Socioenvironmental Contexts of Artisanal Fishing

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Edited by

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MAYBE THIS IS WHAT I'D LIKE TO WRITE AS A PREFACE…

LUÍS CANCELA DA FONSECA[1]

In the words of a fisherman from Setúbal, "the sea has always been like this, it is like this and it will always be like this, it is uncertain" - a statement made after an outing in which he managed to catch nothing; or another: "The sea is in charge", by a fisherman from Azenha do Mar, emphasising the randomness of the marine environment (Amorim 2018).

This sense of insecurity, dictated by the harsh living conditions, is certainly responsible for the strong bonds of solidarity that usually exist in fishing communities, especially those whose activity is centred on artisanal fishing. In this respect, let's listen to Raul Brandão (1923, 156):

> "Half a century ago, Olhão, immersed in brine and lost in the world, lived only on the sea. Everyone knew everyone else. Those who weren't sailors were the children or grandchildren of sailors, some smugglers and others, inshore and offshore fishermen [...]. Coastal fishing, the capture was done with 'groseiras', large spinels (...) and with the art of 'xávega', in 'calões' and dinghies, with the crew pulling the gear to shore while the 'arrais', in a small boat called a 'calima', watched over the catch and directed the manoeuvres."

Carlos Ribeiro notes that

> "throughout history, the sea has been an example of this confrontation, and the water's edge has been both a hostile and sacred place, a place where risks and dangers are foreseen, the scene of exorcisms, cures and therapeutic rituals (...) It is well known that, in terms of landscape history, the sea - like the mountains and the desert - was/is a hostile landscape, because it is an area of incalculable risks and dangers. And it is only in modern times that

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> the sea (as well as the seafront and the beach) has become a landscape and a place of leisure (Ribeiro 2020, 211-221)."

According to the same author,

> "The sea appears as a hostile, non-human space (...) and, consequently, as the privileged destination of a large part of the evils hidden during the magical-therapeutic ritual. There is a clear boundary between the humanised spaces - symptomatic where the mother calls for her child or the boy cries; where roosters and chickens sing and, by extension, other domestic animals - and the so-called forbidden, non-humanised and barren zones, which generate fear and anxiety. Necessarily, a border to be veiled and maintained for the sake of (fragile) bodies, human and non-human (Ribeiro 2020, 211-221)."

Joana Freitas notes a long historiographical tradition in the field of maritime activities at the European level, pointing out that

> there are numerous studies on fishing, salt production, seaweed harvesting, ports, cabotage, long-distance shipping, shipbuilding, trade, coastal societies, customs, military defence and local powers. However, the approaches are almost always from an economic, social, cultural or political point of view, and very rarely do we try to relate these factors to the constraints imposed by the specificity of the territory, or analyse the impact of these activities on the surrounding environment (Freitas 2018, 11-14).

These are points that are also developed in the book "Socioenvironmental Contexts of Artisanal Fishing", with texts compiled and edited by M.R. Bastos, O.N.A. Pereira, S. Lira & J. Viegas, in which various aspects of artisanal fishing and other activities with a special focus on the marine environment are approached in a diachronic way, trying to understand not only their evolution over the last few centuries, but also the relationship that this evolution has had with the increase in knowledge (both empirical and scientific) and its corresponding technical application during the periods analysed.

The activity of all those who have made artisanal fishing their way of life for thousands of years has led to the accumulation of practical and empirical knowledge that cannot be neglected and must be taken into account by those who are responsible for regulating and legislating on fishing activities.

It should be noted that some of the fishing equipment still used today (nets, hooks, harpoons...), despite the material improvements that have been made, date back to prehistoric times; others, such as bone hooks, date back

to the Palaeolithic period, with improvements made, for example, in the Bronze Age.

Paulo Seda mentions populations that occupied the coastal areas of the state of Rio de Janeiro more than 4,000 years ago, when fishing was one of the main activities for gathering food (Seda 2015, 140-154). It is also known that fishing activities, both in coastal areas and on the riverine areas and banks of rivers, lakes and lagoons, have very ancient origins and are frequently mentioned by ancient authors. Marcelo de Vasconcelos mentions that between 4,000 and 3,000 years ago, the population was essentially nomadic, living by gathering, hunting and fishing between the Appalachian Mountains and the great prairies that dominate the central region of North America (Vasconcelos 2003).

