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HERITAGE 2020

Proceedings of the 7th International Conference on Heritage and Sustainable Development

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Volume 01
ISSN 2184-8017

green lines institute
for sustainable development

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Proceedings of the 7th International Conference
on Heritage and Sustainable Development
8-10 July 2020, Coimbra, Portugal

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ISSN 2184-8017
Green Lines Bookseries on Heritage Studies
ISBN 978-989-8734-45-7 ISBN 978-989-8734-44-0 (PDF)

1st edition, November 2020

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There is always a bigger fish! Shaping Vouga's watershed (Portugal) and its ichthyofauna in 1758

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ABSTRACT: Fishing is an historical activity considered intangible cultural heritage. Among the several inherited traditions by fishermen communities, a profound knowledge, as far as the environment is concerned, exists. The natural legacy determines the quality of life of those communities (which can be threatened due to anthropogenic actions). Through an interdisciplinary analysis, this study identifies the natural and anthropogenic actions that influenced the changes in Vouga's watershed, including the Aveiro lagoon, and respective ichthyofauna. Our focus is to elaborate an environmental interpretation from a synchronic approach. For the aforementioned purpose, fish species specified in the 1758 historical source "Parish Descriptions" were highlighted. Among the vernacular fish names listed, it was possible to find at least twenty species of fish from both freshwater and marine affinities. It is prudent to remark that in the year before the date just mentioned, the lagoon's contact with the ocean was halted (thus causing a reduction of the water salinity). Could that have impacted the species that were declared in the "Parish Descriptions"? Certainly yes, because marine or brackish species were cataloged only in the lagoonal area near the sea. In fact, differences in the reported fish were found between the upstream watershed locations and the downstream lagoonal sites. Analysis of data supports the idea that salinity and fresh water may be the main influence for species distribution, either positively conditioning the presence of marine species or negatively, pushing freshwater species upstream. What is of notice is that there are documents that allude to an application for the king to request authorization to open a new inlet. The construction of dams, watermills and other kinds of interventions in rivers (Vouga and its affluents) impacted the watershed ichthyofauna. As a consequence, the species' migration processes were thus influenced, namely those of anadromous and catadromous fishes, highly susceptible to anthropic activities (said interferences determine their absence or presence in these different water bodies). The heritage we gain from environmental history is fundamental to successfully understand and manage our current interventions when it comes to deal with nature in a harmonious way. It is essential to learn from what we have done to avoid mistakes. Let us not waste the steps of those who came before us!

KEYWORDS: Northwest Portuguese coast; Environmental History; Vouga's fish species; Parish descriptions; Natural heritage.

1. INTRODUCTION

Artisanal fishing has a long tradition in human history. It is a labor occupation that assembles several inherited traditions and important non-formal knowledge. Therefore, this historical activity is considered intangible cultural heritage since it represents distinct social practices, rituals, festive events, oral traditions and expressions, and also, knowledge and practices

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R. Amoêda, S. Lira and C. Pinheiro (eds.). *HERITAGE 2020*
Proceedings of the 7th International Conference on Heritage and Sustainable Development, pp. 177 - 186.
Green Lines Bookseries on Heritage Studies, Volume 01.

concerning traditional craftsmanship and nature (UNESCO, 2018). In face of the climatic changes, with extreme consequences on coastal areas (Oppenheimer & Glavovic, 2019) the traditional ecological knowledge held by coastal populations is very important to contribute on mitigation and adaptation processes (Freitas et al. 2018). As far as the environment is concerned, since the UNESCO 1972 "Convention for the Protection of the World Cultural and Natural Heritage" that the broad concept of cultural heritage encompasses environmental assets along with historical, artistic and archaeological ones (UNESCO, 1973). This profound interdependence between the intangible and material cultural heritage with natural heritage was recognized in the UNESCO 2003 "Convention for the Safeguarding of Intangible Cultural Heritage" (UNESCO, 2018). In fact, with the emergence of the Anthropocene, the existence of boundaries between them no longer makes sense and new conceptual ideas are emerging (Harrison, 2015; Heise, 2016; Sterling, 2020). The natural inheritance determines the quality of life of fishing communities, as it is through the exploitation of natural resources, namely fish, that they survive and prosper. However, this community's identity, and successively, the intangible cultural heritage that they represent, can be threatened due to anthropic interventions on the aquatic ecosystems. Human interference has promoted heritage decay and even disappearance. This leads to a concern about its preservation, conservation and management, reflected in ways of preventing its loss for future generations. The "UNESCO List of World Heritage in Danger" and the "IUCN Red List of Threatened Species" are examples of this (Desilvey & Harrison, 2020).

