



Dunefield transgression and the lost fishing settlement of La Barrosa de Doñana

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Abstract

Considering its etymological meaning, the aim of this work was to identify the location of *La Barrosa*, a lost fishing settlement located on the dynamic coast of Doñana, and to relate the origin of the name (*barrosa* = muddy), and the causes of its disappearance to its geomorphological landscape context, tracing its recent evolution over time. Historical documentation and cartography about the coast of Doñana have been analysed to find records on *La Barrosa* and contrasted with the geomorphological information available for the area. The results have shown that *La Barrosa* went from being a shallow pond on the coast during the fifteenth century, which mud was used in pottery, to a fishing settlement on the coastline (first quarter of the seventeenth century), to finally disappear in the second half of the seventeenth century. Due to its location, close to the anchorage of the Doñana coastal spit barrier, its origin could be related to the mouth of an old marsh channel that drained the ancient marshland, or to an outflow to the sea from the ancient Santa Olalla lagoon. Its disappearance under transgressive dunes seems to be related to two pulses of dune building that took place around 1560 and 1661. This study shows that the use of toponymy, historical sources, and geomorphological knowledge must be considered in the interpretation of recent geomorphological landscape changes to broaden our understanding of the dynamic of coastal environments.

Keywords Doñana · Historical documentation · Landscape changes · Land-use changes · Toponymy · Transgressive dunefields

Introduction

Geomorphological, biological, and hydrological processes give coastal environments a highly dynamic character that should be seen both in a temporal and a spatial context (Arens et al. 2001). Besides, coastal areas host many human activities that may affect coastal processes, making the coasts particularly dynamic in terms of landscape change.

Located at the west margin of the Guadalquivir River estuary, Doñana is considered one of the most outstanding protected areas in Western Europe due to its wetlands, marshlands, and dunefields. It was declared Nature Reserve in 1964, National Park in 1969, Biosphere Reserve by the UNESCO in 1980, and UNESCO World Heritage Site in 1994. The present-day Doñana landscapes are a clear outcome of the geological evolution since Late Miocene times,

and mainly since the Last Glacial Maximum (Rodríguez-Vidal et al. 2014), shaped by the interaction with cultural drivers (Granados Corona 1987; García García 2014; Muñoz-Reinoso 2018).

Transgressive dunefields (also called mobile dunes) are one of the most characteristic landscapes of Doñana. The dunefield has developed in multiple phases during the late Pleistocene and Holocene (Rodríguez-Ramírez et al. 1996; Borja Barrera 2011; Goy et al. 2022). Some of the modern phases may have been assisted in their development due to removal of the coastal vegetation in a period of climatic instability in the seventeenth century (Granados Corona et al. 1987), resulting in a large dune field, 26 km long and 3.5 km wide, located in the SW of the National Park, between the Atlantic Ocean and the saltmarshes.

Recent studies are providing a detailed understanding of regional coastal landscape dynamics during the Holocene, both of wetlands and dunes (Manzano et al. 2018, 2019; Goy et al. 2022). However, written evidence and general knowledge about historical documentation must be considered in the understanding of recent geomorphological landscape changes,

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which may contribute to a more precise dating of changes. Thus, some studies have addressed transformations in Doñana's ecosystems based on historical documentation (Granados Corona 1987; Sousa et al. 2009). Despite this, the disappearance of some elements that may help to a better understanding of the processes of change has not received any attention. Such is the case of *La Barrosa*, a fishing settlement that was mentioned in a document from 1624 in connection with a famous royal visit to Doñana (Espinosa 1624), and whose existence and disappearance has gone unnoticed.

According to Ganiyeva (2021), in the study of toponyms, special attention should be paid to place names that have not been scientifically studied, or not recorded on maps, because the names of such places, despite small in terms of area, in terms of meaning, etymologically, they may contain a cultural, spiritual, and historical heritage not only for science but also for the region itself. That may be the case of *La Barrosa* because toponyms frequently have deeper meanings, often involving complicated semantics related to language and history, but many toponyms also describe the features they name (Perdana and Ostermann 2018; Membrado-Tena 2021). Thus, each toponym contains information about the place it designates, in terms of its meaning and its context, origin, and evolution (Rodríguez de Castro et al. 2017).