Fishing, particularly artisanal fishing, is considered one of the oldest human activities and is still an important economic activity and the mainstay of the economy in several regions of the world. In the least-favoured areas, this activity is particularly important for the livelihoods of large sections of the population and is carried out by fishermen alone or, more often, in families and/or with the help of other partners. This activity has a great expression worldwide, being responsible for about 50% of the total fisheries production (FAO 2018).

Marcelo de Vasconcelos, referring to small-scale local and coastal fishing (which largely corresponds to what in the not too distant past was called artisanal fishing)", states that "this is an important segment of the fleet in terms of the number of vessels, the volume of employment and the quality/value of production"; he also states that "the diversity of situations that can be found in the activity of this sub-sector justifies considering more appropriate solutions for its management, with a twofold objective: To ensure fairer and more effective regulation and, at the same time, to guarantee its compatibility with the activity of the rest of the fleet". It also emphasises that "two aspects should be carefully considered from the outset: the possibility of clearly defining areas of reserved action and the development of conditions that allow solutions based on local communities to be tested (Vasconcelos 2002).

It should be stressed that, as mentioned above, there is a considerable corpus of accumulated knowledge and know-how, which undoubtedly constitutes a collection of cultural and intangible heritage of great importance. These facts have led Figueira et al. to point out that

> "In the context of heritage conservation, the preservation of oral knowledge and handicrafts (...) is fundamental in any approach to valorising the heritage of these types of knowledge, because with the disappearance of the people who carry this knowledge (a fact that is part of the human life cycle), a whole

> universe of individual and community skills in relation to the environment also disappears (Figueira et al. 2016, 79-90)."

The strong growth and development of fishing activities, both industrial and small-scale (artisanal), with more powerful engines, new and improved fishing gear, giant nets, greater trawling capacity, greater autonomy of vessels, together with the increase in global pollution and climate change, has led to an enormous depletion of fish stocks worldwide, threatening the sustainability of fish stocks and driving some fish populations to levels of extinction that would have been unthinkable only a few years ago. This is also threatening all economic activities based on the fishing sector and is affecting social relationships and ways of life around the world (Vasconcelos 2002, 2003).

Less than a century ago, it would have been unthinkable for species as common as the European eel and other commonly fished species to be included in the International Union for Conservation of Nature (IUCN) list of threatened species...

However, the circumscription of a large part of the most developed nations with the greatest capacity to catch fish in the sphere of influence of the Abrahamic religions has always led them to believe that everything that exists is at the disposal of mankind. Our models of growth (not development!) have been extremely voracious, and with the unbridled growth of the world's population and the increasing demand for food, there is no time to think... Corporate health has taken precedence over Human health... Children and young people are growing up in a hurry and in solitude, with no time for the irresponsibility of their young age, but with the pressure to become useful quickly - they are spare parts in the infernal machine of our society! As many warnings as there are from the scientific community about the disastrous state to which we are leading the planet that supports our existence, some of the world's top leaders either don't listen or quickly forget them after loud declarations of good intentions.

As a result, the issue of the conservation of species, and not just those subject to fishing activities, has become extremely important. And a large number of endangered species owe their status both to the over-exploitation to which they have been subjected and to the loss of their habitats due to competition with man, whose actions have led not only to a significant reduction in the number of exploited animal populations (some of which are exploited surreptitiously to satisfy vanity, ostentation or more or less abstruse purposes), but also to a reduction in natural areas and the diversity of their biotopes. The evolution of life generates diversity. The standardisation of spaces that man has promoted undermines the maintenance of this

diversity and therefore promotes the disappearance of a considerable number of species.

> "The loss of biodiversity is essentially the result of direct or indirect human action, not because its components cannot or should not be used, but rather because he has not known how to manage them, since *conservation is essentially about managing human use of the various components of ecosystems in order to guarantee their continuity* (Cancela da Fonseca and Marcelo 1999)."

