

RESEARCH ARTICLE

The LiguSTAR Project: Archaeological Survey Techniques as Applied to the Study of Roman Settlement on the Riverbanks of the *Lacus Ligustinus* (Southwest Spain)

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The LiguSTAR project studies a transformed watery environment, the ancient *lacus Ligustinus*. The *Ligustinus* was the paleo-estuary of the *Baetis flumen*, currently named the Guadalquivir River (Southern Spain). At present, it is a radically transformed landscape due to intensive sedimentation and other geomorphological dynamics. Yet the estuary banks were highly populated during the Roman period. Important urban sites controlled the surrounding rural settlements, which were dedicated to farming activities. In addition, the *lacus* enabled connections with maritime routes for the export of surplus goods. Nowadays this spatial configuration is difficult to reconstruct, especially the settlement patterns related to the *villae* exploitation system. The LiguSTAR has devised a methodology applicable to the study of the paleo-banks by combining geomorphological, archaeological, and other historical information data with geophysical survey and UAV flight applications. In this paper, we present the state of the art, the hypotheses, the methodology, and the initial fieldwork results from the LiguSTAR Project.

Keywords: Landscape Archaeology; Riparia; *Baetis*; *Ligustinus*; Remote Sensing

Introduction

During the second century BC, the southern Iberian Peninsula was incorporated into the Roman Empire and the Hispania *Baetica* province was established in the late first century BC. *Baetica* was rich in resources such as metals, oil, and wine and included many towns and cities which controlled an intensive exploitation of their territories through the *villae* systems (Hidalgo 2016; Campos and Bermejo 2018). The goods they produced were exported through the main fluvial route, the Guadalquivir River or *Baetis* which spanned this vast area. This river was the main communication route of the province and consequently became the focus of many urban settlements. The mouth of the river was an estuary, a large coastal lake known according to the ancient author *Avienus* (*Ora Maritima* 283–284) as *lacus Ligustinus* in Late Antiquity. Nowadays it is transformed, as a result of the effects of silting up and geomorphological changes which occurred in a depression on the Atlantic coast of Andalusia (Spain) (Rodríguez-Ramírez 1998; Rodríguez-Ramírez et al. 2019). Most of the area is now marshland and predominantly part of the National Natural Park of Doñana. LiguSTAR, **Ligustinus** Project, archaeological **S**urvey **T**echniques for an **A**ncient **R**iparian landscape, aims to investigate the ancient historical settlement patterns that led to the development of the landscape configuration along the banks of the *lacus Ligustinus*. The chronological time-frame of the project involves the *long durée*, from the eighth century BC to the twelfth century AD. Nevertheless, this study focuses on the second BC to the fifth century AD since it is the most interesting period to investigate the impact of the Roman conquest on the region.

In order to achieve our main research objective, we applied diverse analytical perspectives as a theoretical framework: the *riparia* concept within the study of the Roman settlement on the *Ligustinus* banks, the analysis of the archaeological landscape as a *continuum*, and the study of the evolution rural settlement

patterns in relation to the economic global structure of the Roman Empire. This approach is in contrast with traditional local studies (Ramos and González 1992; Barrionuevo 2001; Parodi et al. 2019).

Rural settlements located on the paleo-banks of Guadalquivir River were dedicated to mixed farming and the subsequent processing and export of agricultural products. Furthermore, there is archaeological evidence of viticulture in this territory (Roldán Gómez 1999; Carreras 2001; Lagóstena and Traperó 2019). The proximity of archaeological sites to the river banks enabled fluvial-maritime communications, oriented toward the export of the products to Mediterranean markets. The identification of these archaeological remains allows us to propose a paleo-bank reconstruction, drawing upon recent geomorphological and geographical studies. This project also expects to demonstrate a high density of settlement. Archaeological excavations are often difficult to undertake, expensive, time-consuming, and can be an extensive process. To address these challenges, we propose to design and apply a method to identify and analyse these archaeological landscapes using non-invasive techniques, such as remote sensing techniques on different scales. This methodology, designed by the University of Siena's *Laboratory of Landscape Archaeology and Remote Sensing* (LAP&T), will be applied in the study area. It is necessary to open up new historical approaches for the analysis of Roman settlement patterns in the *lacus Ligustinus* riverbanks and its diachronic evolution on the paleo-estuary. Departing from the historical context and previous research, we propose various hypotheses which we aim to corroborate with the proposed methodology. In fact, we are designing and developing a methodology that has never been carried out in this territory in contrast with other Roman territories where it has been widely applied, and we aim to assess its suitability for our study area.

Firstly, this paper gives a brief overview of the historical and geographical context along with the previous research conducted in the *lacus Ligustinus*. Then, it presents the objectives and challenges of the LiguSTAR project, as well as its theoretical framework and methodology. The second part is concerned with a case study, the settlement of Évora and its surrounding while focusing on the initial field works carried out, the preliminary results and the future investigations.

Previous Archaeological Research in the Area

The ancient *lacus Ligustinus*, currently known as the Lower Guadalquivir Region (south Andalusia, Spain), has been studied by applying different research approaches. Its environmental interest and geological evolution, transformed by climatic, geological, hydrological, tectonic and human effects, have attracted the attention of research areas across the Earth Sciences.

The French school of Geography has studied this area, providing important results about its geomorphological evolution processes (Vanney 1970; Ménanteau 1978; Ménanteau and Vanney 1985). Their investigation goes beyond a paleogeographic study to also consider information by ancient sources (Gavala y Laborde 1959). In the last decades, numerous studies have recognized the range of agents involved in the process of landscape transformation. The main studies have been devoted to different subjects, such as the chronology of the phases of progradation and erosion events, the analyses of sediment cores, and the multidisciplinary examination of the geomorphological patterns and historical data (Ruiz et al. 2005; Rodríguez-Ramírez and Yáñez 2008; Rodríguez-Ramírez et al. 2014; 2015; 2016).

Geoarchaeology has also contributed to the landscape's reconstruction, through its human occupation and its stratigraphic record (Arteaga and Roos 1995). From a historical approach, the most common research line is the analysis of its settlement patterns (Ferrer et al. 2007; 2008). The main periods studied have been the Tartessian Period (ninth to sixth century BC) (Belén 2000; Escacena 2013; Villarías and Rodríguez-Ramírez 2017), the Turdetan-Iberian phase, (fifth to second century BC) (Escacena and Belén 1997; García Fernández 2003), and the initial Roman period (third to first century BC) (Ponsich 1991; Escacena and Padilla 1992). Alternatively, site-based studies have been carried out, as in the cases of *Conobaria* (Caro 1985, who located the city in Cerro de las Vacas (Lebrija); Beltrán 1999; Beltrán 2004, who in turn located it in Las Cabezas de San Juan), *Orippe* (Fernández Gómez et al. 1996), *Laelia* (Caballos et al. 2005), *Hasta Regia* (Martín-Arroyo 2018) and *Caura* (Escacena et al. 2018). In contrast to the known civic settlement, rural settlement remains under studied due to archaeological remains being less visible in surface survey.

From the mid-eighties, field-walking surveys have been carried out in the study area following the boundaries of current municipal districts (Lavado 1986; Riesco 1987). The main objective was the identification of archaeological sites of any historical period through the recording of surface material. Some surveys were focused on the Roman period sites (Ponsich 1991) while others followed the landscape as a criterion, specifically the study of the ancient bank of the *Ligustinus* (Ramos and González 1992; Barrionuevo 2001). More recently, a review of archaeological sites was completed by the Sanlúcar de Barrameda municipality (Parodi et al. 2019). The most recent studies have tried to represent the sites with polygons (Parodi et al. 2019).

Because of the inaccuracy of the survey equipment used and the recording methodology, many sites were duplicated in these studies, with several GIS (Geographical Information System) location dots often belonging to the same site. Many sites have also disappeared as a consequence of urban development.

Recently, the Greco-Roman perception of the *Ligustinus* and its shores as centre of Tartessian region by Avienus (*Or. Mar.* 120–128) and Strabo (*Geographica* 3.1.6–9), has been explored within the *Riparia* project (Lagóstena 2014). Further insights have been proposed regarding its viticulture and related sites in the territory of *Hasta Regia* (Martín-Arroyo and Castro 2019, see also Trapero 2016; Lagóstena and Trapero 2019).

Research Objectives

The main objective of the LiguSTAR Project is the integral study and reconstruction of the Roman settlement patterns and their diachronic evolutionary development along the riverbanks of the paleo-estuary. This reconstruction will be made in connection with the environmental changes taking place in this transformed landscape.