Therefore, the name of *La Barrosa* deserves particular attention because *barrosa* (muddy) is a hydronym (Friera 1992), that is a toponym related to hydrography, that comes from the pre-Roman term *barrum* which means *barro* (mud) and the suffix of abundance *-osa* (Nebot 1982; Santamarta 1986). According to the Dictionary of the Spanish Royal Academy (RAE 2020), *barrosa* means a terrain that is muddy or easily produces it, while *barro* is a mass resulting from the mixture of earth and water, and a mouldable clayey material that hardens by firing, used in pottery and ceramics. That is, *La Barrosa* was a fishing settlement (Espinosa 1624) which name seems to refer to a muddy place located on the old sandy coast of Doñana.

Considering its etymological meaning, the aim of this work was to identify the location of *La Barrosa* on the coast of Doñana, and to relate the origin of the name and the causes of its disappearance to its geomorphological landscape context, tracing its recent evolution over time. To do this, historical documentation and cartography about the coast of Doñana have been analysed to find the records on *La Barrosa* and its location.

Material and methods

Study area

Doñana covers a large area on the right bank of the mouth of the Guadalquivir River (SW Spain), that includes a mosaic

of unique ecosystems, such as wetlands, saltmarshes, ponds, dunefields (mobile and stabilized), and sandstone cliffs. In 1969, part of the area was declared a National Park due to its role as wintering area for migrating waterfowl and for being the habitat of two endangered species: the Iberian lynx (*Lynx pardinus*) and the imperial eagle (*Aquila adalberti*). However, the territory, known as the *Coto de Doñana* (Fig. 1), belonged to the Dukes of Medina Sidonia from 1309 to 1900, and the rich documentation preserved in the General Archive of the Casa de Medina Sidonia Foundation (AGFCMS onwards) shows a long history of land use practices and exploitation of natural resources on soils poor in nutrients.

Several authors have described the geomorphological evolution of this landscape of the south-western Iberian Peninsula but see the summary of Rodríguez-Vidal et al. (2014) and references therein. From a geomorphological point of view, Doñana is characterised by the great development of coastal and fluvial/coastal formations. The most significant coastal formations are large sandy barriers (littoral spits) and the extensive dune fields (Fig. 1). Recently, Goy et al. (2022) have differentiated seven Holocene dune systems in the study area, dated through OSL (Optically Stimulated Luminescence). Three systems are stabilised (aged between 11.1 and 2.6 ky BP), one semiactive (2.6–1.6 ky BP), and three more recent still active (from 1.6 ky to present). Since ca. 4,000 years ago, the protection provided by the growing coastal spit of Doñana favoured the development of a sheltered marsh dominated by tides and fluvial currents. About 2,200 years ago, during the Imperial Roman Period, the estuary was dominated by marshlands with a wide lagoon at its mouth (*Lacus Ligustinus*), and the current landscape of Doñana started to form. The evolution along the last 2,000 years includes the quick and continuous growth of coastal barriers by longshore drift, the origin of the present-day saltmarshes and the development of dune fields migrating inland towards the wetlands (Rodríguez-Vidal et al. 2014).

Historical documentation

To find the records on *La Barrosa*, I have mainly used two sources of historical documentation on Doñana. First, the collection of documents compiled by Anasagasti and Rodríguez (2006) for the study of Niebla and its land in the late Middle Ages, which brings together 607 documents from the General Archive of the Casa de Medina Sidonia, the General Archive of Simancas, and the National Historical Archive, among others. Second, the General Archive of the Casa de Medina Sidonia Foundation (AGFCMS), whose collections include approximately six million documents, gathered in 6316 docketts. This allows for an in-depth study of geographical, economic, political, philosophical, sociological,

Fig. 1 Location map showing the boundaries of the old Coto de Doña Ana and the present Doñana National Park, the main ecosystems, the location of the watchtowers and some old toponyms (see text)



and legal aspects of Doñana (Ramírez and Olmedo 2020). For the identification of these documents there is a manuscript index made by Doña Luisa Isabel Álvarez de Toledo y Maura, 21st Duchess of Medina Sidonia, which has been digitised. The works of Granados Corona (1987), Castrillo (2000) and García García (2014) have facilitated the identification of some dockets of interest.

Historical maps

The existing cartography of Doñana has been studied to find the place name of La Barrosa. Over time, the territory of Doñana has been mapped at different scales,

either as part of a larger territory, or considering only the county level, which implies a different cartographic treatment (Posada 2020). The analyses on the cartography of Doñana by Cortés (2019), who studied maps from the 16th to the nineteenth centuries, and Posada (2020), who studied cartography between the fourteenth and eighteenth centuries, have served as a starting point to search for available cartographic sources. Thus, the cartography available in the National Geographic Information Centre of the National Geographic Institute and in the Digital Catalogue of Historical Cartography of the Institute of Statistics and Cartography of Andalusia have been consulted.