The IUCN, aware of these problems, proposed a World Conservation Strategy in 1980, in which it defined conservation as "the organisation of human use of the biosphere in such a way as to derive the maximum continuing benefit for present generations, while maintaining its potential to meet the needs and aspirations of future generations" (IUCN 1980). But it wasn't until more than a decade later that the concept of sustainable development emerged and entered the world's vocabulary with the 1992 Rio de Janeiro Conference, where it was recognised that development and conservation are like two sides of the same coin.

As I have written before (Cancela da Fonseca 2003, 5-10), today we are increasingly seeing

> "The discussion of sustainability: the use of human resources for the improvement of the human condition (development), which in theory should be able to continue indefinitely (sustained, continued), promoting well-being and ensuring the conditions for the survival not only of present generations but also of future generations. In other words, a development that, while respecting the intrinsic characteristics and bio-ecological processes related to the carrying capacity of life on Earth and its perpetuity, gives hope for a better quality of life for the world's population as a whole."

But every day we are confronted with something very different from the beautiful goals set out above, and that is the unsustainability that prevails in our increasingly globalised world.

We can see that (and I refer again to earlier writings) "human activity has directly or indirectly contributed to the reduction of landscape units and their biodiversity, particularly in the 20th century" (Cancela da Fonseca and Marcelo 1999). Unbridled growth is not sustainable, it is not development and it will continue to produce misery and social problems. Human needs have led to a drastic reduction in the space available for the other inhabitants of the planet, which is why the so-called conservation of biodiversity has become an absolute priority; otherwise the main loser will be man himself!

Although coastal ecosystems are among the most biodiverse and scientifically interesting, and have the highest natural productivity, the concentration of human populations in coastal areas jeopardises their functions (protection from storms, erosion control, nursery, breeding and feeding grounds for many commercially exploited marine species, support for migratory routes for various species, recreation and leisure...), because they are also among the most vulnerable, being one of the favoured targets of the human socio-economic development mentioned above, and therefore require careful and rigorous planning (Cancela da Fonseca 2007, 5-16).

Once again, human intervention is often counterproductive to the dynamic equilibrium established (industry, dams, deforestation, intensive agriculture, fires...), with effects on sediment flows, nutrient and pollutant inputs and the disruption of trophic webs in coastal areas, the most productive in the oceans (Vasconcelos 2002, 2003).

This book, is an original contribution to the understanding of the activity of artisanal sea fishing. In its twelve chapters, it approaches the subject from a time perspective, covering a long period from the Middle Ages to the present day; but it also approaches it from different perspectives, including not only the activities related to fishing, but also aspects related to its socio-economic, cultural and heritage environment, the latter in both its tangible and intangible aspects.

It can certainly be seen as a continuation of the BRASPOR network goals, which was set up following the meeting held in Porto in October 2010 as an informal, open network, with variable geometry and no specific funding, whose aim is to create new synergies that will promote more intense collaboration between scientists dedicated to the study of coastal systems on both sides of the Atlantic; and which, by encompassing "both the natural environment and the man who explores and modifies it", proposes to look at these systems in a more comprehensive way, promoting awareness that the natural heritage (geology, landscapes, biodiversity…) together with the socio-economic environment and the historical and cultural heritage, both tangible and intangible, constitute the true wealth of humanity.

The present texts are the result of some further steps towards these synergies, without losing sight of the fact that understanding and preserving the heritage in question requires not only knowledge of the specific current realities and the respective socio-economic frameworks, but also an understanding of its development throughout history (both natural and human).

The articles collected here certainly contribute to this great purpose:

- In the first chapter, O. PEREIRA analyses the use of the art of “xávega”, which dates back to the Middle Ages in Portugal's sandy

coastal areas; it was probably introduced during the Moorish period and expanded during the Middle Ages due to its high productivity and the increase in areas with favourable sedimentary substrates. One of the most important in these coastal areas, the predominance of this art was due to the profound changes in the coastline that took place from the Middle Ages onwards, caused by the greater influx of sediments resulting from the development of agricultural activities and the consequent deforestation of large areas of the territory.