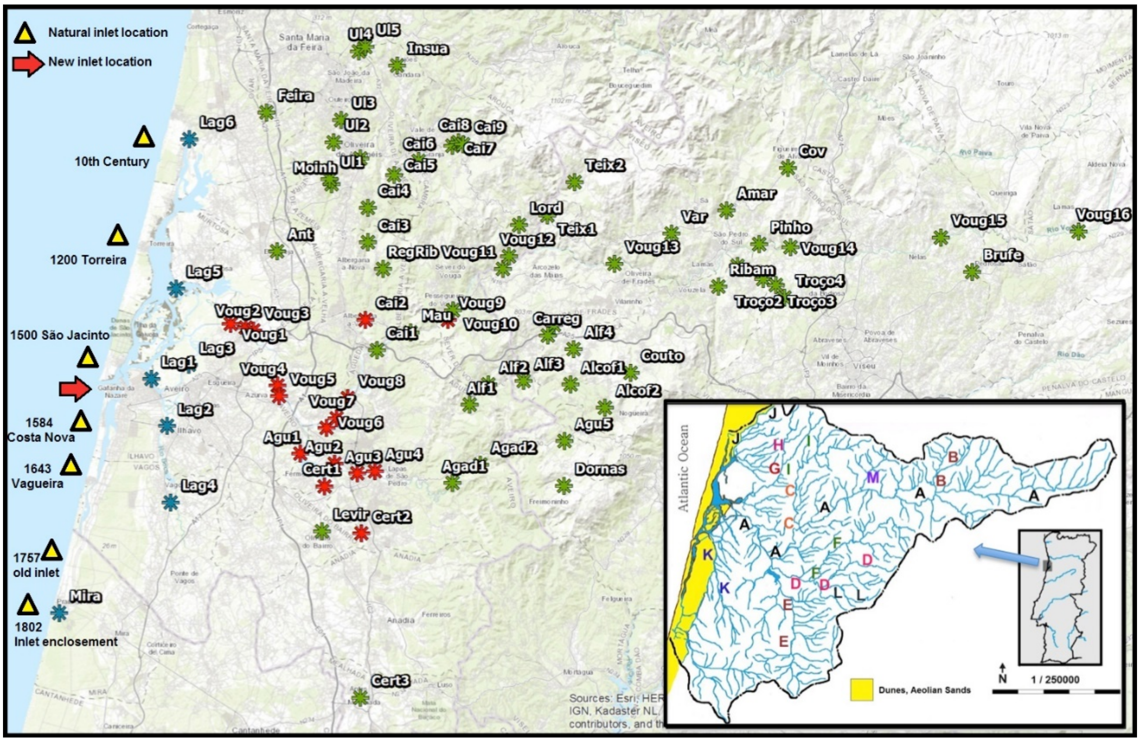

Fig. 1. Current position and evolution of the Aveiro lagoon natural bar (Adapted from DIAS et al. 2012). Vouga River and Aveiro Lagoon Watershed: Vouga (A), Sul (B), Caima (C), Águeda (D), Cértima (E), Alfusqueiro (F), Antuã (G), Ul (H), Ínsua (I), Caster (J), Boco (K), Agadão (L), Teixeira (M). **Agad**: Agadão river; **Agu**: Águeda river; **Alcof**: Alcof river; **Alf**: Alfusqueiro river; **AMaias**: Arcozelo das Maias; **Amar**: Amarantes rivulet; **Ant**: Antuã river; **Brufe**: Brufe rivulet; **Cai**: Caima river; **Carreg**: Carregal river; **Cert**: Cértima river; **Couto**: Couto river; **Cov**: Covelo river; **Dornas**: Dornas river; **Feira**: unnamed rivulet; **Insua**: Insua river; **Lag**: Aveiro lagoon; **Levir**: Levira river; **Lord**: Lordelo river; **Mau**: Mau river; **Mira**: Mira lagoon; **Moinh**: Moinhos rivulet; **Pinho**:Pinho rivulet; **Ribam**: Ribamá rivulet; **RegRib**: Ribeira rivulet; **Teix**: Teixeira river; **Troço**: Troço river; **Ul**: Ul river; **Var**: Varoso rivulet; **Vilar**: Vilar river; **Voug**: Vouga river. (Alf 1, Alf2, Alf3… Numbers from downriver to upriver sites)