The specific objectives that will be pursued are:

To examine the historical settlement and environmental transformation produced in the ancient riverbanks of *lacus Ligustinus* from a long-term diachronic perspective through the selection of a case study (the site of Évora).

To focus on archaeological analysis and GIS-databased interpretation in a multiscale landscape context and to integrate the data-collection into the previous historical debate and knowledge.

To apply the holistic methodology developed by the LAP&T through the application of new technologies. Through this adapted methodology, the following items will be detected: the diachronic changes in the landscape's articulation through the protohistoric period; the important classical settlement patterns and the evolution in the Medieval era and Early Modern period, in accordance with the environmental changes in a transformed landscape.

As a consequence of the 2 year duration and the resources of the project, the primary objectives will be explored in a first case study as a test for checking the viability of the methodological approach. The identified case study area includes the settlement of Évora and its surroundings. This zone presents the general characteristics of the settlement on the riverbanks of *Ligustinus*, as well as offering some specific historical challenges that we will consider in the hypothesis and research questions above. In the future, the study area could be extended.

Historical and Geographical Context

The mouth of the Guadalquivir River in the Gulf of Cádiz (South-West of Spain, Atlantic Ocean) generates one of the biggest wetlands in Europe, comprising an area of 185,000 hectares. It is the result of a process that occurred over the Holocene. During the Post-glacial sea level rise (3000 BC), the Gulf reached its maximum expansion. At this time, the silting up effect began to transform this coastal space into a marshland, involving geomorphologic forces and dynamic marine-riverine processes (Rodríguez-Vidal et al. 2011; Rodríguez-Ramírez et al. 2015; 2016; a synthesis of the geomorphological process: Ménanteau and Vanney 2011; Rodríguez-Ramírez et al. 2019).

The Holocene evolution of this space is fundamental to understanding the geographic framework of the historic phenomena we are studying (**Figure 1**). It can be summarised by the following phases: During the Neolithic period, the last Post-glacial sea level rise generated the maximal extension of the Gulf. During the Late Bronze Age (1,150–750 BC), tide flats and sandy spits increased and the alluvial plain became a river delta. The river mouth was displaced towards the Atlantic in a gradual process of silting up. During the Turdetan-Iberian and Roman periods, supratidal marshes and alluvial plains were consolidated and the coastal spit and the dune system increased (370 BC–AD 418) (Arteaga et al. 1995; Borja et al. 2018: 379). The estuarine shore reached the central part of the original zone, creating a multitude of floodplains behind it. During this period the alluvial landscape was widespread, the sandy spit augmented the enclosed feature of this space and the dunes expanded (Rodríguez-Ramírez et al. 1996). More recently, agriculture and aquaculture have eroded the vestiges of ancient natural drainage systems, which were identified in aerial photography and mapped by Ménanteau (Alonso and Ménanteau 2011; Ménanteau and Vanney 2011).

The historic settlement is related to environmental changes in the banks of the *lacus Ligustinus* as well as to the regional contexts of the Southern Iberian Peninsula, the Guadalquivir Valley, and the Atlantic coast. The changing landscape was described by Strabo as an estuary zone with navigable waterways and densely populated shores (Strabo, *Geog.* 3.2.5) (**Figure 2**). Since the Late Bronze Age (1150–750 BC), there was an intensive occupation of these lands. The Orientalizing period and the Tartessian culture, which expanded in the

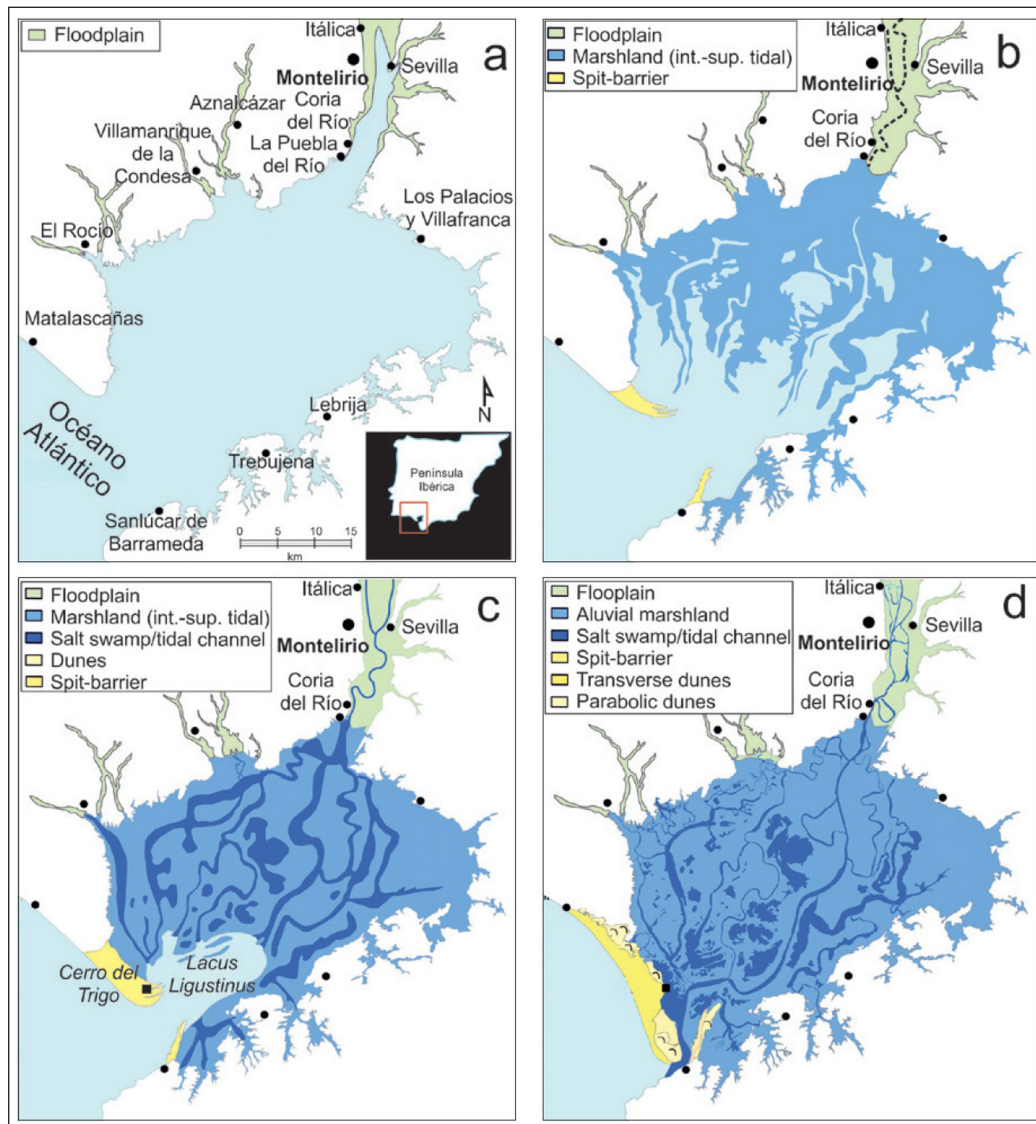


Figure 1: Hypothetical reconstruction of the Guadalquivir mouth evolution during the second half of the Holocene [Key: **a:** Neolithic period; post-glacial maximum flooding, marine-estuarine environments fully occupy the bay, without reaching close to Itálica (ca. 6500 BP); **b:** Late Bronze Age; accelerated expansion of the tidal flats and rapid growth of sand barriers, and floodplain consolidated near Coria del Río (ca. 3300-2800 cal BP); **c:** 2nd Iron Age to Roman times; consolidation of floodplain south Sevilla; alluvial marshes and sandy barrier increasing, as well as dune system (ca. 2390-1600 cal BP); **d:** Latest centuries; widespread alluvial marshes, intense hydraulic management of floodplain and marshes, the beach barrier system shows two new prograding morph-sedimentary units]. Mapping based on ecological regionalization from C. (Montes et al. 1998) morph-topographic restitution from Ménanteau (1982); and chronologies come from the references. By Borja et al. (2018) with the author's permission.

Southwestern Iberian Peninsula, were related to the arrival of the Phoenicians and to their settlement foundations. The coastal settlements located from the Strait of Gibraltar to the mouth of Guadalquivir were connected to the Phoenician colony of *Gadir*. Metals from the mining zone in the current province of Huelva were exported through the Guadalquivir and its tributaries, such as the Guadiamar River. This trade is presumed to have increased the population and the number of sites on the estuary banks (Ferrer et al. 2008: 222).