- In chapter 2, A. GINOT-JULIÀ refers to fishing as one of the first human activities in coastal areas and discusses the social and economic interactions in fishing communities in Catalonia (15th and 16th centuries). The fishing community was diverse, characterised by strong social and economic hierarchies and was fully integrated into the respective communities. For example, the work and operation of the "xávega" made this art a social task with different actors: owners, investors, regular or casual workers and even slaves.
- In chapter 3, S. LIRA discusses aspects of heritage and musealisation related to artisanal fishing. He refers to the migrations of fishing communities during periods when weather and sea conditions prevented fishing activities - the communities of "Avieiros" of the Tejo river, coming from Vieira de Leiria beach during the winter. He analyses aspects of the musealisation of both the material culture and the intangible heritage of "Praia da Vieira – Avieiros", largely based on interviews and reports from former (old) fishermen who carried out this "human transhumance".
- J. VIEGAS, based on studies of the "Mary Rose", demonstrates the continuity between life on land and at sea in the late Middle Ages (chapter 4); the artefacts collected from this wrecked warship provided an exceptional lens through which one may observe and understand the Tudor-Era dietary practices and their social and cultural dynamics, highlighting how sailors adapted "land norms" to the "maritime environment". The results also emphasised that food was both a necessity and a means of maintaining cultural identity and social cohesion.
- For E. CARBONELL (chapter 5), the transition from the 20th to the 21st century has highlighted a double crisis in many coastal areas of the world. In some places, the "model" of tourism development; in others, a generalised crisis in the primary sector, with a focus on artisanal fishing activities. The consequences for the maritime heritage of Catalonia and Quebec are analysed in the light of the UNESCO Convention for the Protection of the Intangible Cultural Heritage, in

terms of its application to the occupations, uses and customs of human communities in coastal areas that are currently undergoing profound and accelerated change. There are two different visions of the past in Catalonia and Quebec: one that defends the heritage of their coastal peoples and their uses, and another that is more concerned with the respective origins that define the community.

- M. PALMA (Chapter 6) discusses the relationship between the sea and medicine in 19th century Portugal. She places this reflection within the framework of the 'One Health' movement, which emphasises the interrelationship between human, animal and environmental health, both in terms of maintaining health and studying the transmission of infectious diseases. Many of the medical reports show a strong relationship with the marine environment and the presence of non-human pathogens. History provides elements for analysing the relationship between Portuguese medicine in the 19th century and the marine environment from a medical perspective.
- In Chapter 7, N. BATISTA & M. GONÇALVES analyse artisanal tuna fishing in Faro (Algarve - southern Portugal); yesterday, as today, technical and social skills were essential for the adaptation and success of fishing populations. Today, and in the face of climate change, new adaptations are required for the activities they continue to carry out. In the face of the "ravages" of mass tourism on the Algarve coastline, there is an urgent need to try to preserve and enhance the memory of those times when fishing traps (especially for tuna) were the lifeblood of the Algarve's coastal towns, and are now in a phase of accelerated extinction. This formidable heritage of use and knowledge will be lost forever if it is not preserved quickly.
- J. RAMOS & P. LINO refers to the socio-economic importance of tuna fishing in the Algarve and question whether it could become a tourist product (Chapter 8). They point out that these fisheries have developed over thousands of years and are of great importance in the Mediterranean region, leading to a significant evolution of the human communities living in its coastal areas. The history of these fisheries and their development, both as an economic activity and in terms of social evolution, constitutes an important heritage of these peoples and their settlements that must be known and not lost for the enjoyment and knowledge of future generations. Today's "tuna routes", in addition to preserving the social, economic, cultural, patrimonial and immaterial heritage of this fishery, can provide added tourist value, not only in the coastal areas where the fishery was developed and established (e.g. in Roman and Muslim times), but also

in those where it has existed until recently or where it has been revived.