Vouga's River Basin (Fig. 1) is an example of an ecosystem where a long tradition of artisanal fishing can be found. The Aveiro lagoon ichthyofauna is well documented, usually in ecological and biological studies. A considerable number of these analyses examined the fish species occurrence and, in some cases, suggested the causes to interferences in their natural dynamics (Arruda et al. 1988; Rebelo, 1992; Cunha et al. 1999; Pombo et al. 2005; Rodrigues, 2012; Lillebø et al. 2016). Other studies referred to the species detected since the early 20th century to the present (Pombo & Rebelo, 2002; Pombo et al. 2002, Garnerot et al. 2004). Long term historical studies were also conducted, however, mainly concerning the lagoon (Vidal et al. 2013; Bastos et al. 2013). This system is only a segment of the study area. Hence, there is a lack of analysis on the Vouga's watershed ichthyofauna from an historical perspective; usually only the lagoon fish fauna are considered. Thus, this study focuses on the Aveiro lagoon and the Vouga river watershed ichthyofauna. The objective is to elaborate an environmental interpretation from a synchronic approach, through the historical source "Parish Descriptions", dated of 1758. It must be borne in mind that its scope is restricted, since the list of species mentioned only includes those that were used for human consumption. Changes in the lagoon landscape, namely by its inlet closure, caused water salinity reduction. Therefore, it was observed that salinity may be the main reason for species distribution stated in the historical source. Such changes had conditioning the presence of marine species or pushed the freshwater species upstream. Other anthropogenic causes (e.g. construction of dams, watermills and other kinds of interventions in streams and rivers), have probably affected the anadromous and catadromous fishes, highly susceptible to anthropic activities. These human interferences determine the fish distribution and its absence or presence on the basin's waterbodies.

2. MATERIAL AND METHODS

2.1 *Study Area*

The Vouga's river basin it is located in the north-west coast of Portugal (40º 15'- 40º 57' N and 07º 33'- 08º 48' W) and constituted by the rivers (Fig. 1) Vouga (A), Sul (B), Caima (C), Águeda (D) and its affluents Cértima (E) and Alfusqueiro (F), the Antuã (G) formed by the rivers Ul (H) and Ínsua (I), the Caster (J), Boco (K), Agadão (L), Teixeira (M), beside many tributary streams (Amorim 1997). In the low Vouga's watershed, to where the main rivers flow, the Aveiro lagoonal system is located. It is a shallow coastal lagoon with a length of about 40 km and a maximum width that reaches 8 km in the central sector, constituted by four main channels, islands, inner basins and mudflats, forming a unique meso-tidal wetland area connected to the Atlantic Ocean through a single inlet with 1.3 km in length, 350 m wide and 20 m deep. The lagoon it is separated from the ocean by a sandy spit with a variable width of almost 2.5 km maximum to less than 200 m (Bastos et al. 2013; Lillebø et al. 2016).

2.2 *Subject approach*

An interdisciplinary analysis was made through historical, geological and ecological methodologic approaches. For the aforementioned purpose, the fish species data from the 1758 source "Parish Descriptions" was selected and processed (ANTT 1758). This historical source selection was due to its relevance about local descriptions. This inquiry was sent to all parish priests as a royal effort to better know the Portuguese territory and also understand the effects of the 1755 Lisbon earthquake. It was divided in three main parts concerned to questions about: a) economic, religious and administration subjects; b) the mountains; c) the rivers (Osswald, 2002; Capela, 2011). The data was gathered mainly in the third part of the inquiry, specifically on the parish descriptions located on the Vouga's river basin. In some parishes located in our study area, the priests didn't answer to the questions about the rivers or didn't respond to the entire inquiry. So, sometimes, even located nearby rivers or its affluents, it wasn't possible to gather data from some locations (e.g. ANTT 1758, v. 5, f. 839-842; v. 7, f. 1031-1032; v. 8, f. 355-364; v. 9, f. 745-752, f. 1075-1084; v. 12, f. 2973-2976). Besides the fish species, special attention was given to data related with geomorphological modification descriptions and the anthropic actions or infrastructures (dams, watermills and other river interventions) that could have affected the natural dynamic of fish communities. Then, all this data was confronted with geological and ecological studies regarding such area.

