of Anna Marguerite McCann on the Receipt of the Gold Medal of the Archaeological Institute of America.* Oxford: Oxbow Books, pp. 232-237.

Rickman, G. 2008. Plenary Address: Ports, Ships, and Power in the Roman World. In Hohlfelder, R. L. (ed.) *The Maritime World of Ancient Rome. Proceedings of "The Maritime World of Ancient Rome' Conference Held at the American Academy in Rome 27–29 March 2003*. Ann Arbor: Published for the American Academy in Rome by the University of Michigan Press, pp. 5-20.

Rieth, E. 1998. *Des Bateaux et des Fleuves : Archéologie de la Batellerie du Néolithique aux Temps Modernes en France.* Paris, Éditions Errance.

Rieth, E. 2006. *Archéologie de la Batellerie et Architecture Nautique Fluviale.* Conflans-Sainte-Honorine, Ed. de l'Association des Amis du Musée de la Batellerie.

Rieth, E. 2010. *Les Épaves de Saint-Georges-Lyon (Ier-XVIIIe siècles): Analyse Architecturale et Études Complémentaires.* Paris, Archaeonautica 16, CNRS.

Rieth, E. 2011. L'épave du chaland gallo-romain de la place Tolozan à Lyon: approche d'une tradition régionale de construction « sur sole » en relation avec l'architecture navale maritime méditerranéenne. In Boetto, G., Pomey, P.

& Tchernia, A. (eds.) *Batellerie Gallo-Romaine : Pratiques Régionales et Influences Maritimes Méditerranéennes.* Paris : Aix-en-Provence: Editions Errance, pp. 61-72.

Rieth, E. 2016. *Navires et Construction Navale au Moyen Age : Archéologie Nautique de la Baltique à la Méditerranée.* Paris, Picard.

Rodríguez Almeida, E. 1984. *Il Monte Testaccio : Ambiente, Storia, Materiali.* Rome, Quasar.

Rodríguez Gutiérrez, O., Fernández Flores, A. & Rodríguez Azogue, A. 2012. *Ilipa* (Alcalá de Río, Sevilla). In Beltrán Fortes, J. & Rodríguez Gutiérrez, O. (eds.) *Hispaniae Urbes : Investigaciones Arqueológicas en Ciudades Históricas.* Seville: Universidad de Sevilla, pp. 683-721.

Román, J. 1985. De Alcalá a Sanlúcar. In Rubiales, J., Menanteau, L., Martín, Á. & Carrasco, D. (eds.) *El Río: El Bajo Guadalquivir.* Seville: Equipo 28, Ayuntamiento de Sevilla, pp. 171-197.

Roos, A. M. & Arteaga Matute, O. 2002. El puerto fenicio-púnico de Gadir: una nueva visión desde la geoarqueología urbana de Cádiz. *SPAL: Revista de prehistoria y arqueología de la Universidad de Sevilla,* 11**,** pp. 21-40.

Rosselló Mesquida, M. 2008. Cerámicas en el Portum Sucrone (Cullera, València): indicadores del tráfico comercial durante la Antigüedad tardía (siglos V-VII d. C.). In Pérez Ballester, J. & Pascual Berlanga, G. (eds.) *Comercio, redistribución y fondeadores la navegación a vela en el Mediterráneo.* Valencia: Universitat de València, pp. 305-312.

Rougé, J. 1966. *Recherches sur l'Organisation du Commerce Maritime en Méditerranée sous l'Empire Romain.* Paris, S.E.V.P.E.N.

Rouillard, P. 1991. *Les Grecs et la Péninsule Ibérique du VIIIe au IVe siècle avant Jésus-Christ.* Paris, De Boccard.

Ruiz de Arbulo, J. 2001. Eratóstenes, Artemidoro y el puerto de Tárraco. Razones de una polémica. *Revista d'arqueologia de Ponent,* 11-12**,** pp. 87-107.