Results

Historical documentation

After consulting the index of the AGFCMS and other sources that trace different aspects of the history of the territory since the conquest of the Taifa kingdom of Niebla by Alfonso X (Anasagasti and Rodríguez 2006), six documents were used to determine the location of *La Barrosa* and to trace its evolution over time. This documentation covers the period from the 15th to the eighteenth century.

The oldest documents are two rulings dating from the fifteenth century (1431 and 1498), reproduced by Anasagasti and Rodríguez (2006), which establish boundaries between ancient properties. Among other things, with minor differences in the spelling, the rulings establish a boundary between Dehesa del Carrizal and Dehesa de la Figuera: "...e la Madre ayusso el estelo que dezian del Carbon, que era vn caño que parttia el termino de Almonte con las dehezas del Carrizal, que era del conde, e el estelo arriua fasta el charco de la Barrosa que era costa de la mar que era en el termino de La Figuera, que era termino de Almonte..." (and the Madre down to the estero (estuary) known as of Carbon (charcoal), which was a channel that divided the municipality of Almonte from the Dehesa del Carrizal, which belonged to the Count, the estero up to the *Charco de la Barrosa*, which was on the coastline in the district of La Figuera, which was the municipality of Almonte). Thus, the name *La Barrosa* was given to a landmark described as a small, shallow pond (charco) located on the coastline in the fifteenth century.

No references to *La Barrosa* were found in the sixteenth century documents. In the seventeenth century, the place name appears twice in Espinosa's account (1624). In the first one, during the preparations for the king's visit, to ensure that different fishing gears from the towns of Huelva and Almonte would be ready in that place in case the king wanted to see them fishing, as well as to contribute to the supply of fish that had to be transported to the Palace every day to supply the king and his entourage, indicating that *La Barrosa* was one league away from the Doñana Palace. The second time was during the royal visit to that place on Sunday 16th March 1624.

After the town of Almonte was acquired by the Duke of Medina Sidonia, and the dehesa de la Figuera was annexed, from the beginning of the sixteenth century the pastures of the dehesas of Carrizal and La Figuera began to be leased. At the beginning of the seventeenth century, four dehesas began to be distinguished from the two early dehesas (Las Casas, El Caballero, Majada Real and La

Marismilla). During the second half of the seventeenth century, and with the aim of leasing these pastures separately, they were demarcated (García García 2014). In docket 704, a document from 1661 details the demarcation between the dehesas of Las Casas and El Caballero, which roughly follows the line of the boundary described in the fifteenth century between the dehesas of La Figuera and El Carrizal. The boundary describes the location of each of the boundary-marks up to number eleven, from which the boundary goes to the coast without indicating any landmarks or place names there.

Docket 1156 of the AGFCMS includes the "*Descripcion de la Costa del Coto de Doña Ana, y situacion de la Almadrava que en ella hay al sitio de la torre de Carboneros*" (Description of the coast of the Coto de Doña Ana, and the state of the Almadrava (netting fence to catch tuna fish) which is on the site of the Carboneros Tower) dated to 1743, and a map (see below). The author points out that the best place for the trawling almadrava is between Carboneros Tower and *El Guerrero*, as the waters are clearer, deeper and there are fewer currents along this stretch of the coast. This place, known at the time as *El Guerrero*, is located half a league to the northwest of Carboneros Tower, and describes the existence of abundant mud of two qualities, yellow and red, close to remains of kilns for the manufacture of bricks, jugs, and ceramics such as clay casserole, plates, and pots. Let us remember that the meaning of *barrosa* is a land that has mud or that produces it easily (RAE 2020), which suggests that *El Guerrero* and *La Barrosa* could be the same place.

The last docket consulted in the AGFCMS is 6058, which contains the "*Descripcion thopografica del Cotto llamado oy de Doña Anna y de sus limites o linderos modernos y antiguos...*" (Topographical description of the Coto known today as Doña Ana and its modern and ancient boundaries...) from 1767. The text, which aims to legitimise the Ducal Household's ownership of the saltworks located on the saltmarshes, describes the perimeter boundaries of the dehesas of El Carrizal and La Figuera. However, for the coast, the only landmarks it refers to are the four watchtowers located on the Doñana coastline (La Higuera, Carboneros, Salabar, and San Jacinto).

Historical maps

There are no maps specific of the Doñana area for the fifteenth-seventeenth centuries. However, this area is depicted on maps that represent a larger territory. In those maps, the most frequent place names are "Arenas Gordas", in most cases referring both to the cliffs between Mazagón and La Higuera Tower, and to the dunes between the latter and the mouth of the Guadalquivir river, and "Higuera", where the watchtower of the same name was later built.