Poor agricultural soils are found on the northern side of the *Ligustinus* watershed, on the right bank of the Guadalquivir. Furthermore, the topography did not offer convenient high ground for the protohistoric settlement (Ferrer et al. 2008: 221).¹ A polynuclear pattern of settlement, characterized as numerous *oppida*, is found on the southern side of the *lacus Ligustinus*, especially from Los Palacios (Seville) to the mouth of the Guadalquivir. Some of the main locations became Roman cities, such as *Nabrissa* (Lebrija), *Asta* (indigenous place name, Mesas de Asta, Jerez de la Frontera), *Ebora* (Cortijo de Évora, Sanlúcar de Barrameda) and



Figure 2: Ancient *lacus Ligustinus* and main civic roman settlement (mouth of the Guadalquivir River).

Conobaria (Cerro de las Vacas, Lebrija) (Ferrer et al. 2008: 237–238). They were positioned in elevated and well-defended positions, with fresh water supply, protection against the floods with navigational control from their ports (Caro 1985: 12).

At the end of the Tartessian period, during the transition to the Turdetan era, the small sites disappeared and the population was concentrated in large sites with access to the sea or the estuarine waterways, as in the case of the city of *Asta*. The beneficial trade of metals declined after the fall of Tyre in the sixth century BC, and the related Phoenician colonies and indigenous cities in the Iberian Peninsula also declined. During the fifth century BC, the main urban sites, surviving from the Tartessian period, were located in elevated positions beside the marshes. The hierarchy of sites is unknown. They exploited the agrarian hinterland and the sea resources, and they used the ports to trade with their agrarian surpluses (Escacena 1993). The Punic influence has been related to the economic activities in the coastal sites and the agrarian colonization, which reach an important development in the fourth century BC, and especially during the third century BC (Ferrer and Pliego 2010: 543–544).

After the Second Punic War, Roman control of the region probably changed the relationships between the local civic powers. The defeat and punishment of *Asta*, one of the main territorial centres, is confirmed by written and epigraphic sources (Martín-Arroyo 2018: 152–154). It probably affected the political order on

the *Ligustinus* banks to a considerable extent. Afterwards, the arrival of Italic people to this city will have been very influential to the economy of the zone. The record of Campanian pottery (black gloss tableware, types B and C) shows the intensity of the trade exchanges in the late Republican period. It will have continued during the Early Roman Empire, with the development of the viticulture and despite the increasing enclosure of the *lacus*. A transformation of the rural settlement pattern started in the third century AD, as part of a general phenomenon in the Hispanic Roman provinces (Chavarría 2007). Trade and, consequently, navigation is supposed to have become reduced in the *Ligustinus*. The silting up of the estuary reduced the size of suitable channels for navigation, which became more dependent on tides.²

Theoretical Framework

Regarding the aforementioned chronological and geographic context, LiguSTAR's Project's theoretical framework is founded on the concept of *Riparia*, as used in the study of the Roman Empire. Riverbanks and shorelines have been defined as spaces which incorporate particular ecological characteristics. The ecosystems located in zones of land-water interaction, the so-called "riparia" in Ecology, are susceptible to geomorphologic and climatic changes (Naiman et al. 2005). By understanding landscapes through a cultural perspective, our approach considers the *Riparia* as integrated spaces where a certain interaction occurs between society and the environment. This interrelationship with the ecosystem is examined from three angles: known space, built space, and perceived space. During the Roman period, the Latin term *riparia* defined the riverbanks and shorelines with a political, juridical, and economic status (Hermon 2010; 2014a; 2014b: 5–7).³ For these reasons, the Roman Empire is an optimal period to investigate the cultural and social response to changing environments, embracing the adaptation through political adjustments and the increased resilience of riverine communities (Hermon 2010; Hermon and Watelet 2014).

From a methodological perspective, we apply the *continuum* concept to understand archaeological landscapes. The analytical scale used in this kind of study affects our subsequent interpretation (Mathieu and Scott 2004). The cartographic representation of the archaeological landscapes and its scale is a matter that has been recently examined. The archaeological landscape is stratified. The use of GIS, which allows the superimposition of layers, has enabled a huge advance in its representation. The mapping process affects the quality of the data and their quantification, which is important in understanding the landscape. In archaeological studies, different geographic scales of representation have been identified.⁴

In addition, depending on the geographical scale, maps can affect the perception of the density of settlement.⁵ Consequently, a recent approach postulates that the more convenient scale to study archaeological landscapes is the local one (represented in cartography as 1:10.000–1:50.000).⁶ The local scale refers to the zone between the detail and the general scales that is, the type of space in which the rural communities operated (Campana 2018: 23).⁷ The local scale covers the shadowy zone between the mid- and macro scale at a cognitive level. Finally, the use of the local scale resolves the problem of the relationship between micro and macro scales in the use of determined methodologies, which risks the lack of important pieces of information. These pieces could be invisible in the macro scale, as well as not being present in the micro scale (Campana 2009: 6–7). For this reason, we selected the local scale as the most appropriate for our study.

Traditionally, field-walking surveys have been the main method of examining the archaeological landscape, in conjunction with other techniques such as aerial photography interpretation. The results are traditionally mapped using a series of points that represent "sites", lacking explanations of any kind of linking or physical relationship between them (Bintliff 2000). This type of representation makes it difficult to comprehend the time-space evolution of the underlying settlement patterns. The gaps (empty spaces) make it difficult to understand the functionality of sites and their relationship to surrounding areas (Campana 2009; Powlesland 2009: 174). There is a lack of other types of linking evidence to understand the spatial patterns, such as traces of field systems, communication infrastructure, exploitation of natural resources, etc. Nevertheless, there is a conflict of methodology because the field-walking survey as an effective technique to detect artefacts and define historical phases of a settlement, and its limited ability to uncover particular phases of past activity or to discern the relationship between archaeological sites (Campana 2009; Vaccaro et al. 2013). In addition, field-walking survey techniques, have been considerably developed in recent decades from a methodological point of view. They are very useful at a regional scale. Nevertheless, they have been criticised because they have focussed too much on individual records of artefacts without putting them in context. In the majority of cases, the identity and social practices that show the variability of rural communities is forgotten. The studies of consumption in Roman times have focussed on urban communities and have reduced the importance of rural communities based on production. Some researchers have considered

the rural communities as consumers, and pay more attention to the intangible aspects of the pottery record (such as evidence for local food preparation and consumption practices) (Witcher 2006).

More recently, other techniques of site detection are being incorporated into archaeological methodologies. Remote sensing has been applied to the study of cities, but the use of this technique is not always extended to include the rural landscape. From a methodological point of view, the application of new techniques of large-scale prospection allows us to delve into every historical feature that configures the landscape in its diachronic dimension (Powlesland 2009; Campana 2018: 43). With this methodology, we can fill in the spatial gaps in the archaeological maps. The historical landscapes are understood as a *continuum*. However, discontinuities, gaps, or recorded absences need a holistic approach. The research strategy should integrate remote sensing (geophysical, magnetic, and aerial prospection) with traditional techniques (collection of literary and historiography information, geomorphological and environmental studies, etc.) (Campana 2017: 1225) and computational modelling (Verhagen 2018).

Another part of the theoretical framework is the study of the rural landscape, its organization, settlement pattern, relationship with urban centres, its economic potential, and its repercussions for the demography in the context of the Roman Empire. This period has been considered optimal for the analysis of the establishment of settlement patterns in relationship with the agrarian regimen as an economical system. Several researchers have conducted studies to identify the impact of the Roman socioeconomical and political model in different territories, through the establishment of certain organizational forms, rational economical strategies, and new forms of production. This process requires resources, investment in technology, and economic intensification strategies, involving labour and precise organization of the global structure of the settlement. This impact can be understood by looking at the agricultural potential and its capacity to generate production surpluses for commercial purposes. Frequently it involved intensive cash crops, such as olive and vine cultivation. Therefore, different researchers have conducted studies on the settlement patterns through extensive landscape surveys in Italy: the Tiber Valley Project-Rome hinterland (Lazio) (Goodchild 2007; Patterson et al. 2020); the Potenza Valley Project (Macerata Marches) (Vermeulen et al. 2017); and the Sarno River Valley Project (*Pompeii* hinterland, Campania) (Vogel et al. 2016; Seiler et al. 2019), as well as the the Laetanian region studies (Northeast Spain) (Martín i Oliveras and Revilla 2019; Stubert et al. 2020). All of these offer methodological and theoretical research approaches that are relevant to our project.