2.3 *Data analysis*

To the vernacular fish names, scientific species names were tentatively assigned. The data obtained was grouped in presence/absence (P/A) matrices (78 river and lagoon sites x 20 fish items and 78 river and lagoon sites x 8 infrastructure types - watermills, weirs, levees, dams, olive oil presses, olive oil mills, fulling-mills, channels - considered as environmental variables). Based on those matrices, the similarities between locations were investigated with multivariate analysis methods (Correspondence Analyses - CA and principal coordinate analysis - PCO), using the appropriate Brodgar v.2.5.6 (Zuur, 2000) and PRIMER v.6 (Plymouth Routines in Multivariate Ecological Research - Clarke & Gorley, 2006, with its complement PERMANOVA - Anderson et al. 2008) software packages. A CA using the Brodgar software package was the multivariate ordination technique used to identify patterns within sites, based on fish presence. In order to investigate the existence of patterns in the different locations determined by the presence of the different fish and their relationship with environmental factors, a PCO was carried out (PERMANOVA - PCO routine) on the similarity matrix obtained through Sorensen's Similarity Coefficient on P/A data. To this ordination, vectors representing Spearman correlations between fish and environmental variables with the PCO axes were superimposed (Anderson et al. 2008). In order to assess the sites ordination based on fish variables and their relationship with the implanted structures, descriptors were superimposed one at a time on the fish PCO ordination as circles (PRIMER bubble graphic routine), to emphasize a visual relationship between the grouping of locations and the considered variable.

3. RESULTS

From the “Parish Descriptions”, 78 sites belonging to the Vouga watershed were identified (Fig. 1), as well as 24 vernacular fish names occurring in these locations. The species assigned to the reported fishes (Table 1) are considered to be those most likely to occur in the Vouga River basin and Aveiro lagoon. From this list we retain 20 “species” that can be assigned to different, environmental affinities: marine/estuarine, freshwater and indifferent euryhaline that can support both fresh and salty environments (Fig. 2a).

Table 1. List of fish cited for the Vouga River basin and Aveiro lagoon system in the 1758 “Parish Descriptions” (Portuguese vernacular names, English names and most likely species concerned)

Vernacular Names (Pt)	**English Names (Uk)**	**Most likely species**
Azevias	Bastard sole	*Microchirus azevia* (Capello, 1867)
Barbos	Barbels	*Luciobarbus bocagei* (Steindachner, 1864)
Bogas	Iberian nase; Northern straight-mouth nase	*Pseudochondrostoma polylepis* (Steindachner, 1864); *Pseudochondrostoma duriense* (Coelho, 1985)
Bordalos	Chubs; Iberian-Roach	*Squalius cephalus* (Linnaeus, 1758); *Squalius alburnoides* (Steindeachner, 1866)
Corvinas	Meagre	*Argyrosomus regius* (Asso, 1801)
Eirós	European eel	*Anguilla anguilla* (Linnaeus, 1758)
Enguias	European eel	*Anguilla anguilla* (Linnaeus, 1758)
Escalos	Northern Iberian chub	*Squalius carolitertii* (Doadrio, 1988)
Lampreias	Sea lamprey; European river lamprey	*Petromyzon marinus* Linnaeus, 1758; *Lampetra fluviatilis* (Linnaeus, 1758)
Linguados	Black sole; Senegalese sole	*Solea solea* (Linnaeus, 1758); *Solea senegalensis* Kaup, 1858
Machos	European eel (male)	*Anguilla anguilla* (Linnaeus, 1758)
Muges	Black mullet	*Mugil cephalus* (?) Linnaeus, 1758
Robalos	European seabass; Black-spotted bass	*Dicentrarchus labrax* (Linnaeus, 1758); *Dicentrarchus punctatus* (Bloch, 1792)
Rodovalhos	Brill	*Scophtahalmus rhombus* (Linnaeus, 1758)
Ruivacos; Ruivaços; Ruivacas; Ruivães	Roach; Ruivaco	*Iberochondrostoma lemmingii* (Steindachner, 1866); *Achondrostoma arcasii* (Steindachner, 1866); *Achondrostoma oligolepis* (Robalo, Doadrio, Almada & Kottelat 2005)
Sáveis	Allis shad	*Alosa alosa* (Linnaeus, 1758)
Savelhas	Twait shad	*Alosa fallax* (Lacepède 1803)
Solhas	European plaice; European flounder	*Pleuronectes platessa* Linnaeus, 1758; *Platichthys flesus* (Linnaeus, 1758)
Solhos	Atlantic sturgeon	*Acipenser sturio* Linnaeus, 1758
Tainhas	Mullets	*Chelon auratus* (Risso, 1810); *Chelon ramada* (Risso, 1827); *Chelon saliens* (Risso, 1810); *Chelon labrosus* (Risso, 1827)
Trutas	Brown trout	*Salmo trutta* Linnaeus, 1758

