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Wellness of Coastal Communities – Psychological, Social, and Economic Impacts of Coastal Risks

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Wellness of Coastal Communities – Psychological, Social, and Economic Impacts of Coastal Risks

Authors:
Benjamin A. Mosley
Gabriela Gonçalves
Jorge Ramos
M. Alexandra Teodósio
Marisa Macuéria
Patrícia Nogueira
Rita B. Domingues
Saúl Neves de Jesus
Silvana Faria
Vânia Baptista

Guest-Editor: Rita B. Domingues

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Research Centre for Tourism, Sustainability and Well-being - CinTurs
Gambelas *Campus*, Faculty of Economics, Building 9
8005-139, Faro
cinturs@ualg.pt
www.cinturs.pt

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NEWS MEDIA COVERAGE AND PUBLIC REACTIONS TO A RED TIDE AT THE ALGARVE COAST (SOUTHERN PORTUGAL)

Rita B. Domingues[1]

ABSTRACT

In June 2019, a red tide caused by the dinoflagellate *Lingulodinium polyedra*, whose toxins do not cause harm in humans, developed in the Algarve coast (southern Portugal). The occurrence of algal toxins and consequent interdiction of bivalve harvesting is common in this region, but harmful algal blooms that lead to water discolouration are rare. This study analyses the scientific accuracy of the information communicated by news media, and consequent public reactions, by analysing news pieces shared on Facebook by regional and national news media outlets, and comments to the news posted by individual users. Overall, news pieces had a sensationalized, negative tone, and many lacked scientific accuracy. For instance, some news referred that ingestion of contaminated water, fish, and shellfish leads to gastrointestinal problems, and the toxic substances that the algae produce may contaminate the air and cause respiratory difficulties – which is false in the case of a *L. polyedra* bloom. Many commenters showed an adverse reaction to the event, most likely influenced by the negative portrayal of the red tide by news media. Other Facebook users were quite knowledgeable about the red tide, due to their previous experience with these events. Individuals seemed to be aware of the lack of cooperation between authorities and scientists and expressed their mistrust in these stakeholders. As red tides may become a common feature in the Algarve coast, journalists, scientists, and authorities should strive to offer accurate and responsible information to the public.

Keywords: Red Tide, Dinoflagellate, Public Perceptions, Communication, Public Health.

JEL Classification: Q54, D83

1. INTRODUCTION

Harmful algal blooms (HABs) are natural events caused by microalgae that have negative impacts on ecosystem dynamics and human activities (Zingone & Enevoldsen, 2000). HABs have been expanding worldwide; consequently, their deleterious impacts on ecosystem functioning, public health, tourism and fisheries are becoming more pronounced (Anderson et al., 2012). Society's need for more information on HAB phenomena is more pressing than ever (McGillicuddy, 2010), but research on the socio-psychological aspects of HABs is still in its infancy. Understanding public perceptions and, in particular, risk perceptions towards HABs, is critical for a sustainable coastal management, as different risk perceptions can promote different motivations and behaviours from individuals and communities, from completely ignoring the risks, to actively avoiding, mitigating, and adapting to them (Roberts et al., 2016).

Risk perception is a complex process that involves, among others, gathering and interpreting information about the risk. It is mainly a subjective judgement driven by

[1] Centre for Marine and Environmental Research (CIMA), Universidade do Algarve, Faro, Portugal (rbdomingues@ualg.pt)