- M.G. ALBUQUERQUE et al. discuss artisanal fisheries in Brazil and their diversity (Chapter 9). As in most coastal and riverine areas of the world, this type of fishing is an important source of livelihood and survival for millions of people, but it is also an important cultural and socio-economic activity. It is an activity that leads to the development of technological improvements, multiple skills and multidisciplinary endeavours; in this way, it has generally become an activity that fosters a complex web of interrelationships within fishing communities. These communities need to be understood as complex socio-ecological systems that are constantly adapting to their seascapes and their variations and changes, particularly in the face of expected (ongoing) climate change.
- In chapter 10, D. GARCEZ et al. focus on the resistance and resilience of artisanal fishing communities along the coast of Ceará (northeastern Brazil), discussing how this is a relevant socio-economic activity for the subsistence of countless fishing communities and shellfish gatherers, both in coastal marine, estuarine and lagoon environments. These places and resources have always shaped the people and their form of territorial integration. In the Northeast of Brazil, these activities account for a significant proportion (around 25%) of the total catch. The vicissitudes resulting from environmental and morphodynamic changes on the coast require these communities to adapt in order to resist and be resilient. All of this implies that those involved in these artisanal fisheries have acquired knowledge and experience that are extremely important for the survival of the communities concerned, and which constitute a set of cultural and immaterial heritage that must be understood, accepted and shared, considering it as valid as the scientific knowledge that must confront and complement it. These communities must be listened to and their advice and knowledge must be accepted in order to effectively manage the target stocks of their extractive activities.
- The vulnerability of artisanal fishing communities to coastal risks was assessed by D. PAULA et al. (Chapter 11) in a case study in northeastern Brazil. The emergence of numerous conflicts related to the use of coastal areas and the threats to these areas, both from anthropogenic activities and from physical and climatic changes affecting coastal morphodynamics (erosion processes, reduction of beach area, destruction of dunes...), not only alter the integrity of coastal ecosystems, but also severely affect the communities that depend on

the beaches for their livelihoods, namely those involved in artisanal fishing. This activity combines sustainability and tradition, depending on environmental conditions. The development of these communities began between 4000 and 2000 years ago, as evidenced by archaeological works, and the knowledge acquired has been passed down from generation to generation. In Ceará, where more than 45% of the coastline has been eroded, artisanal fishing is threatened by the reduction of the necessary fishing areas. This threatens the socioeconomic and food security of these communities.

- F. N. FERREIRA & R. LUCAS study the phenomenon of "El Niño" in the city of Rio Grande from the second half of the twentieth century to the present day (Chapter 12), awakened by the great floods of Rio Grande do Sul (southeast Brazil) in 2024, in an attempt to understand how such events work. About forty years after the beginning of the study of the phenomenon, "El Niño" is recognised as a "global disturbance" and not only a "local" one (Pacific coast)... and also as something to be taken into account for fishing activity, because of the high impact it causes. The greatest impact is felt, in particular, by the artisanal fishing community. They noted the absence of a coherent and structured policy, which, together with the lack of qualified technical solutions capable of perceiving the integration between climatic variations and the territory, reveals the lack of balance between the subjects and the environment in which they live.

As I have already mentioned, humanity has been guided by models of growth (not Development!) inadequate relative to the capacity of Planetary Resources. Hence the emergence of environmental and climate crises (destruction of habitats, accelerated loss of biodiversity, collapse of fish stocks, excessive increase in toxic waste, in particular plastics, increased risks of pandemics, increase in marine diseases, increase in highly destructive storms, uncontrollable fires...) and the urgency of warnings to the need for conservation of life support systems on planet Earth (Cancela da Fonseca 2023, 183-197)! We must investigate and find a more solid and durable development model... another development! That's the big challenge!

This is the urgent challenge facing the global world. Politicians, technicians, scientists, activists and citizens in general are now summoned to something they had not dreamed of not so long ago. It is also another challenge for the BRASPOR Network: how to maintain balanced coastlines in which it is possible not only to develop the enjoyment of humanity, but also to support activities as necessary as artisanal fishing, among other activities fundamental to our well-being. For this, it is necessary to continue to deepen

the fundamental knowledge for the understanding of the territory and its resources, investing in the search (in research!) of viable alternatives for coastal and riparian regions and their activities to which they provide both shelter and support, without calling into question what was intended to preserve... and discover the cultural, economic, and social capacities, and the political courage to apply them!