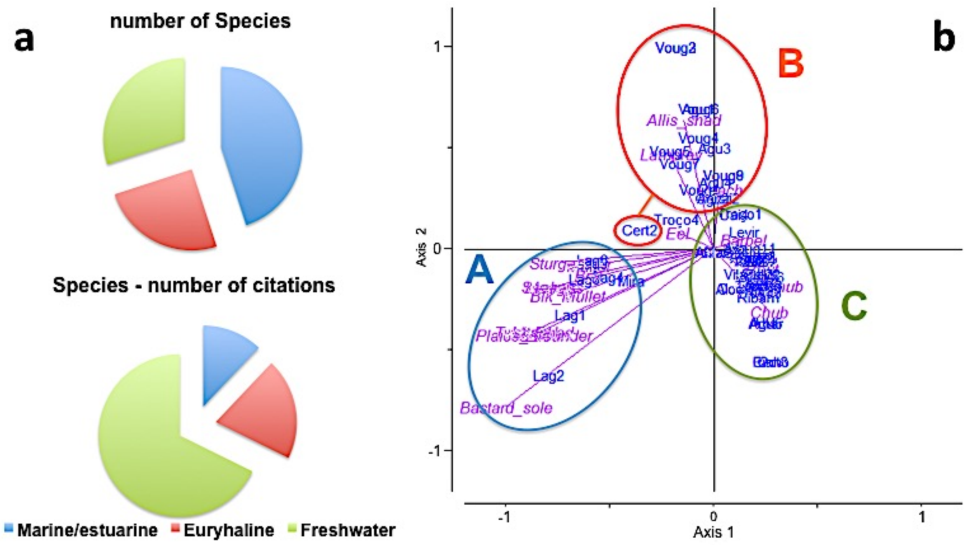

Fig. 2. a: Marine/estuarine (9), freshwater (6) and indifferent euryhaline species (5): percentage of the number of species assigned to these environments and of the number of citations of those species (total 257); b: Ordination (Correspondence Analysis) of sites in the Vouga and Aveiro lagoon Watershed based on the presence/absence of fish species. A: Near shore lagoonal areas; B: rivers downstream locations; C: upstream freshwater areas