Ruiz Muñoz, F., Rodríguez Ramírez, A., Cáceres Puro, L., Rodríguez Vidal, J., Yáñez, C., González-Regalado Montero, M. L., de los Santos, M., Andrés Alonso, J. R. d. & others 2002. Cambios paleoambientales en la desembocadura del río Guadalquivir durante el Holoceno reciente. *Geogaceta,* 31**,** pp. 167-170.

Russell, B. 2013. *The Economics of the Roman Stone Trade.* Oxford, Oxford University Press.

Sáchez Velasco, J. 2012. *Arquitectura y Poder en la Bética Occidental entre los Siglos IV y VIII D.C. : La Cristianización de las Ciudades y del Territorio.* Doctoral Thesis, Universidad de Sevilla.

Salas, A. S. R. & Gordillo, M. O. 2005. De la cárcel de Caballeros al corral de las Herrerías. La Casa de la Moneda de Sevilla. *Anuario Arqueológico de Andalucía 2002 III Actividades de Urgencia Volumen 2.* Seville: Junta de Andalucía. Consejería de Cultura, pp. 189-204.

Salvador Ventura, F. 1990. *Hispania Meridional entre Roma y Islám : Economía y Sociedad.* Granada, Universidad de Granada, Departamento de Historia Antigua.

Salvador Ventura, F. 2006. La Hispalis tardoantigua entre los siglos V y VIII: De baluarte de la aristocracia meridional a pilar del reino visigodo de Toledo. In Jiménez Sancho, Á. (ed.) *La Catedral en la Ciudad (II) Los Caños y los Difuntos.* Seville: Catedral de Sevilla : Aula Hernán Ruiz, pp. 4-42.

Sanchez, C. & Jézégou, M. P. 2011. *Espaces Littoraux et Zones Portuaires de Narbonne et sa Région dans l'Antiquité.* Lattes, Association pour le développement de l'archéologie en Languedoc-Roussillon.

Sanchez, C. & Jézégou, M. P. (eds.) 2016. *Les ports dans l'Espace Méditerranéen Antique : Narbonne et les Systèmes Portuaires Fluvio-Lagunaires : Actes du colloque international tenu à Montpellier du 22 au 24 mai 2014,* Montpellier-Lattes: Éditions de l'Association de la Revue archéologique de Narbonnaise.

Sánchez López, E. 2013. El puerto de Sexi Firmum Iulium. Evidencias de una estructura portuaria en las excavaciones realizadas en 1962 en el Majuelo (Almuñécar, Granada). *Zephyrus. Revista de prehistoria y arqueología,* LXXII, pp. 139-151.

Sanmartí i Grego, E. 1988. La secuencia histórico-topográfica de las murallas del sector meridional de Emporion. *Madrider Mitteilungen,* 29, pp. 191-200.

Sarris, P. 2002. The Eastern Roman Empire from Constantine to Heraclius (306-641). In Mango, C. A. (ed.) *The Oxford History of Byzantium.* Oxford: Oxford University Press, pp. 19-59.

Schäfer, C. 2016. Oil for Germany : Some thoughts on Roman long-distance trade. In Schäfer, C. (ed.) *Connecting the Ancient World: Mediterranean Shipping, Maritime Networks and their Impact.* Rahden/Westf: Verlag Marie Leidorf, pp. 213-250.

Schäfer, C. 2017. The debate on the ancient economy as a “battlefield” and the question of transport routes to the Rhine region. In Remesal Rodríguez, J. (ed.) *Economía romana : nuevas perspectivas = The Roman economy : new perspectives.* Barcelona: Universitat de Barcelona, pp. 89-118.

Schörle, K. 2011. Constructing Port Hierarchies: harbours of the central Tyrrhenian coast. In Robinson, D. & Wilson, A. (eds.) *Maritime Archaeology and Ancient Trade in the Mediterranean.* Oxford: Oxford Centre for Maritime Archaeology, pp. 93-106.