It was only from the eighteenth century onwards that the Doñana area really began to be represented territorially. There are four eighteenth century maps that represent the coast of Doñana. The rest of maps are of a larger scale and do not show relevant coastal details.

All the eighteenth-century maps of Doñana show in common the four watchtowers along the coastline. One of the maps, dated around 1780 by Ramírez and Olmedo (2020), also shows two landmarks named as *Barranco Bermejo* (Red Cliff), near Higuera Tower, and *Corral de los Nebros* (Maritime juniper dune valley), to the south of the Santa Olalla lagoon.

The map of 1743 is part of docket 1156 and consists of the “*Descripcion de la Costa del Coto de Doña Ana, y situacion de la Almadrava que en ella hay al sitio de la torre de Carboneros*” (see above). It has a scale of a French league (20 leagues to the degree), shows the depth of the sea in hands, and represents the coast between the Oro Tower (to the west of La Higuera) and Chipiona (to the east, on the left bank of the Guadalquivir). It shows the site of the almadraba next to Carboneros Tower. Half a league northwest of Carboneros Tower the map illustrates a place called *El Guerrero*. As previously stated, *El Guerrero* and *La Barrosa* could be the same place.

Location of *La Barrosa* of Doñana

Based on the documentation and maps consulted, four references were used to locate *La Barrosa*: 1) the two fifteenth century sentences; 2) Espinosa's account (1624); and 3) the description of the coast of 1743. With this information, I draw up a map with the approximate location of *La Barrosa* (Fig. 2).

The two fifteenth century sentences describe the same boundary to separate the dehesas of El Carrizal and La Figuera. This boundary went from the *Estero del Carbón* to the *Charco de La Barrosa*, which was on the coast at the time. The Estero del Carbón was an old marshland channel that was excavated to prevent it from silting up and to make it navigable, and through which the wood charcoal was taken, down the *Madre*, to Sanlúcar de Barrameda. To mark the boundary, a straight line has been drawn from the mouth of the channel at the Madre towards the coast, passing alongside the charcoal loading point (Fig. 2).

In Espinosa's account (1624), it is narrated that the fishing gears were prepared “at the site of *La Barrosa*”, which was located “a league away from” the Doñana Palace. According to the RAE dictionary (2020), the *legua* (league) was an itinerary measure, with different definitions depending on the country or region, defined by the distance that is

Fig. 2 Approximate location of *La Barrosa* in the mobile dunes of Doñana: half a league from Carboneros Tower, one league from the Doñana Palace, and from the Madre, Estero del Carbon upstream, to the old coastline. Modified from Google Earth



regularly walked in one hour, and which in the old Spanish system was equivalent to 5572.7 m. Although the distance estimated by Espinosa should be taken as an approximation, a circle has been drawn with this radius centred on the Doñana Palace (Fig. 2).

Finally, in the "*Descripcion de la Costa del Coto de Doña Ana...*" (docket 1156), the author indicates the existence on the coast of a place called *El Guerrero*, where the existence of abundant mud was described. Taking into account that *El Guerrero* and *La Barrosa* could be the same place, the description indicates that *El Guerrero* is located half a league northwest Carboneros Tower. In this case, as indicated on the map scale, it is the league of 20 to one degree, i.e., 5555.55 m, so that a line has been drawn from Carboneros Tower parallel to the coast, with a length of 2777.77 m. As can be seen in Fig. 2, the three spatial references coincide in the same area in a radius of about 125 m where *La Barrosa* would be located.

Discussion

The study of the historical documentation has made it possible to find the approximate location of *La Barrosa* of Doñana and follow its temporal land use changes. This, along with the etymology of the name, and the geomorphological knowledge of the area, makes it possible to trace the process of its disappearance, as well as to hypothesise about its possible origin. All the above is a rich source of information about Doñana's geomorphological history.

The historic information shows that *La Barrosa* went from being a shallow pond on the coast (*Charco de la Barrosa*) during the fifteenth century, to a fishing settlement on the coastline (first quarter of the seventeenth century), to finally disappear under the sands (second half of the seventeenth century), although during the first half of the eighteenth century the presence of mud was mentioned, but no longer on the coastline.

On the other hand, the documentation shows the possible existence of an old settlement that made use of the mud (presence of a potter's kiln and ceramics), although we do not know when or for how long. Subsequently, *La Barrosa* was a landmark on an important boundary that separated the properties of the Count of Niebla (*Dehesa del Carrizal*) from those of the municipality of Almonte (*Dehesa de la Figuera*) during the fifteenth century. Later, the place would remain as a fishing settlement, before finally disappearing in the seventeenth century.