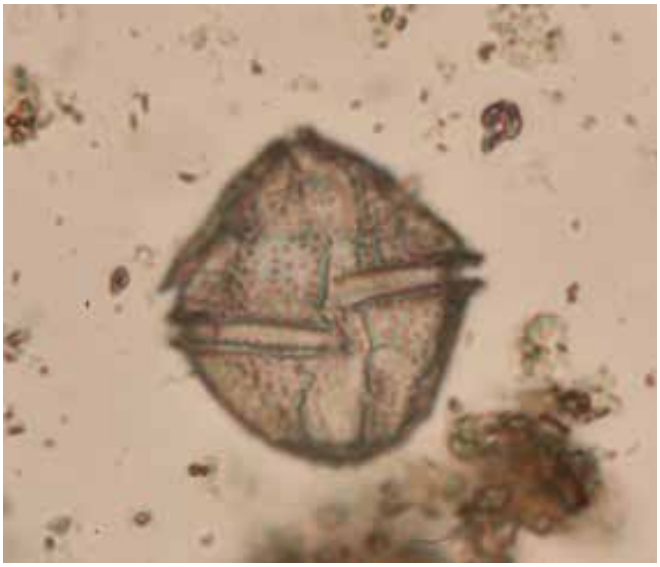
unconscious emotional processes made by an individual regarding the characteristics and severity of a risk (Slovic, 1987; Gifford, 2014), but risk perception is also influenced by the individual's cultural and social context. People's risk perception, knowledge and behaviour towards HABs may be incongruent with the actual risk, as observed for other coastal risks (Costas et al., 2015; Domingues et al., 2018), which can have extensive personal, social and economic impacts (Kuhar et al., 2009; Nierenberg et al., 2010). Indeed, a considerable lack of knowledge and misperceptions regarding HABs are the norm in coastal communities (Nierenberg et al., 2010). These misperceptions may be attributed to the negative media coverage of HAB events (Kuhar et al., 2009) and are further amplified by the socio-cultural context (Renn et al., 1992). News media in particular play a fundamental role in environmental risk communication and, thus, on the social construction of risk (Wakefield & Elliott, 2003).

Florida red tides are probably the best studied case of news media shaping the public's perception of red tides. Although red tides are common in Florida, residents and tourists are not very knowledgeable about them (Li et al., 2015), and they perceive the risks as more prevalent than they really are (Hoagland et al., 2020). A negative portrayal of red tides in the media clearly contributes to this social amplification of risk (Kuhar et al., 2009; Li et al., 2015), based on a lack of accurate information or a misunderstanding of red tides and their effects (Hoagland et al., 2020).

In the Algarve coast (southern Portugal), the occurrence of HABs is common and their prevalence in this region has increased over the years (Oliveira et al., 2015). In central Algarve, HABs usually develop in the coastal zone and are imported by tidal currents into the Ria Formosa coastal lagoon, a shallow multi-inlet barrier island system, leading to the interdiction of bivalve harvesting. Interdictions are frequent in the Ria and adjacent coastal zone, and may extend for long periods; for instance, in 2019, harvesting of the wedge clam *Donax trunculus* in the coastal zone was prohibited for more than five consecutive months (IPMA, 2019). Given that 88% of bivalve production in Portugal comes from the Ria Formosa (INE, 2019) and supports 7,000 families (Newton et al., 2014), HABs in this system are a major concern. However, the public is mostly unaware of their occurrence, as HABs in the Algarve coast rarely cause the water discoloration known as red tide. The public is even oblivious regarding the prohibition of bivalve harvesting, given that alerts are not publicized through news media, to avoid potential negative effects on bivalve commerce (Vale et al., 2008). Thus, tourists and locals keep collecting bivalves in beaches along the Portuguese coast, and, consequently, cases of human poisoning by phycotoxins still occur (Vale et al., 2008).

In June 2019, the dinoflagellate *Lingulodinium polyedra* (Figure 1) bloomed in central Algarve and caused an extensive red tide (Figure 2), leading to beach and bivalve fishing closure, and making headlines for a few days. In other coastal regions where red tides are common occurrences, the coverage of red tides has been inadequate, from alarmist stories to scientific inaccuracies (Kusek et al., 1999). Drawing on past research on red tide coverage and the inexistence of information on red tide perception in Portugal, the goal of this study is two-fold: firstly, to analyse the scientific accuracy of the information published by news media regarding the 2019 *L. polyedra* red tide, and, secondly, to examine the public's reactions to that information. To accomplish these goals, we analysed the news referring to the red tide published by news media outlets and shared on Facebook, and the comments to those news pieces posted by individual users.