On the other hand, the analysis of rural settlement patterns from a demographic perspective is restricted by the limitations in archaeological survey methods and the visibility of sherds on the surface (see Witcher 2011: 3–4 for an overview). Nevertheless, in recent years, some studies have dealt with demography by considering food production and consumption within the modelling of agrarian landscapes (Goodchild 2019 and contributions in Remesal et al. 2019; Verhagen et al. 2019).

The modelling of the Roman agrarian landscape and its relationship with wetlands has been carried out in our study region. According to Columella (*De Re Rustica* 4.30.2.), the Latin agronomic ratio between the land required for cultivation of riparian vegetation and the related vine training systems has been used here to model the potential implementation of an economic intensification strategy (Martín-Arroyo 2016; Martín-Arroyo and Remesal 2018; Martín-Arroyo and Castro 2019). Other models have been developed involving viticulture within the territory of *Hasta Regia* (Trapero 2016), which the LiguSTAR Project complements through the investigation of the Évora case study. Starting from the theoretical and historical framework, and after a first phase of identification of archaeological elements, we aim to carry out an analysis of the evolution of the rural settlement. In this respect, we intend to study the extension and density of remains on the surface, as well as the underground vestiges attested by remote sensing, to establish a typology of the sites. In addition, we will examine the relationship between rural settlements, water points, and communication routes. We will study the connectivity of the rural and urban areas through optimal routes and resource catchment analyses, including land suitability and potential crops analysis for extensive cereal cultivation and viticulture.

The selected study area is an optimal environment to apply the aforementioned investigations.⁸ Firstly, there was an important previous cultural tradition and organization of these lands, including the Tartessian-Turdetane one, as well as foreign cultural influences, namely the Phoenician-Punic one. Secondly, its insertion within the Roman Empire organizational structure, highlighted by the creation of the colony of *Hasta Regia*, must have had a remarkable impact. Moreover, the region was connected by an important communication route, the *Via Augusta*, that surrounded the *Ligustinus* banks, from East to South shores. The *Ligustinus* channels and the *lacus* itself were also important communication networks. Finally, the area presents a remarkable density of archaeological sites and larger network of cities, in addition to some evidence of viticulture.

Research Challenges

The research commences with a map of the study area in which archaeological sites are represented as dots. These sites were detected by field-walking surveys, which recorded the presence of archaeological material dispersed on the land surface. This approach involved several research challenges. One of them is our relative ignorance of the size, structural composition, and functionality of these sites. Different dots could belong to the same functional unit, or vice versa. Consequently, the initial number of sites could be reduced or increased. The site locations were recorded by five different researchers, who visited the sites at different times of the year, with diverse ground visibility affecting their identification. Therefore, our current archaeological information must be clarified. Many ephemeral features that must have had an important role in past landscapes, such as quarries, field boundaries, and minor road systems, remain totally unrepresented in the available maps. The detection and mapping of these items will allow us to more fully understand the ancient landscape.

The LAP&T's methodology within the LiguSTAR project

From the late 1970s the University of Siena has fostered a systematic programme of landscape and archaeological investigations within southern Tuscany.⁹ As a result, this area now has a substantial database of archaeological evidence and historical written references at various scales. In 2003 the LAP&T was established for the progressive introduction of remote earth observation systems, along with the enhancement of surface data collection techniques, including new documentation, instruments, and methods (Campana and Francovich 2007). Despite the success of this research in the subsequent years, some questions remain unresolved. For example, the majority of the archaeological traces belong to certain periods, between the six century BC to the six century AD, with Prehistory and Medieval periods unrepresented in the record. For this reason, the field-walking surveys and artefact collections can be considered good methods for detecting "positive pieces of evidence" (e.g. walls, tanks, collapsed remains of walls, etc.) but they cannot easily detect "negative ones" (e.g. ditches, pits, postholes, etc.). Furthermore, methods for representing "emptyscapes", or the lack of data, still remains problematic.¹⁰

Departing from the LAP&T methodology, the examination of the landscape will be undertaken using different scales of analysis. First the macro-scale, then the local-scale (as explained above, meso-scale) and finally the micro-scale. The proposed methodology is based on the use of non-invasive techniques of archaeological survey, already widespread in landscape archaeology, together with the so-called "traditional techniques". It is also necessary to develop a methodological strategy for the correct application of these techniques in order to guarantee their effectiveness, taking into consideration the land-conditions, soil composition, vegetation, since these techniques have not been applied until now.

The first step of our project included reviewing and analysing the existing historical information and the collection of all previous knowledge (historical and archaeological) of the study area. This work enabled the integration of historical elements detected in the application of survey techniques into the rest of the scales and helped with the interpretation of results. We then mapped the archaeological elements of the study area using a GIS-database. After that, we applied non-invasive survey techniques in the large-scale to detect the settlement configuration, research which is still ongoing. The techniques are being and will continue to be used according to their suitability at the scale of analysis. The exploration is being planned at the local-scale. The remote sensing techniques for the identification of archaeological evidence are, firstly the interpretation of aerial photography, vertical and oblique, and regional LIDAR (Light Detection and Ranging). Secondly, large-scale geophysical prospection: involving the use of GPR (Ground Penetrating Radar). And finally, UAV (Unmanned Aerial Vehicle) flight applications, such as photogrammetry for high-density 3D survey and measurement, high resolution DEMs (Digital Elevation Models) and thermographic image capture with a sensor thermal camera. Moreover, terrestrial surveys are being employed to complement the information collected. Subsequently, we will process the data collected with the software suitable for each technique. The summation of these data will allow us to arrive at the final interpretation to identify historical settlements patterns and environmental changes.

The archaeological data will be analysed in relation to the microtopography and its relationship to the *Ligustinus's* riverbanks. In addition, the artefacts will be classified in broad categories (transportation-storage, vessels, cooking-service) in order to understand the functionality of the rural settlement. The sherds collected will be classified using more detailed typologies and a selection of the most representative ones will be drawn. The last objective is to establish the chronological order of occupation, the site's functionality and identity within the regional context and finally, to achieve a social analysis of the rural settlement.

On the one hand, the densities and distribution of artefacts will enable us to identify potential areas for the application of geophysical prospecting techniques. The archaeological features detected through non-invasive techniques will allow us to characterise the archaeological sites and reveal detailed information about the distribution, form, and extent of settlements. The possibilities of carrying out geochemical analysis and obtaining data which can be superposed on the geophysical ones could define the character of different land-use zones within and beyond settlements (Loveluck et al. 2014: 222–225). On the other hand, the geomorphological analysis through sampling sediment collected in specific locations is relevant for understanding the evolution of the landscape.¹¹ Finally, future projects should consider carrying out test excavations on an appropriate scale.

The originality of the project lies in the use of non-invasive survey techniques in this territory. At the moment these techniques have not been applied in this specific area. In addition, thanks to the development of a methodological strategy being applied to this area, it can provide a method for future studies.

Évora, the selection of the case study

Ancient *lacus Ligustinus* is a large area that has transformed into a marshland today, which is included within the National Natural Park of Doñana, biosphere reserve and “World Heritage Site” recognised by UNESCO in 1994 with important protection measures consisting of a restricted zone and a buffer protection area (108,087 hectares.). Given the large size and the restricted access to this zone, the project is focused on a specific part of this area. In the large-scale perspective, the selected study zone concerns the southwestern and northern parts of Seville and Cádiz respectively, comprising the left riverbanks of the Guadalquivir River. Regarding the proposed optimal scale for this type of study (local-scale), we selected a target area of 8,000 hectares (**Figure 3**). With this target area, we identified an important archaeological site with specific