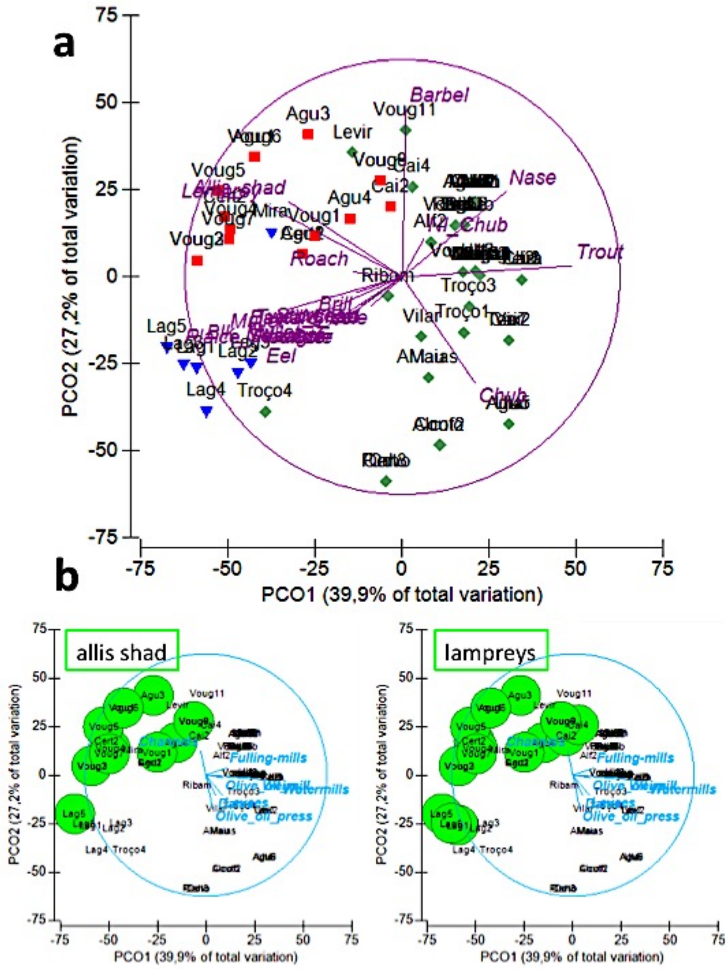

Fig. 3. Ordination (Principal Coordinate Analysis - Sorensen similarity coefficient) of sites in the Vouga and Aveiro lagoon Watershed based on the presence/absence of fish species. The vectors represent the Sperman correlations between the variables fish (a) and structures in the environment (b) with the axes. Presence of allis shad and lampreys (circles over PCO)

The CA ordination reveals differences in the fish distribution across the Vouga/lagoonal basin, and this distribution determines a structure in which three main groupings of sites are recognized (Fig. 2b). The main separation is found between the stream and river sites, and near shore lagoonal areas with the presence of marine fish (bastard soles, meagres, soles, seabasses, brill, plaices, flounder, twait shad, mullets and sturgeon); the stream and river locations separate in two groups following the species' spatial distribution according to specific conditions: rivers downstream locations (e.g. Vouga, Águeda…), with the most tolerant catadromous and anadromous species (eels, lampreys and allis shad); the upstream freshwater areas characterized by the presence of barbels, nases, chubs, northern Iberian chubs and trouts.

The Principal Coordinates Analysis (PCO) allow to explain these differences in site ordination according to fish species, with 67.1% of cumulative percentage of total variance explained by the first two components (Fig. 3). The PCO indicates a separation, along the first axis, between sites with mostly marine and/or euryhaline fish species (negative part of axis 1) and those in which freshwater species are present (positive part of axis 1). In the 1st case with predominance of marine and estuarine species in lagoon sites (Mira and Lag) and euryhaline species in lagoonal zones and terminal stretches of the main rivers; on the 2nd case with the presence of nases, chubs, northern Iberian chubs and trouts. The barbels, with a wider distribution, are located in an intermediate position of axis 1 (Fig. 3a).

The vectors relative to the structures implanted in the environment in relation to the PCO axes emphasize that these structures are preferentially positioned in the upstream hydrographic areas (positive part of axis 1). PCO Bubble plots overlaying sites and representing the presence of allis shad and lampreys (Fig. 3b) may indicate that the areas with the greatest human constructive structures should constitute an obstacle to the presence of these anadromous species in the considered sites.

4. DISCUSSION

4.1 *Coastal Evolution*

The Aveiro's lagoon coastal area has undergone by processes of deep changes since at least 3000 years BP. Sediments from rivers located north were carried south through coastal drift processes and deposited in coastal stretches. This phenomenon has gradually rectified the coastline by filling in recesses such as estuaries and bays. These geological changes resulted in the growth of a sandy spit from north to south and enclosed the wide bay of the Vouga estuary where the Aveiro lagoon was formed (Dias 2004, 2009; Dias et al. 2012). The coastal modifications in its area can be observed through the distinct geological soils, as the oldest formations are from the Mesozoic period, and the most recent derived from Pleistocene and Holocene sedimentary accumulations - Fig. 1 - (Lucci, 1918; Girão, 1922; Souto, 1923; Dias et al. 2012).