Throughout history, Doñana has been viewed as an isolated and marginalised territory, which has resulted in a scarcity of place names and geographical landmarks until relatively recent times (Posada 2020). When the Doñana area began to be represented as a territory in the

eighteenth century, *La Barrosa* had already disappeared. It must have disappeared between 1624, when it appears in the Espinosa's account, and 1661, when the boundary between the dehesas of *Las Casas* and *El Caballero* was drawn, and it is no longer mentioned as it was in the fifteenth century boundaries. If the place name disappeared between 1624 and 1661, the process that caused it to disappear must have been very fast. This would be due to the mobilisation of the dunes and coastal progradation, which is consistent with the statement of Borja et al. (1999), who pointed out that the dunes partially covered the coastal watchtowers built in the seventeenth century, and which occurred associated with beach ridges that prograded after the construction of the towers. According to Villegas et al. (2005), the construction of the watchtowers on the Doñana coast was completed in 1618.

However, it seems that previously, between the end of the fifteenth century and the first quarter of the seventeenth century, the *Charco de la Barrosa* must have been buried by the sands, as Espinosa (1624) only refers to *La Barrosa* and not to a shallow pond (*charco*). In their study about the relationships between climatic episodes and dunefield dynamics in southwest Europe, Costas et al. (2012) dated two pulses of dune building separated by a hundred years, between 0.44 and 0.35 ky BP (1560 and 1661 AD), which may be responsible first for the covering of *Charco de la Barrosa*, and second for a stronger pulse of the mobile dunes and coast progradation that made the site and the toponym disappear.

Several hypotheses may be put forward to explain the singularity of *La Barrosa* and the muds in the old coast of Doñana. *La Barrosa* was located close to the site where the great sand barrier of Doñana starts. That sand barrier closing the Guadalquivir estuary grew from the northwest to the southeast and contains four distinct morphosedimentary units (progradation phases H1-H4) separated by erosional surfaces in the Doñana spit bar (Zazo et al. 1994; Rodríguez-Ramírez et al. 1996). The spit growth was interrupted several times by great energy events (storms, tsunamis) (Rodríguez-Ramírez et al. 2008). Thus, the origin of *La Barrosa* may be related to the destruction of the first spit bar progradation phase (6900–4500 cal. BP), that resulted in the chenier of Carrizosa-Vetalarena (ca. 5,000 cal year BP) and probably in a former watercourse with marine connection that drained the *Lacus Ligustinus* (Zazo et al. 1994), although the sediments of the second progradation phase (4200–2600 cal. year BP) completely covered the first phase (Rodríguez-Ramírez et al. 2008).

A second possibility is that the *Charco de la Barrosa* was the result of an ancient outflow or drainage to the sea from the ancient lagoon of Santa Olalla that was in the back dune, like the "sangradouros" of the Brazilian coast of Rio Grande do Sul (Figueiredo and Calliari 2004, 2005), although the

site probably had a complex palaeoenvironmental evolution as Abad et al. (2019) have shown for a peat bog located on the beach of Doñana only 4.5 km away.

The analysis of historical documentation has made it possible not only to determine the location of *La Barrosa*, but also to appreciate its geomorphological and land use changes over centuries in parallel with the causes of its disappearance. In any case, complementary palynological, archaeological and geomorphological studies are necessary to allow a detailed chronological dating of their original uses, as well as their sedimentary phases, in order to properly understand their origin and evolution. Therefore, the results presented here are a good basis for further studies of landscape changes at different scales, from geomorphological units and the appearance of new ecosystems, to the human history associated with those changes.

Conclusions

This study addresses for first time the issue of the lost toponym of *La Barrosa* located at the old coastline of Doñana. The analysis of the historical documentation and cartography of Doñana from the 15th to the eighteenth centuries has allowed finding its approximate location and following changes in both landscape and land use. This, along with the etymology of the name (*barrosa* = muddy) and the geomorphological information available for the area, allowed us to hypothesise about its possible origin and disappearance.

The interdisciplinary approach used here for the study of the lost place name of *La Barrosa* has produced a deeper understanding of the long-term landscape changes, framed by the historical interplay between human and natural drivers (Tappeiner et al. 2021). Given that coastal areas are particularly dynamic in terms of landscape change, the use of toponymy, historical sources, and geomorphological knowledge could very well be of great help in other locations to broaden our understanding of the evolution of those dynamic systems.

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Declarations

Competing interests The author has no conflicts of interest to declare that are relevant to the content of this article.

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