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INTRODUCTION

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SÉRGIO LIRA[3]
JOÃO VIEGAS[4]

> "(…) There is only the fight to recover what has been lost. And found and lost again and again: and now, under conditions. That seem unpropitious. But perhaps neither gain nor loss.
> For us, there is only the trying. The rest is not our business."
> —Thomas Stearns Eliot, Four Quartets

The impetus for the creation of this book was restlessness and dissatisfaction. It comprises the contributions of a group of authors who, in their respective countries of origin or research, encounter a paucity of substantial scientific backing when undertaking the analysis of existing literature to produce their works. This predicament is particularly pronounced in instances where interdisciplinary approaches are necessitated, encompassing a broad chronological span that facilitates a comprehensive perspective on the themes of the sea, the coast, and the utilization of coastal resources.

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1–The editors

The editors of this book have one thing in common: they are historians who have worked and taught in the field of environmental history and the preservation of the tangible and intangible heritage of coastal memory. This heritage inevitably constitutes a local, regional and national identity matrix. Despite hailing from different generations and possessing distinct academic backgrounds, these individuals have collaborated within international science networks, with a particular emphasis on those that convene researchers from countries with extensive coastal regions. Over time, they have expanded their network of contacts and are now convinced that their work is of interest to the scientific community and requires significant expansion to consolidate the object of study (the sea and the exploitation of marine resources) across a broad geography and chronology. To this end, the network of collaborators and researchers is to be expanded, and awareness of the significance of these issues is to be raised among new undergraduate, master's and doctoral students. Furthermore, the thematic areas and study zones involved (in coastal countries, it should be noted) are to be broadened in preparation for a possible EU-funded research project, with collaboration from emerging countries. This will take advantage of the synergies already established between the authors of the chapters in this book.

2–The theme

The theme of the book is of particular interest. A cursory reading of the text may lead the reader to conclude that it is a work with seemingly disconnected content. However, a closer inspection reveals that this is not the case. It must be acknowledged that... A common thread of analysis can and should be traced, which has as its leitmotif the connection between populations and coastal areas, and, above all, the practice of artisanal fishing or the underlying activities. The following binomial will be of particular focus: Sea/fishing as a standard for analyzing:

- This will allow us to analyze the preservation and over-exploitation of natural marine resources.
- This binomial can also be used to frame socio-professional and economic dynamics.
- Furthermore, it provides an anthropological framework for the analysis of coastal population settlements.
- It is also important to note that these binomial guarantees food security.

- It is also a repository of a tangible and intangible heritage of techniques and knowledge that cuts across coastal communities.
- Furthermore, it is imperative to acknowledge the role of the sea as a source of biodiversity, health, leisure and well-being.
- It is also an indicator of climate change, as evidenced by the erosion of sandy beaches, the warming of sea currents, overtopping and the recurrence of other coastal disasters.

3–The book's objectives and target audience

This book provides a critical and concise contribution to the general theme of artisanal maritime fishing, covering a broad chronological range from the Middle Ages to the present day. It incorporates contributions from multiple disciplinary domains, including History, Biology, Geography and Geology, alongside case studies from various countries. The set of analyses that constitute the book is the result of one main objective: the dissemination of the material/immaterial heritage of the activity and the preservation of its collective memory in the context of international collaboration. It provides a comprehensive examination of fishing and fishing communities, adopting an integrative approach that links past, present and future socio-environmental challenges. This book represents a distinctive interdisciplinary endeavor, drawing upon the insights of the arts, humanities and natural sciences. The methodological approach adopted is one that focuses on long-term chronology and integrates case studies from various countries across different latitudes. The text goes on to discuss the modern conflict between the tangible and intangible heritage of artisanal fishing conservation and the interests of the tourism industry, climate change patterns and the rules of new technologies.