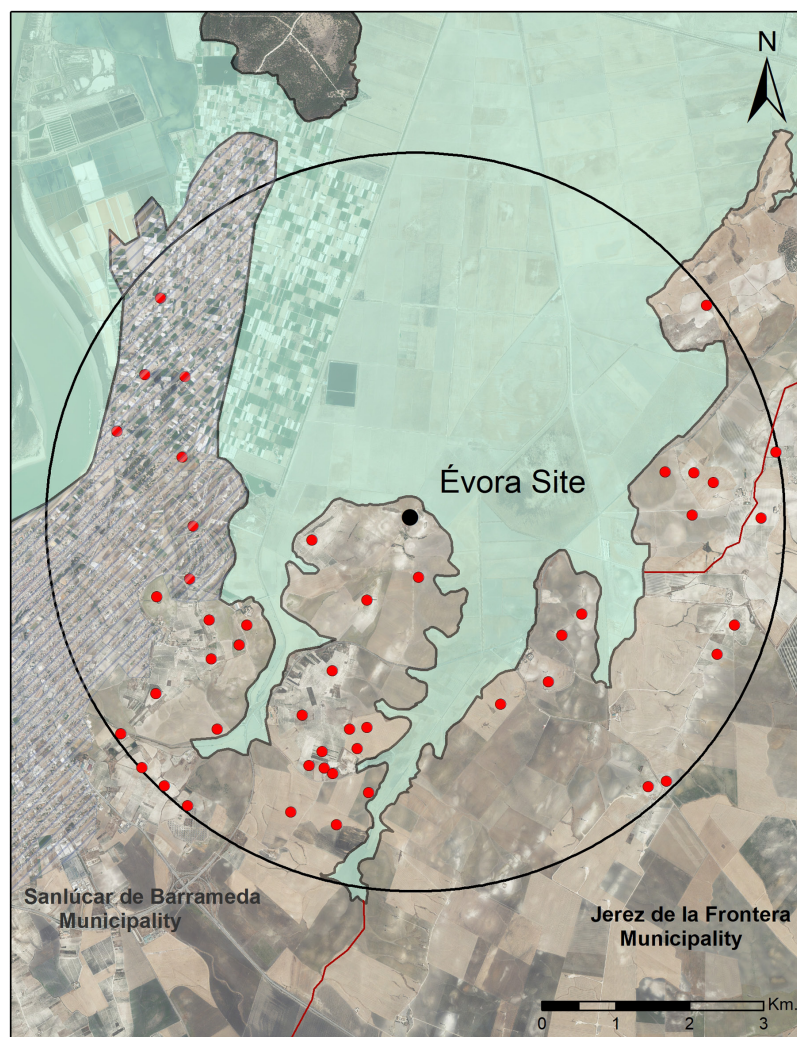


Figure 3: Research area buffer and selected archaeological sites.

historical values and evidence related to surrounding settlements. Following this criterion, we chose the site of Évora (Cortijo de Évora, Sanlúcar de Barrameda), located on the left bank of Guadalquivir, near to the river mouth. The Low Guadalquivir area, and specifically the southwestern riverside, was characterized by an intensive protohistoric and ancient settlement. In addition, it offers a *longue durée* historical sequence with settlement continuity in the medieval and modern ages. This is a consequence of the optimal soil fertility, the potentiality of the sea resources exploitation, and the possibilities of fluvial and maritime communication.

Situated within this area, the city of *Ebora* was continuously inhabited from at least the seventh century BC until the Early Roman Imperial period, and possibly into the Medieval period with a minimal displacement of the urban nucleus. In 1958, the fortuitous discovery of a group of golden objects dated to the seventh to second century BC resulted in an archaeological excavation being conducted, although the site's functions were not conclusive (Carriazo 1970). *Ebora* was a city with a significant Tartessian influence but was assigned to the Iberian-Turdetanian culture. It was located on a former escarpment, a vestige of the maximum extension of the *Ligustinus*, which occurred after the ice melting from the Last Glacial Period. The city had a direct contact with the open sea, before the formation of the spit of La Algaida. The La Algaida spit system is located on the left bank of the estuary and extends towards the north northeast, while a sand-bar system caused by the drift currents is located on the left bank of the estuary and extends towards the northeast. Originally, La Algaida was an island in the mouth of the estuary. The Guadalquivir River formed two channels, surrounding the island along its northern and southern shores respectively (**Figures 1 and 2**) (Rodríguez-Ramírez et al. 1996; 2014; 2019: 535–536; Villarías and Rodríguez-Ramírez 2017). During the Third Progradation Phase (310 BC–AD 890 approx.), the *lacus Ligustinus* started to infill, the fluvial influence increased, and the Guadalquivir delta expanded into the estuary. The silting up changed the morphologic configuration of La Algaida, transforming it from an island to a spit that joined the continent (Rodríguez-Ramírez et al. 1996).¹²

The closure of its navigable exit to the sea is a key feature in understanding the historic evolution of Évora and its surroundings. The *Lux Duvia's* sanctuary mentioned by Strabo was located in La Algaida as a sacred space with numerous ritual offerings, spanning from sixth to second century BC. It is related to the navigation and the commercial network of the Atlantic coast and the Guadalquivir River (Blanco Freijeiro and Corzo 1983; Corzo 2000; Ferrer 2002).¹³

The Évora site was located across three hills of 42–43 metres in height with the possibility of water table supply. The excavation discovered a building with a residential and industrial area destroyed by a fire or other catastrophic event such as an earthquake (Carriazo 1970).¹⁴ The site remained inhabited into the Imperial period. *Pomponius Mela (De Chorographia 3.1.4)*, in its description of the Iberian coast, called the site *castellum Ebora*. The term *castellum* has been analysed to understand what type of entity Mela refers (González Román 2002: 193–196). Researchers suggest an explanation of the term to be a modest indigenous centre, with a surrounding settlement and without a significant territorial autonomy, where the security was more important than the monumental aspects. It can be compared to an Iberian *oppidum* surrounded by a controlled territory (Le Roux 1994).

Around the middle of the second and the beginning of the first century BC, there was a period of an increased number of agrarian settlements. The city could even mint coins with the name *Aipora*, testifying the independence of the city during the republican period (González Román 2002: 193). The rural sites are characterized by the presence of Campanian pottery and Republican *amphorae* (Greco-italics, Dressel 1, Dressel 2/4 and Lamboglia 2 types) (Parodi et al. 2019: 65). The territory was structured through the *villae* system. The settlement in rural communities began before Cesar's policy of civic promotion.¹⁵ An intensive inhabitation of the territory is dated at the transition between the first century BC and first century AD (Barrionuevo 2001).

The site of Évora was the only Iberian-Turdetan period area that survived. The rest of the sites were new foundations (Parodi et al. 2019: 66).¹⁶ During the first century AD, the number of sites of rural settlements sharply increased. There was a slight augmentation in the number of *villae* and an important rise in the number of farms.¹⁷ The crisis of the third century significantly affected this area. A reduction in as many as 50% of the sites occurred. This might have occurred in response to the growth in size of the surviving sites.¹⁸ During the third and fourth century AD few changes occurred in the settlement pattern. A notable regression in the number of riverbank sites occurred, probably related to the sedimentary clogging of the *lacus*. (Tomassetti 1997: 255; Parodi et al. 2019: 67–68). The situation in the fifth century continued in a similar way to the last period. The main change occurred in the transition between the fifth and sixth century

AD with a transformation of the ancient settlement patterns. There was an abandonment process of rural sites. Little is known about Medieval period transformations, specifically between the eighth and thirteenth centuries AD. In the eighth century, Islamic culture arrived at the South of the Iberian Peninsula. A re-occupation of the dispersed settlement suggests an exploitation of the agricultural land with the control of the mouth of the Guadalquivir River mouth (Parodi et al. 2019: 68–69).

Hypotheses and Research Questions

Starting from the main objective of the project, that is, the analysis of the rural settlement patterns of the riverbanks of the *Ligustinus*, we established a series of hypothesis with which to investigate the case study.

Ebora was probably an urban centre, as attested by the volume of historical evidence. It was called a *polis* by Strabo (*Geog.* 3.1.9) and a *castellum* by Pomponius Mela (*Corog.* 3.1.4). How was *Ebora* and its territory affected in its civic independence by the establishment of the Roman colony of *Hasta Regia* and a likely related *centuriatio* process?

A Roman site near to the Évora hill is attested, called “Évora B”. The end of the occupation on the Évora hill during the Early Roman Empire is suggested by the surface material record. Could the reduction in size of the aforementioned second emplacement be linked with the promotion of *Hasta Regia* as a Roman colony and its hegemony over the territory? *Ebora* could have been included in the enlarged territory of the colony and its elites could have been moved to the new colonial urban centre. On the other hand, a part of *Ebora*'s population may have dispersed into the surrounding rural settlement.

Did the morphological and environmental changes, which happened in the paleoestuary of the Guadalquivir River during the first millennium, affect the political, economic, and territorial role of Évora? The transition from Évora to Évora B during the Early Roman Empire could be related to the suitability of a better location for the city port. Could the closure by the merging of the south part of the La Algaida spit with the continent have effected this change? Could the increase in rural settlements in Évora B after belonging to the Roman Empire be due to an intensification of agricultural production, with its associated long distance trade of products, such as salt fish, and wine? The impact of the Roman Empire in this territory is reflected in the abundance of surface material in the field-walking survey. Why did other historical periods not have the same relevance? Is this due to a huge settlement density during this period or is it only a matter of material visibility on the surface?