Serrano Mangas, F. 1985. El río y la navegación en la historia moderna. In Rubiales, J., Menanteau, L., Martín, Á. & Carrasco, D. (eds.) *El Río: El Bajo Guadalquivir.* Seville: Equipo 28, Ayuntamiento de Sevilla, pp. 48-53.

Sillières, P. 1990. *Les Voies de Communication de l'Hispanie Méridionale.* Paris, De Boccard.

Smith, W. & Anthon, C. 1851. *A New Classical Dictionary of Biography, Mythology, and Geography, : Partly Based upon the "Dictionary of Greek and Roman Biography and Mythology".* London, John Murray.

Spaar, S. L. 1981. *The Ports of Roman Baetica: A Study of Provincial Harbors and Their Functions from an Historical and Archaeological Perspective.* Doctoral Thesis, University of Colorado.

Steffy, J. R. 1994. *Wooden Ship Building and the Interpretation of Shipwrecks.* College Station, Texas A&M University Press.

Stevens, R. W. 1863. *On the Stowage of Ships and Their Cargoes.* London : Plymouth, Longmans : Stevens.

Strauss, J. 2013. *Shipwrecks Database* [Online]. Version 1.0. Available: http://oxrep.classics.ox.ac.uk/databases/shipwrecks_database/ [Accessed 15 December 2016].

Stroheker, K. & Gigon, O. 1965. *Germanentum und Spätantike.* Zürich, Artemis-Verlag.

Tabales Rodríguez, M. Á. 2001. Algunas aportaciones arqueológicas para el conocimiento urbano de Hispalis. *Habis,* 32**,** pp. 387-423.

Tabales Rodríguez, M. Á. 2003. *Arqueología y Rehabilitación en el Parlamento de Andalucía : investigaciones Arqueológicas en el Antiguo Hospital de las Cinco Llagas de Sevilla.* Seville, Parlamento de Andalucía, Servicio de Diario de Sesiones y Publicaciones no Periódicas.

Tabales Rodríguez, M. Á. 2013. Origen y alcázar islámico. *Apuntes del Alcázar de Sevilla nº 14.* Seville: Patronato del Real Alcázar de Sevilla, pp. 94-117.

Tabales Rodríguez, M. A. n. 2015. *Excavaciones Arqueológicas en el Patio de Banderas, Alcázar de Sevilla : Memoria de Investigación 2009-2014.* Seville, Real Alcázar de Sevilla.

Tammuz, O. 2005. Mare clausum? Sailing seasons in the Mediterranean in early Antiquity. *Mediterranean Historical Review,* 20**,** pp. 145-162.

Tchernia, A. 1978. *L'Épave Romaine de la Madrague de Giens (Var), Campagnes 1972-1975 : Fouilles de l'Institut d'Archéologie Méditerranéenne.* Paris, CNRS.

Tchernia, A. 1997. Le commerce maritime dans la Méditerranée romaine. In Pomey, P. (ed.) *La Navigation dans l'Antiquité.* Aix-en-Provence: Édisud, pp. 116-145.

Tchernia, A. 2011. *Les Romains et le Commerce.* Naples, Centre Jean Bérard : Centre Camille Jullian.

Terrado Ortuño, P. 2015. El muelle sobre pilares de Tarraco en época augustea. Historiografía y Fuentes literarias. In López Vilar, J. (ed.) *Tarraco Bienal Actes 2 Congrés Internacional d'Arqueologia i Món Antic A ugust i les províncies occidentals 2000 aniversari de la mort d'August Tarragona, 26-29 de nove mbre de 2014*. Port de Tarragona, pp. 237-244.

Terrado Ortuño, P. 2016. *Officia Portuensia. Vida i treball al port a través de l'epigrafia i les fonts textuals: una aproximació a Tarraco, Port de Tarragona.* Tarragona, Port de Tarragona.

Thompson, E. A. 1969. *The Goths in Spain.* Clarendon Press.