During Medieval ages there was an increase of sediment deposition in the rivers. In this phase, the Christian Reconquest and the pacification of this part of the territory stimulated the demographic increase and the anthropic activity with deforestation and consequent soil erosion. This had intensified the sediment supply to the coastal drift currents and resulted in the continuous growth of the sandy spit, changing the lagoon's inlet location (Fig. 1). Around the 10th century, the sandy spit was located in the vicinity of Ovar. Two centuries later, around the year of 1200, it was located further south, near the town of Torreira (Martins, 1947; Bastos, 2015). By then, intense modifications had also occurred in the medium and low course of Vouga's river basin. The sediments discharge by its fluvial curses, contributed to fill the inner part of the gulf, since the sandbank prevented their removal to the ocean (Bastos, 2015). In fact, by the year 1394, lagoon silting had already constituted the Ovar, Vagos and nearby Aveiro channels. In the 15th century, several documents allude to inner islands and channels formation, confirming the siltation process of the lagoon system. Between the years of 1200 and ca.1500, the sandy spit extended from Torreira to São Jacinto. In addition of its growth from north to south, there was also another sandbank extending northern from Mira. In 1646 the sandy spit location was nearby Vagueira. Along the

18th century, it has oscillated between Vagueira and Mira (Martins, 1947; Amorim, 1997; Bastos, 2015; Pereira, 2019).

During this century the connection between the lagoon and the ocean got worst and in 1757, the year before the answers to the parish inquiry, the inlet that was then located in Mira closed. In the same year, the Ílhavo governor “Capitão-Mor” João de Souza Ribeiro da Silveira, invested from his own money to open an inlet nearby Vagueira. This was a man with several interests in the region. He owned and rented islands in the lagoon with salt pans (Amorim, 1997) that needed the hydric exchanges to be productive. With the king’s acceptance to make such enterprise, the task was completed on 8th of December of that year. It was a success as vessels could navigate again inside the lagoon and the water exchange was possible (ANTT 1758, v. 5, f. 813-814; v. 14, f. 420; v. 25, f. 1966). Several priests mention the new inlet opening, referring how it was positive to provide the flow of the tides and prevent constant flooding in the lagoon surrounding cities (ibid. v. 9, f. 723; v. 15, f. 281; v. 18, f. 143; v. 26, f. 356; v. 28, f. 920). The opening and closing of inlets, had influence in fish distribution. As we have seen, the main distribution of fish is certainly due to salinity; we found a clear separation between the stream and river sites, and near shore lagoonal areas (Fig. 2b). For these ones priests refer the presence of marine fish, but their distribution seems to be very localized and fish diversity appear to be very low when compared with the results of the twentieth century studies (Pombo et al. 2002). Even considering that the mentioned species were only those used for human consumption, the list is very poor (9 species), when compared with those referred by the 20th century authors (e.g. Arruda et al. 1988; Pombo et al. 2002; Pombo et al. 2005), that can reach about 50 species used for human consumption, which certainly would not go unnoticed in surveys carried out in 1758, if they were present and not very rare. Nevertheless, despite such human intervention, the problem of the lagoon sea connection continued and was again interrupted in 1791. In the year of 1802 the sandbar definitively enclosed the lagoon system until 1808 when the new artificial inlet was open (Amorim, 1997).

4.2 *Human interferences in the Vouga’s watershed*

With a large and complex network of fluvial curses and the presence of a coastal lagoon, the Vouga’s watershed was economically vital to the region. The Aveiro lagoon made possible the location of several trade ports. Through them, commerce of goods, such as salt, fish, wine, olive oil and cereals, with other regions was frequent (Amorim, 1997; Bastos, 2015). The production of cereals, olive oil or even the fur and cloth tanning, was essentially made by watermills. This situation has provoked human interferences on the Vouga’s watershed. Indeed, the construction of several types of water moved devices in the rivers and eventual pollution due to those activities might have impacted their ichthyofauna. Mills had an important economic role in the Middle Ages. With an economy characterized by a strongly ruralized structure, the cereals grinding on this type of infrastructures wasstill remained in the 18th century and in the Vouga’s watershed, practically all river courses and its affluents had several watermills for production of bread and oil. There were also fulling-mills moved by water, used to fur and cloth tanning (Amorim, 1997). Dams, weirs, levees and channels, structures built across the watercourses to direct the water flow to their wheels and provide them the necessary energy to work, accompanied all of these water devices. The large amount of the compiled data does not allow us to cite each one of these types of mills and dams.

Such structures certainly have influenced fish progression on the fluvial curses. For instance, in the summer, when watercourses were emptier, the progression upstream or even downstream, depending of the water volume, was probably more difficult or even impossible to some species, namely the anadromous fish, which may not reach their reproductive areas. This fact is stressed for the distribution of allis shad and lampreys (Fig. 3b), which excludes areas with abundant men made structures. Incidentally, this continues to be the biggest factor of disturbance to the populations of these species, currently considered by IUCN as threatened (Cabral et al. 2005). It was mainly in this time of the year that nearby inhabitants used to fish, since the reduction in the volume and speed of water made the fishing nets application easier (e.g. ANTT 1758, v. 1, f. 391; v. 8, f. 452; v. 9, f. 1172; v. 12, f. 2907; v. 13, f. 92; v. 24, f. 1372; v. 26, f. 84; v. 36, f. 70).