Preliminary Results and Future Investigations

It was necessary to first establish the local-scale study area. We created a 5 kilometres buffer zone radius around Évora, producing a study area of almost 8,000 hectares. The selected area comprises a major part of the north of the Sanlúcar de Barrameda municipality and a small part of Jerez de la Frontera, both in the province of Cádiz, on the eastern side of the research area polygon. The buffer zone extends over a great part of the ancient marshlands and flood plains, a portion of almost 4,000 hectares. We also consider in our analysis 44 kilometres of ancient banks of the *lacus Ligustinus* as riparian space, without taking into account the left side of the buffer zone, excluding a part of the Atlantic shore beside the Guadalquivir mouth (**Figure 3**).

We then selected 42 archaeological sites, using the information provided by previous studies. We did not select the west side of the study area because it is an urbanised zone today (shaded area on **Figure 3**). We employed the more recent catalogue of the archaeological sites from Sanlúcar de Barrameda and Jerez de la Frontera municipalities (Parodi et al. 2019; PGOU Jerez 2009) and contrasted this information with previous investigations (Lavado 1986; Riesco 1987; Ponsich 1991; Barrionuevo 2001). The chronological range of the resulting set of sites spans from the Protohistoric to the High Middle Ages. From these possible sites, we selected different zones to apply the field-walking survey in extensive and intensive ways. The main criterion was the location of sites within a maximum distance of 500 meters from the ancient coastal line or *lacus Ligustinus* riverbank. We consider that the riparian condition of these sites determined the type of interaction between the dwelling communities and their environment, which is presumed to be reflected by the land management, resources exploitation, and settlement persistence over time.

The first fieldwork campaign was carried out in the summer of 2019. We selected six prospection areas of different sizes (**Figure 4**). The density map shows the major concentration area of settlements (**Figure 5**). The largest one (zone A), measuring about 380 hectares, corresponds to the peninsula where Évora was located. Zone B, about 114 hectares, is called Maína and Pastrana and includes a larger number of Roman sites. They are situated at high elevations, protected against tides and floods, in one of the largest inlet arms

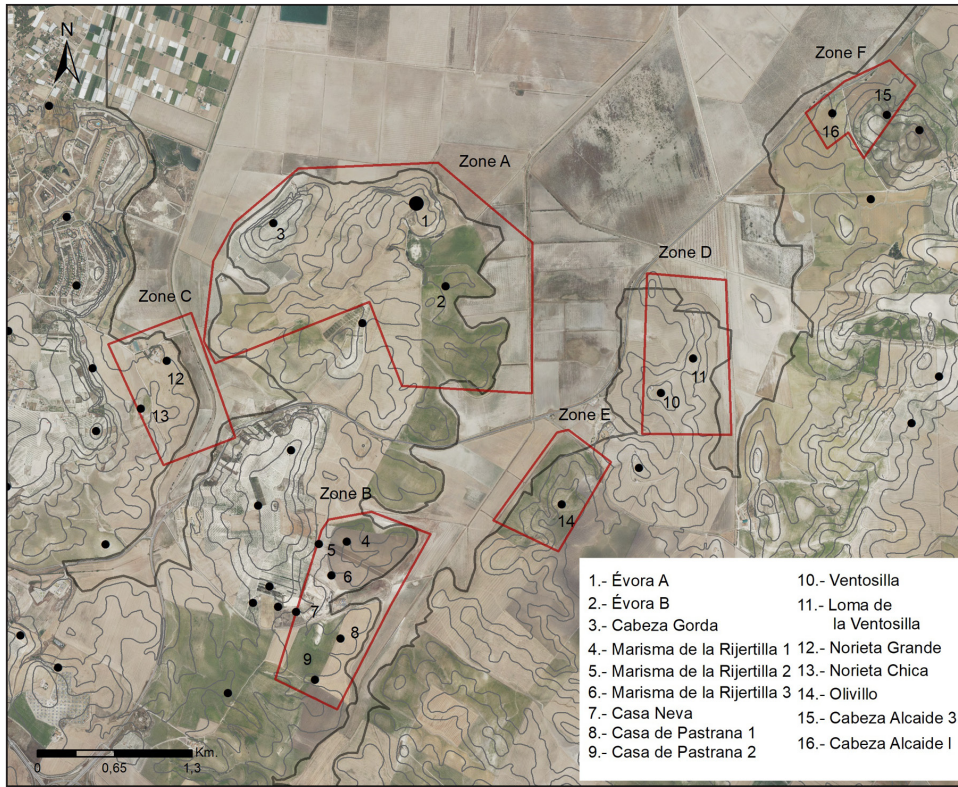


Figure 4: Areas selected for prospecting.

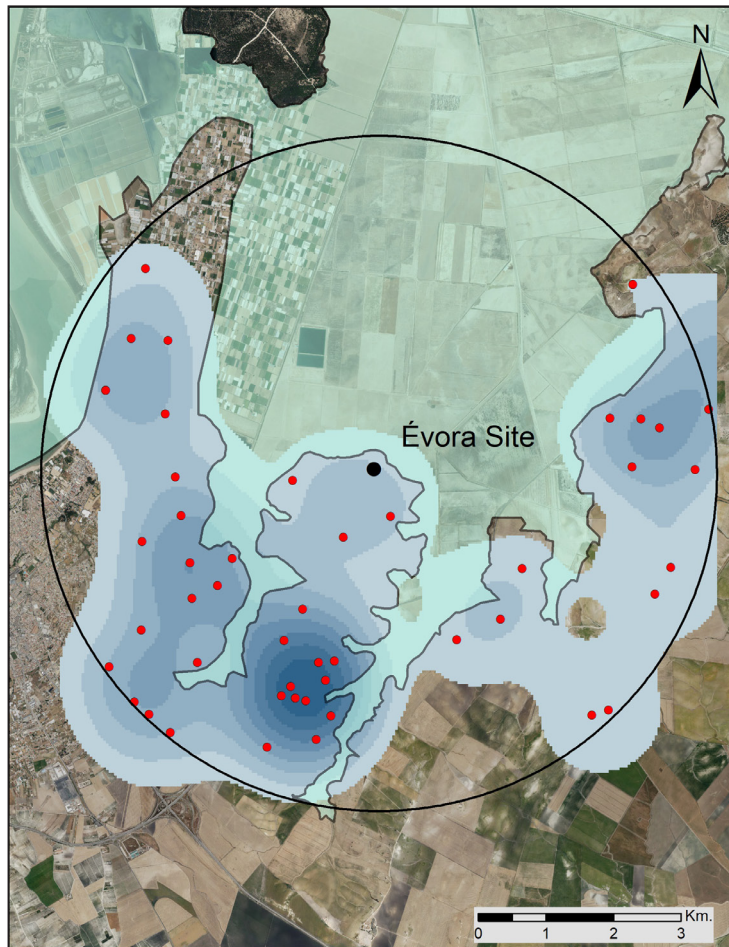


Figure 5: Density map of archaeological sites.

of the estuary. In addition, there were little coves which could have been used as ports. Zone C, about 77 hectares and called Norieta, is placed on the edge of an estuarine channel at the west side of the Évora's peninsula. This was an important location of the western entrance to the estuary, with occupation since Prehistoric times. A Roman *villa* and a medieval pottery workshop have been identified there. Zone D, about 93 hectares, is called Ventosilla and comprises of several ancient sites. It is characterized by large hills that longitudinally extended beside the riparian edge of the occidental area. Zone E, with an extension of 51 hectares, comprises of only one site called Olivillo. It was a Roman *villa* next to a modern site, attested by the surface material record. Finally, zone F, measuring about 38 hectares and called Cabeza Alcaide, is the smallest zone. It is situated on a hill with great visual control of the estuary. Different archaeological sites dating back to the Final Bronze Age, the Early Iron Age, and the Roman period (Republican, High Empire and Late Antiquity) were found in all zones.

According to the typology and quantities of the discovered artefacts, the categories of the sites are diverse. In these cases, we find major settlements such as cities or *villae*, or minor ones, such as farms. Here, we propose a typology based on previous classifications of the rural settlements in *Baetica* and *Hispaniae* (Table 1). In the first methodological approach, we surveyed the zone in an extensive way. The main objective was the localization of every site and the definition of their limits in the surface dispersion of vestiges, always with regard to their relationships with the *Ligustinus*'s banks. We aim to verify the maximum extension of every site and to detect any type of evidence of port structures or historic human interaction with the riparian environment.