Thorndycraft, V. R. & Benito, G. 2006. Late Holocene fluvial chronology of Spain: the role of climatic variability and human impact. *Catena,* 66**,** pp. 34-41.

Thornes, J. B., López-Bermúdez, F. & Woodward, J. C. 2009. Hydrology, river regimes, and sediment yield. In Woodward, J. (ed.) *The Physical Geography of the Mediterranean.* Oxford: Oxford University Press, pp. 229-253.

Thorpe, L. 1974. *The History of the Franks.* Harmondsworth, Penguin.

Torres Balbás, L. 1934. Las torres del Oro y de la Plata, en Sevilla. *Archivo Español de Arte y Arqueología,* 29**,** pp. 121-140.

Torres Balbás, L. 1946. Atarazanas hispanomusulmanas. *Al-Andalus,* 11**,** pp. 175-209.

Torres Balbás, L. 1951. Barbacanas. *Al-Andalus,* 16**,** pp. 454-480.

Torres Balbás, L. 1957. Cementerios hispanomusulmanes. *Al-Andalus,* 22**,** pp. 144-207.

Tran, N. 2006. *Les Membres des Associations Romaines: le Rang Social des Collegiati en Italie et en Gaules, sous le Haut-Empire.* Rome, École française de Rome.

Treadgold, W. 1995. *Byzantium and its Army, 284-1081.* Stanford, Stanford University Press.

University of Southampton. 2005. *Roman Amphorae: a digital resource* [Online]. Available: http://archaeologydataservice.ac.uk/archives/view/amphora_ahrb_2005/index.cfm [Accessed 15 December 2016].

Uribelarrea, D. & Benito, G. 2008. Fluvial changes of the Guadalquivir river during the Holocene in Córdoba (Southern Spain). *Geomorphology,* 100**,** pp. 14-31.

Urteaga Artigas, M. M. 2003. El puerto romano de "Oiasso" (Irún) y la desembocadura del río Bidasoa. In Fernández Ochoa, C. & Camino Mayor, J. (eds.) *Gijón, Puerto Romano: Navegación y Comercio en el Cantábrico durante la Antigüedad.* Gijón: Autoridad Portuaria, pp. 212-221.

Urteaga Artigas, M. M. 2005. El puerto romano de Irun (Gipuzkoa). In Urteaga Artigas, M. M. & Noain Maura, M. J. (eds.) *Mar Exterior : El Occidente Atlántico en Època Romana : Congreso Internacional, Pisa, Santa Croce in Fossabanda, 6-9 de noviembre de 2003.* Roma: Escuela Española de Historia y Arqueología en Roma, CSIC, pp.

Urteaga Artigas, M. M. & Noain Maura, M. J. (eds.) 2005. *Mar Exterior : El Occidente Atlántico en Època Romana : Congreso Internacional, Pisa, Santa Croce in Fossabanda, 6-9 de noviembre de 2003,* Roma: Escuela Española de Historia y Arqueología en Roma, CSIC.

Valencia Rodríguez, R. 1988. *Sevilla musulmana hasta la caída del Califato: contribución a su estudio.* Doctoral Thesis, Universidad Complutense.

Vallejo Girvés, M. 1993. *Bizancio y la España Tardoantigua (ss. V-VIII) : un Capítulo de Historia Mediterránea.* Alcalá de Henares, Universidad de Alcalá de Henares.

Vallejo Girvés, M. 1996. The treaties between Justinian and Athanagild and the legality of the Byzantine possessions on the Iberian peninsula. *Byzantion,* 66**,** pp. 208-218.

Vallejo Girvés, M. 2012. *Hispania y Bizancio : una Relación Desconocida.* Madrid, Akal.

Valor Piechotta, M. 1989. La estructura urbana de la Sevilla islámica prealmohade. In Madrid: Asociación Española de Arqueología Medieval (ed.) *III Congreso de Arqueología Medieval Española: Actas: Oviedo, 27 marzo-1 abril 1989*. Oviedo: Universidad de Oviedo, pp. 327-340.