Indeed, some references show that dams imprisoned the fish and were used as fishing places. This procedure is observed in localities such as Lamas do Vouga (ibid. v. 19, f. 209), Cucujães (ibid. v. 12, f. 3320-3321), Macieira de Cambra (ibid. v. 22, f. 124-125) Oliveira de Frades (ibid. v. 26, f. 231-232) Couto de Esteves (ibid. v. 12, f. 2907) and Pessegueiro do Vouga (ibid. v. 28, f. 618).

The applied fishing techniques also had impacts in the ichthyofauna. In the lagoon, fishing was one of the main economic activities. It was extensively employed, often resorting to harmful fishing gear concerning the species development (e.g. Amorim, 1997; Bastos, 2015; Pereira, 2019). In the rivers of Vouga's watershed, the same problem occurred. In some cases, spurge flax ("trovisco") was used to poison the fish. This was a very urgent problem because according to the priests' statements, not only juveniles were killed, therefore diminishing fish quantity, but also, other animals die when they drink such waters. Such cases happened in Ribafeita (ANTT 1758, v. 31, f. 479) and Bodiosa (ibid. v.7, f. 934), two nearby localities along the Vouga and Troço rivers spring. In nearby rivers that belong to Mondego watershed the same situation happened (e.g. ibid. v. 7, f. 813). As these are regions far from urban centres, it could be a practice used due to the lack of inspection. During March, April and May, the migratory marine species, allis shad, twait shad and lamprey, entered the rivers to spawn. Supposedly fishing was then forbidden. Some priests from parishes located nearby Caima river (ibid. v. 7, f. 1193, v. 26, f. 333) and Águeda river (ibid. v. 14, f. 496) mention a royal law with such order. Indeed, since at least the 16th century laws were made to avoid fishing activity in those months as a way to secure the fish stock renewal (e.g. Silva, 1891). However, in several places, during such migratory process was precisely the period chosen to fish that species as it was when they were found in larger quantities (ANTT 1758, v. 2, f. 17; v. 8, f. 170-171; v.13, f. 68; v. 21, f. 1167; v. 25, f. 1968; v. 31, f. 173; v. 34, f. 783).

5. CONCLUSION

Through the historical source "Parish Descriptions" it was possible to elaborate an environmental interpretation in the Vouga's watershed from a synchronic approach. Twenty species were identified with Marine/estuarine, freshwater and indifferent euryhaline environmental affinities. Natural and anthropic effects had an impact in the species distribution. The inlets opening and closing had influence since their presence or absence it was mainly due to salinity. The built structures influenced their progression on the fluvial curses, namely the anadromous fish. The intensive fishing with the use of predatory fishing technics and disrespecting the reproductive season also contributed to ichthyofauna impacts.

In a moment when the survival of Aveiro's Lagoon is being discussed because of the silting up that compromises all this wet area, and the gastronomic heritage of the entire region is at risk (namely the famous eel cocking) it seems relevant to discuss the historical ichthyofauna variety. That may bring us the consciousness of all the disturbances that anthropic actions have had in the lagoon hinterland (completely dependent on the entire Vouga's watershed, which ends in the lagoon). The consequences of human activity on the ecosystems are basically still the same in 1758 (year of our analysis) and current days (in spite some climate change effects not yet noticeable): change of natural flora, soil erosion, increase of sediment discharge to rivers and streams, and consequently, into lagoonal environment. When the dredging of the lagoon is completed and if the historical species are detected there, then we can be satisfied because Man managed to remedy the abuses perpetrated against that natural heritage.

ACKNOWLEDGEMENTS

The authors are indebted to Dinis Almeida for improving the English. This study received national funds through FCT (Fundação para a Ciência e Tecnologia, I.P.) strategic projects UIDB/MAR/04292/2020 and UID/MAR/04292/2019, granted to MARE - Marine and Environmental Sciences Centre.

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ISBN 978-989-734-44-0
9 789898 734440