The localisation of sites was planned by using 1,000x1,000 m grids and selecting the 100 metres wide transects to be examined by field-walking survey (Fig. 6). Two people formed the survey team. They used GPS devices to mark the discovery of each artefact. These objects were classified in a simplified range of categories. The most important criterion in classifying the material concerned differentiating between ancient or modern dates in order to define zones of exclusion or inclusion. The former exclusion ones were characterised by the presence of modern and contemporary artefacts, such as some type of building material, porcelain, etc. For the latter inclusion ones, we defined a range of material types which provided us a criterion of inclusion, defining areas of inhabitation associated with specific chronological phases. For example, we considered the finding of Phoenician-Punic *amphorae*, black gloss ware, *tegulae*, *terra sigillata* (Aretine-Samian ware or African red slip ware), etc., as chronological indicators. Then we selected interesting zones where the limits of some sites were defined more accurately. To carry out a more intensive prospection, we established 25 metre transects. To record a more relevant sample of dating artefacts we focused on well-defined zones,

Table 1: Classification of Roman rural settlements in *Baetica* based on Ponsich 1974; Didierjean 1978; Leveau et al. 1993; Sáez et al. 2006; Oria and García Vargas 2007; Garrido 2011: 290; Fernández Ochoa et al. 2014.

<i>Settlement Type</i>	<i>Size</i>	<i>Key Characteristics</i>
<i>Vici</i> or rural agglomeration	More than 5 hectares.	Abundant construction material and decorative architectural elements. Ceramic artefacts of all types. Access and proximity to water sources. Pre Roman occupation in some cases.
<i>Villae</i>	1–5 hectares. <i>Villae</i> with luxurious ornaments, larger than 4.700 m ² (Leveau et al 1993). Small <i>villae</i> , with water storage system (cistern) and remains of paint (<i>idem</i>).	Constructive and decorative material, tableware, cooking and storage ceramics.
<i>Villula</i> or farms, small rural settlement	Less than 1 hectare.	Construction material, tableware and cooking ceramic sherds.
Cabins or shelters	Smaller than 300 m ² .	Construction material (little bricks) and common ceramics. Places to keep tools and cattle.
Other type of functional settlement	Variable size.	Pottery workshops, storehouses, cemetery, etc.
Undefined		

using the aforementioned categories of inclusive or exclusive materials. We established transects measuring 25 metres. In this scale-survey, we collected significant material for a future laboratory study. This information is useful to corroborate the correct location of sites in the current GIS database and to implement their characterization. Through this process, we will verify site sizes and chronologies in order to contrast these data with the results offered by other non-invasive techniques.

For instance, we wish to highlight the identification of a new ancient rural site in Haza de Santa Catalina, which has significance for our research, due to its early chronology and close spatial relationship with the Évora hill settlements.

During initial fieldwork, we have recorded that modern contamination has considerably affected the sites. This is the consequence of anthropic activities, such as the drainage of lands through water canals, or the deposition of earth to avoid the soil salinization on agricultural lands. In addition, we found vineyards, olive groves, and cereal fields fertilised with different kinds of earth or contaminated manure. Besides, we have confirmed the predominance of materials from the Roman Imperial period in all the visited sites, except for the Évora hill. There, the amphora material is less predominant than in other zones of the macro area of study, and we have not detected any pottery production site. We have corroborated that the archaeological visibility and the recorded typology of materials depend on the scale of the survey.

In addition, we carried out an initial campaign of geophysical prospection (**Figure 7**). Polygon A indicates where Évora is located (**Figures 4 and 6**). We have selected this sample zone to test the efficacy of some of the techniques in areas with a high density of scattered artefacts. We have applied photogrammetry by UAV flights to obtain high-density and high-resolution DEM's. Furthermore, we took a series of thermal images that are being analysed.

Summary and Future Prospects

Regarding the next campaigns, we are planning to conduct the following methodological activities. Firstly, we will carry out a photo thermal capture plan using the Mavic 2 Dual Enterprise Drone in Évora A and B sites at different times of day, focusing on the anomalies detected by geophysical prospection to check the

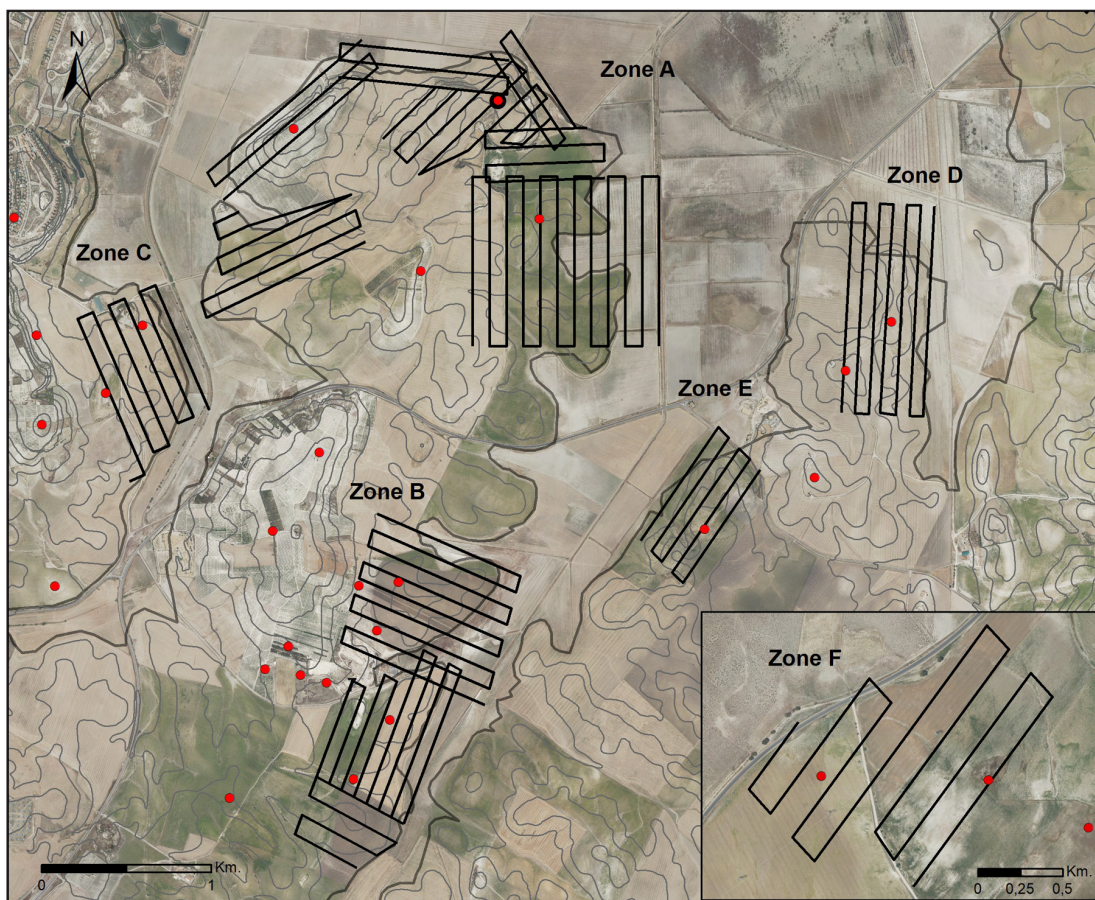


Figure 6: Area prospected through 100 metres transects.