The book's unique contribution lies in its comprehensive coverage of socio-environmental issues related to artisanal fishing, offering a comprehensive and up-to-date perspective on the challenges faced by this sector. The present volume is intended for a broad spectrum of interested parties, encompassing academics, students of various educational levels, decision-makers, NGO members, the curious and, in conclusion, coastal communities. The objective is to empower all stakeholders to value and monetize their natural resources by expanding existing knowledge, maintaining what is sustainable and should be preserved, and raising awareness of how to change predatory behavior, whether individual or collective. While the goals outlined here are ambitious, it is asserted that they are achievable in the short, medium and long term.

However, the discussion will be concluded here for the time being. The floor is now open for the authors to share their perspectives. The conclusion of this project will be determined by the readers' assessment of the presented material.

1

Portuguese Medieval Beach Seine Fishery: An Overview

Olegário Pereira[1]

Introduction

The *arte-xávega* (beach seine fishery) is a non-selective artisanal fishing method used to encircle, capture and bring ashore shoals of pelagic fish, mainly sardines (*Sardina pilchardus*), the Atlantic horse mackerel (*Trachurus trachurus*), the blue jack mackerel (*Trachurus picturatus*), the Atlantic chub mackerel (*Scomber colias*), the European anchovy (*Engraulis encrasicolus*), although in the process many other species are accidentally fished (Silva 1891, 242; Souto 1998, 40; Alves *et al*. 2021a).

This is one of the most important traditional techniques of coastal fishing in Portugal and its applied mainly in littoral areas with sandy seafloors and sufficiently extensive beaches, capable of providing the necessary space and type of terrain to allow the vessels and fishing nets manoeuvres (Silva 1891, 245; Souto 1998, 132-134). Such geomorphological characteristics to *arte-xávega* appliance are found in the central and southern Portuguese coastal zones where historically fisherman migrated and settled fisheries (*e.g.* Silva 1891, 244-245; Amorim 1996, 493-497; Souto 1998, 132-137; Souto 2003, 168-169).

References about the history of this fishing technique appliance in Portuguese coast can be found in studies which are about broader subjects but refer some aspects of this fishing technique. It is the case of the ones authored by Dinis (1960, 96-100), Iria (1988, vol. II, Tomo I, 207) and

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Marques (1993, vol. II, 162). Analysis concerning the history of fishing techniques applied in Portuguese littoral, or in a wider sense, to the history of fishing, also examined *arte-xávega* (Pedrosa 1985, 296 and 301-303; Madureira and Amorim 2001). Several studies were dedicated to scrutinise such a theme considering regional or local fisheries and mainly chronological scales placed between the 18th and 20th centuries (e.g. Laranjeira 1984, *passim*; Amorim 1996, 505-522; Amorim, 1997, 25-43; Amorim 1998, 159-185; Amorim 2002, 187-204; Aires de Amorim 1999; Lamy, 2000a, 2000b; Lamy and Rodrigues, 2001). Others analysed it by observing its appliance retrieving to medieval times (Pereira *et al*. 2015). Anthropological studies also detailed the introduction and dispersion of *arte-xávega* or other beach seine fishery who preceded such technique (e.g. Souto 1998, 132-138; Nunes 2005, 84-99). Meanwhile, besides the historical analysis, several other studies have been dedicated to the theme by investigating sociological, economic, cultural, patrimonial and ecological issues (cf. Alves *et al*. 2021b, 3-4).

Considering this scenario, in general, the investigation on the theme has been increasing and getting new insights from various disciplinary standpoints. In this chapter an analysis is proposed aiming at addressing the medieval roots of such beach seine fishery in Portugal (named then *enxavegua* or *xávega*). To achieve such purpose natural and anthropogenic dynamics that led to that possibility will be examined and discussed. It is expected that such an exercise may contribute to shed some light on the still very arguable reasons and chronologies of such a fishing method introduction and development on the Portuguese coast.