Valor Piechotta, M. 2008. *Sevilla Almohade.* Madrid, Sarriá.

Valor Piechotta, M. & Montes Romero-Camacho, I. 1997. De mezquitas a iglesias: el caso de Sevilla (España). In De Boe, G. & Verhaegue, F. (eds.) *Urbanism in medieval Europe : papers of the "Medieval Europe Brugge 1997" Conference. Volume 1*. Zellik: Instituut voor het Archeologisch Patrimonium, pp. 139-148.

Valor Piechotta, M. & Tahiri, A. (eds.) 1999. *Sevilla Almohade [Exposición],* Sevilla - Rabat: Junta de Andalucía, Consejería de Obras Públicas y Transportes.

Van Doorninck, F. H. 1982. The Anchors. In Bass, G. F. & Van Doorninck, F. H. (eds.) *Yassi Ada.* College Station: Texas A&M University Press, pp. 121-143.

Van Holk, A. 2011. Recent Research on Roman Shipfinds from the Netherlands. In Boetto, G., Pomey, P. & Tchernia, A. (eds.) *Batellerie Gallo-Romaine : Pratiques Régionales et Influences Maritimes Méditerranéennes.* Paris : Aix-en-Provence: Editions Errance, pp. 101-118.

Vanney, J.-R. 1970. *L'Hydrologie du Bas Guadalquivir.* Madrid, Instituto de geografía aplicada del Patronato 'Alonso de Herrera'.

Vavouranakis, G. 2011. Introduction. In Vavouranakis, G. (ed.) *The Seascape in Aegean Prehistory.* Århus: Aarhus University Press, pp. 13-25.

Vázquez, B. S. 2001. El triunfo de la clase media: evolución del cine imperial (Sevilla, 1944-1952). *Cuadernos de la Academia,* 9**,** pp. 311-316.

Vives, J. 1969. *Inscripciones Cristianas de la España romana y Visigoda.* Barcelona, Consejo Superior de Investigaciones Científicas.

Vives, J., Marín Martínez, T. & Martínez Díez, G. 1963. *Concilios Visigóticos e Hispano-Romanos.* Barcelona, Consejo Superior de Investigaciones Científicas, Instituto Enrique Flórez.

Vizcaíno Sánchez, J. 2009. *La Presencia Bizantina en Hispania (siglos VI-VII) : la Documentación Arqueológica.* Murcia, Universidad de Murcia.

Vos, W. K., Morel, J. & Hazenberg, T. 2011. The Woerden 7: an oar-powered Roman barge built in The Netherlands: details on the excavation at the *Nieuwe Markt* in Woerden (Hoochwoert). *Archäologisches Korrespondenzblatt,* 41**,** pp. 101-118.

Votruba, G. F. 2014. *Iron anchors and mooring in the ancient Mediterranean (until ca. 1500 CE).* Doctoral Thesis, University of Oxford.

Walsh, K. 2013. *The Archaeology of Mediterranean Landscapes : Human-Environment Interaction from the Neolithic to the Roman Period.* Cambridge, Cambridge University Press.

Ward-Perkins, B. 2005. *The Fall of Rome and the End of Civilization.* Oxford, Oxford University Press.

Weerts, H. J. T. 1996. *Complex Confining Layers: Architecture and Hydraulic Properties of Holocene and Late Weichselian Deposits in the Fluvial Rhine-Meuse Delta, The Netherlands.* Utrecht, Faculty of Geosciences, Utrecht University.

Weill, R. 1946. Les ports antiques submergés de la Méditerranée orientale et le déplacement du niveau marin. *Revue d'Egyptologie,* 5**,** pp. 137-187.

Westerdahl, C. 1992. The maritime cultural landscape. *International Journal of Nautical Archaeology,* 21, pp. 5-14.

Wickham, C. 2005. *Framing the Early Middle Ages: Europe and the Mediterranean 400-800.* Oxford, Oxford University Press.