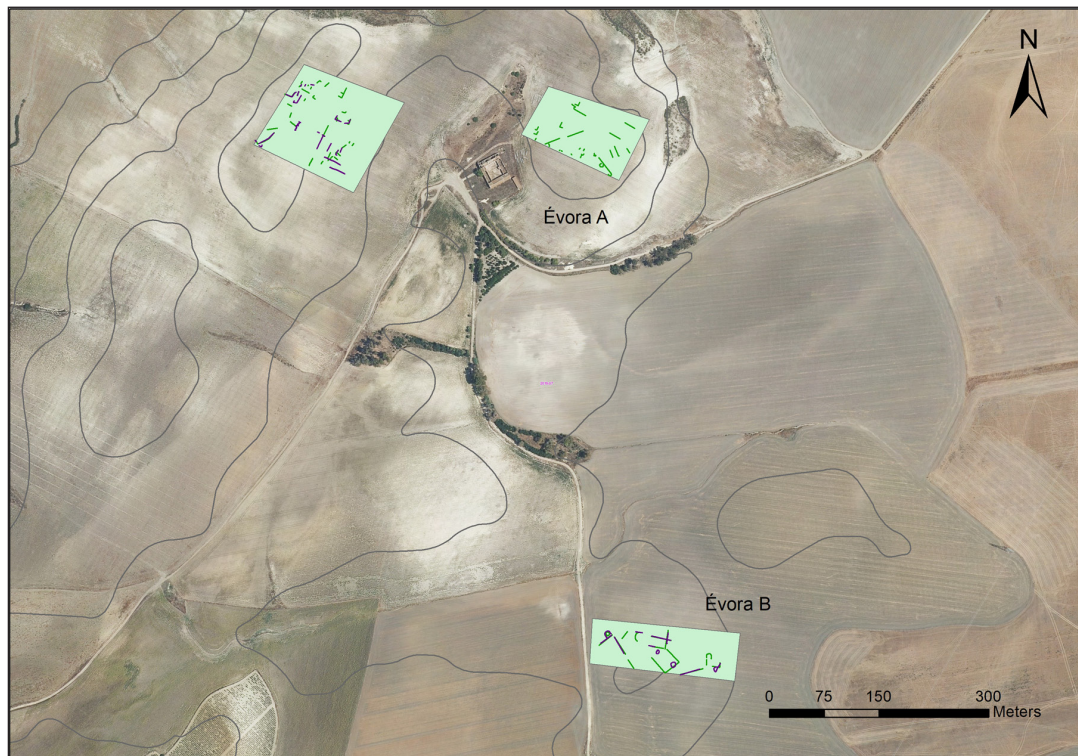


Figure 7: Geophysical survey carried out at three sectors of Évora A and Évora B sites and first digitalization of traces of archaeological features identified.

capability of the instrument. Secondly, we will analyse the LIDAR regional data provided by the National Cartography Institute, paying particular attention to the riverbank zones and possible ancient channels. Thirdly, we will catalogue and study the artefacts collected during the field-walking survey. Fourthly, we will continue applying remote sensing techniques, such as geophysical and electromagnetic prospection. Finally, we will collect geochemical and sedimentological samples in order to analyse key places, gaining understanding about the environmental evolution of the study zone around Évora.

Conclusion

This study set out to investigate the diachronic evolution of urban and rural settlements in the riverbanks of *lacus Ligustinus*, and how it is represented in the archaeological landscape, understanding it as *continuum*. Initial research and results from this ongoing project have been presented in this article. We have explored the potential of studying Évora's settlements at different spatial scales, with a combination of methodologies. Its prolonged historical sequence is closely related with the environmental transition of the clogging of a direct exit to the sea through the meridional mouth of the *Baetis*-Guadalquivir River. However, as proved by the volume of evidence, the site of Évora retained a substantial part of its importance as a local centre. We have confirmed the predominance of materials from the Roman Imperial period, except for the Évora hill. Moreover, we have identified a new ancient rural site in Haza de Santa Catalina which presents an early chronology (similar to Évora site) and a close spatial relationship with the main city (*Ebora*). We have attested the importance of the survey's scales for the identification of archaeological sites, and have also confirmed an abundant modern contamination due to anthropic activities and human environment affections. The research and the archaeological surveys conducted have contributed not only to define spatial extension and site boundaries, but also to discover new sites in a territory already explored.

Notes

- ¹ The banks of the Guadiamar River were an exception. This waterway provided direct access to the region of El Campo (Huelva) and the mining zone of Aznalcóllar, which had attracted populations since the later Prehistoric times (Ferrer et al. 2008: 221; Garrido et al. 2012).
- ² The remains of a boat, which was found in the waterway next to *Hasta*, dates to the sixth century AD. It demonstrates the continuity of the maritime connectivity of the water channels during Late Antiquity (Alonso and Ménanteau 2011: 18).
- ³ As recorded by the agronomic literature since the second century BC, notably through the works of Cato the Elder. Later on, during the first century BC, the riparian environments were identified with different geographical entities by agronomists, regarding three

differentiated natural spaces: *lacus*, *flumen*, and *mare*. They had specific identities related to their ecological and political condition as borders and the fluctuations of water have considered. Subsequently, changes were made in their statuses (Hermon 2010).

⁴ For example, Clarke (1977) recognized three scales: micro (intra-site), semi-micro (intra-site problems, multiple activity areas), and macro (larger territories). Other proposals have been suggested. Butzer (1982) expanded Clark's concept with a more detailed gradation of scales. It includes mid-scale, within-structure aggregation areas (sites). It has been differentiated with respect to the macro-scale, by being characterized by the inter-site patterning relating to environmental features in or around a node defined also on a cultural basis. Recently, scale ranges have been considered unbalanced with respect to the realities of the archaeological landscape, because there are three scales for site studies and just one for inter-site research (Campana 2009: 5).

⁵ For example, a map in the macro scale (1: 2.000.000) shows an apparent higher density of settlement with respect to those in scales between 1:50.000 and 1:25.000 (see examples in Campana 2009: 6–7).

⁶ Also meso or regional scales (1-km–100; 1 km²–10.000 km²) can be assimilated.

⁷ Also it can be assimilated with the scale of the administrative territory of a municipality.

⁸ The case study can be compared with other coastal lagoon landscapes from Roman times, such as those in the province of Narbonne (South of France) (Trément 1999; Sanchez and Jézégou 2011; Leveau 2014; Faisse et al. 2018) or in the Pontine Lagoons (Italy) (Attemma 1993; Walsh et al. 2014). Other cases have been studied in Hispania such as those ones made on the Mediterranean coast by the Valencia Landscape Project (Ortega et al. 2015) or in the *Baetica* province, where wetland cases have been analyzed by the *Riparia* Project (see contribution of local and regional cases, in Lagóstena 2015; 2016 and 2019).

⁹ We note here only the last few in a long series of papers on the methodology used in the Siena Province Archaeological Map Project: Francovich and Valenti 2001: 83–116. For the methodological approach: Campana and Francovich 2003; 2005; 2007.

¹⁰ The geographical area of the project focuses on the lowland rural landscape of the Roman city of *Rusellae* (southern Tuscany) and the ancient Etruscan and Roman city of *Veii* (north of Rome). As a result, they have detected a large number of archaeological contexts (80 in the *Rusellae*'s area) (Campana 2018). The project is still ongoing. <http://emptyscape.org>.

¹¹ The *Algaida* spit is an interesting place to carry out sedimentological analyses in order to date when it closed and, when direct communication between *Ebora* and the sea was halted.

¹² The ancient geographer Strabo described this zone of the estuary as follows: “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.) Then immediately comes the outlet of the *Baetis*, which has a twofold division; and the island that is enclosed by the two mouths has a coastal boundary of one hundred *stadia*, or, as some say, still more than that. [...] Thence is the waterway up the *Baetis*, and the city of *Ebura*, and the shrine of *Phosphorus*, which they call *Lux Dubia*.” (Strabo, *Geog.* 3.1.9; Hamilton and Falconer 1903).

¹³ This *Lucis Dubiae Fanum*, as named by Latin writers, refers to the deity of the crepuscular light, which was very useful for sailors as a reference point for navigation routes, as well as related with Venus goddess (García y Bellido 1993: 120).

¹⁴ Several hypotheses about these possible causes of destruction have been set out. For example, Ruiz Gil (1995: 18) suggests a forced abandonment motivated by Carthaginian pressure and harassment. Similarly, the concealment of the treasure found in Évora has been linked to a hasty abandonment of the site in a dangerous situation during the crisis of the Tartessian culture (sixth century BC) (Escacena 1993: 198–199). In any case, the chronology of the treasure is controversial with different proposed dates: between seventh or sixth centuries to third or second centuries BC (Maluquer 1958), and in the fifth BC (Blanco 1959: 56).

¹⁵ During this period, we recorded many archaeological sites such as Cabeza Alcaide IV and Cabeza Alcaide VII, Casa de Maina II, El Carrascal, El Tesorillo, Évora, Évora II, Látigo de Monteagudo III, and Loma de Ventosilla II (Parodi et al. 2019: 66).

¹⁶ They were placed on the hilltop and hillside of mounds on the riverbanks of *lacus Ligustinus* with easy access to the maritime-fluvial routes of commerce. The inhabitation of the inland zone points out the spread of the agricultural and livestock activities (Chic 2008: 197–198).

¹⁷ The Dressel 7–11 and Haltern 70 *amphora* types predominate in the archaeological record. The Dressel 2/4 and Dressel 20 types are found in lower quantities. The *amphorae* production has been associated with an important fish salting and grape-based goods manufacturing activities (Parodi et al. 2019: 66–67).

¹⁸ The African red slip ware is found distributed between the cities and *villae* of the region, but it is less common in the farms. Conspicuous settlements were restructured in a ruralisation process with a regression of the dispersed inhabitation.

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Competing Interests

The author has no competing interests to declare.

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