Coastal landscape changes

As mentioned earlier, the *arte-xávega* appliance is only possible in coastal areas with sandy beaches and seafloors. These characteristics mainly occur in lagoonal or estuarine littorals, where the coastline (immersed and submerged) is wide and sandy, a *sine qua non* condition for such fishing method practice (Silva 1891, 245; Souto 1998, 132-134). To the north of Espinho city, the coastline is rocky and in the Alentejo region, with few exceptions, it is essentially constituted by cliffs. This means that in those littorals it is not possible to carry out fishing activities using such a method. Therefore, from north to south, the coastal landscapes where *arte-xávega* was traditionally applied (fig. 1-1) are distributed by the following coastal sectors: (1) between the cities of Espinho and Quiaios or the Cape Mondego; (2) from the mouth of the Mondego river to the locality of Nazaré; (3) between the Tagus river mouth and Cape Espichel - the Setúbal Peninsula; (4)

between the Sado river mouth and the Cape Sines; and (5) in the Algarve region, mainly, but not exclusively, in the eastern Algarve, between Quarteira and the mouth of the Guadiana river (Souto 1998, 139-140; Nunes 2005, 70; Pereira *et al*. 2015, 124-125).

Fig. 1-1. Coastal sector's location: (1) Espinho and Cape Mondego; (2) Mondego river and Peniche; (3) Tagus river and Cape Espichel; (4) Sado river and Cape Sines; (5) Algarve.

During the Middle Ages these coastal sections, had faced profound and rapid geodynamic processes. This led to coastal changes that may have influenced the appearance, or at least, the increase of the beach seine fisheries in Portugal. Records referring to the *enxavegua* use are late medieval, coinciding with the coastal changes that took place.

Natural and anthropogenic causes influenced such coastal shifts. As for the natural causes, it should be mentioned the climatic fluctuations, the variations in the mean sea level, the variations in the sedimentary balances and changes caused by neotectonics. As for the human influences on these dynamics, the increase exploitation of soils by agriculture and the deforestation processes had contributed for such a scenario (cf. Dias *et al* 1997 and 2000, 182; Dias, 2004 and 2009).

Indeed, favourable climate conditions increased agricultural and forestry activities (e.g. Marques, 1978, 29 *et seq*.; Devy-Vareta 1985 and 1986; Sousa, 1997, 271-275; Mattoso 1997, 199-207). These human activities increased the sediment supply in the river courses and subsequently along the coast through coastal drift processes. The great availability of sediment has resulted in the constitution, expansion and even disappearance of various coastal lagoon environments (e.g. Dias *et al* 1997 and 2000; Dias, 2004 and 2009).

1. Coastal sector Espinho-Cape Mondego

Immediately southern Espinho, littoral underwent an intense transformation. In the transition from the first to the second millennium, a small sandy sandbank rooted in the south of Espinho began to develop, bordering a large bay that existed between the north of Ovar and the vicinity of Cape Mondego. Sedimentary accretion in this area, culminated on the bay confinement, forming the Aveiro lagoon (e.g. Lucci 1918; Girão 1922; Souto 1923; Amorim 1997, 75-77; Bastos 2015, 34-71). Such sediment supply increase resulted from the intense soil exploitation that occurred northern this coastal area. It is important to remind that the *Reconquest* process was taking place and the littoral area between the Minho and Douro rivers had an intense population concentration (Mattoso 1997, 199-207).

It is known that in the 10th century, the sandy spit was located northern of Ovar and gradually grew southwards. Historical data support this interpretation, once references to a seaport and salt pans in the region shows that the currently interior area once was bathing by the sea (e.g. Oliveira 1967, 60; Bastos 2015, 45-47). In the 12th century marine salt exploitation in several points of this littoral, shows that the sandbar had already moved southern. This natural product exploitation required saltpans protection from the direct impact of the oceanic currents and strong waves. This was possible because of the sandbar constitution which provided calmer conditions. At this point, the siltation of the previously mentioned gulf initiated, and islands began to form. Between the 13th and 15th centuries there was a smaller progression of the sandbank, nevertheless, in the following centuries it continued to gradually extend southwards confining the previous existing gulf in the 18th century (Bastos 2015, 53-71).