Wilson, A. 2008. Economy and trade. In Bispham, E. (ed.) *Roman Europe.* Oxford: Oxford University Press, pp. 170-202.

Wilson, A. 2009. Approaches to quantifying Roman trade. In Bowman, A. & Wilson, A. (eds.) *Quantifying the Roman Economy: Methods and Problems.* Oxford: Oxford University Press, pp. 213-249.

Wilson, A. 2011a. The economic influence of developments in maritime technology in antiquity. In Harris, W. & Iara, K. (eds.) *Maritime Technology in the Ancient Economy : Ship-Design and Navigation.* Portsmouth (Rhode Island): Journal of Roman archaeology, pp. 211-233.

Wilson, A. 2011b. Developments in Mediterranean shipping and maritime trade from the Hellenistic period to AD 1000. In Robinson, D. & Wilson, A. (eds.) *Maritime Archaeology and Ancient Trade in the Mediterranean.* Oxford: Oxford Centre for Maritime Archaeology, pp. 33-59.

Wilson, A., Schörle, K. & Rice, C. 2012. Roman ports and Mediterranean connectivity. In Keay, S. J. (ed.) *Rome, Portus and the Mediterranean.* London: British School at Rome, pp. 367-391.

Wolfram, H. 1988. *History of the Goths.* Berkeley, University of California Press.

Wood, J. 2010. Defending Byzantine Spain: frontiers and diplomacy. *Early Medieval Europe,* 18, pp. 292-319.

Zamora Merchán, M. 2011-2012. La altura de los faros de época romana en relación con su visibilidad marítima: El Faro de Brigantium y el posible Faro de la campa Torres (Gijón). *Cuadernos de Prehistoria y Arqueología,* 37-38, pp. 705-723.

Zazo, C., Mercier, N., Silva, P. G., Dabrio, C. J., Goy, J. L., Roquero, E., Soler, V., Borja, F., Lario, J. & Polo, D. 2005. Landscape evolution and geodynamic controls in the Gulf of Cadiz (Huelva coast, SW Spain) during the Late Quaternary. *Geomorphology,* 68, pp. 269-290.

Appendix I: Ceramic artefacts from the 1981 Plaza Nueva excavation

CERAMIC ARTEFACTS FROM PLAZA NUEVA 1981

BOX #	LABEL ON THE BOX	LABEL/S INSIDE BAG/S	INVENTORY #	PENCIL #	CHRONOLOGY
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438			
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/426		Almoade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/427		Almohade 1ª 1/2 s.XIII
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/428		Almoade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/429		Almohade 1ª 1/2 s.XIII
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/430		Almoade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/431		Almoade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/432		Almoade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/433		Almoade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/434		Almoade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/435		Almoade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/436		Almoade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/437		Almoade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA 81 / 10 mts 4º nivel / 426-438	PN81/4/438		Almoade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466			
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/439		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/440		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/441		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/442		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/443		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/444		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/445		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/446		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/447		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/448		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/449		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/450		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/451		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/452		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/453		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/454		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/455		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/456		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/457		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/458		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/459		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/460		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/461		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/462		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/463		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/464		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/465		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 10 mts 4º nivel / 439-466	PN81/4/466		Almohade 1ª 1/2 s.XIII
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486			
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/467		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/468		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/469		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/470		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/471		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/472		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/473		Islamica s.XI
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/474		Almohade 1ª 1/2 s.XIII
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/475		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/476		Almohade 1ª 1/2 s.XIII
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/477		Almohade 1ª 1/2 s.XIII
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/478		Almohade 1ª 1/2 s.XIII
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/479		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/480		Almohade 1ª 1/2 s.XIII
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/481		Almohade 1ª 1/2 s.XIII
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/482		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/483		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/484		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/485		Almohade 1147-1248
1	SEVILLA Plaza Nueva 4º Nivel	PLAZA NUEVA / 4º nivel - 10 mts / 467-486	PN81/4/486		Almohade 1147-1248