Figure 1. The Causative Organism, the Dinoflagellate *Lingulodinium Polyedra* (Pictured is an Empty Theca, Photographed at the Inverted Microscope, 400x Magnification)



Source: Own Elaboration

Figure 2. Water Discolouration due to the *Lingulodinium Polyedra* Bloom at a Beach in Central Algarve

Source: Photo by Professor Ester Serrão

2. METHODS

Data were obtained by searching Facebook posts published by news media outlets between June 16th and June 20th, 2019, covering the red tide in the Algarve. Facebook was the only source of *vox populi*, given that this is the most popular social media in Portugal (Reis et

al., 2016); as of 2017, Portugal had 56.4% of Facebook penetration, corresponding to 5.8 million Facebook users (Salgado & Bobba, 2019). In addition, news pieces can be easily shared and commented using this platform. Although social media cannot replace surveys to evaluate public opinion, social media as a form of public opinion should not be ignored, as it provides a distinct representation of the public (McGregor, 2019).

Several Portuguese news media were searched, namely regional and national newspapers (Barlavento, Postal do Algarve, Jornal do Algarve, Observador), and national TV channels (SIC Notícias, TVI, TVI24). For each media post, the content of the news story was analysed, to understand the information that was available to the public and the scientific accuracy of that information. Comments to the news stories posted by Facebook users were also analysed using a qualitative content analysis, to extract the public's reaction to the red tide event as portrayed in the news.

3. RESULTS

3.1 On the News

The content of news published between 16th and 20th June 2019 on Facebook allowed the establishment of a timeline of events, as reported by the news media to the public. For each day, the main content of the news is described, with quotations from selected pieces.

Sunday, June 16th 2019

The typical dark blue colour of the waters of several beaches in the Algarve coast turned into a red-brownish colour. Red flags were hoisted in the affected beaches. On Sunday evening, people realized that the coloured patch was also glowing in a bright blue. Photographs and videos of the phenomenon made their way to social media. Water samples were collected and researchers at the University of Algarve quickly identified the dinoflagellate *Lingulodinium polyedra* as the responsible for the water discoloration (TSF, 2019).

Monday, 17th June 2019 – "*Red tide leads to beach closure. Fishing is allowed, but fish consumption is dangerous*"

News media picked up the story, with images of the "*dangerous sea of algae*" (Observador, 2019a) and headlines such as "*Red tide leads to beach closure. Fishing is allowed, but fish consumption is dangerous*" (Observador, 2019d). Scientists explain which dinoflagellate is responsible for the red tide and that this species is not toxic, or, at least, there are no known cases of toxicity in humans caused by *Lingulodinium polyedra*. Efforts to explain the biology and ecology of dinoflagellates and red tides are made by journalists.

News pieces explain that "*dinoflagellates may produce substances that are toxic to humans. Direct contact with skin is not a problem for human health, but ingestion of water contaminated with this organism may lead to severe cases of gastroenteritis. Eating fish or shellfish from a contaminated sea also leads to intestinal problems. Besides, if the algae get close to the shore and the rocks, the toxic substances that they produce may contaminate the air e cause respiratory difficulties. In severe cases, they may cause problems in the nervous system*" (Observador, 2019d).

According to a health authority interviewed for a news piece, "*these dinoflagellates produce a paralytic toxin*" that "*affects the peripheral nervous system*", causing "*numbness sensations*" (NotíciasAoMinuto, 2019). The news piece continues, warning the reader that these "*effects can be observed after inhalation or ingestion, and this can happen when people swim in the water or even when fishing*". In another piece, the health authority refers that problems caused by the microalgae are "*enhanced by accumulation*" and not by the simple contact with the water;

however, "*people who bathe in the water in the last days should pay attention to numbness and tingling sensations*". The health authority warns that there is "*danger caused by ingestion, for instance, for someone who have eaten shellfish contaminated with this toxin for two or three days in a row*" (RegiãoSul, 2019).

Tuesday, 18th June 2019 – "*Red tide may hurt tourism in the Algarve*"

According to the authorities, the dinoflagellate species causing the red tide is not known yet, but water and bivalve samples have been collected and are under analysis to determine the species and its toxicity, and whether or not is necessary to interdict bivalve harvesting in the Ria Formosa days (Observador, 2019b). Another problem emerges on the news – the potential impacts of the red tide, the closed beaches and the interdiction of bivalve harvesting on economic activities, particularly tourism, with headlines reading, "*Red tide may hurt tourism in the Algarve*" (TVI24, 2019).

Some attempts are made to provide scientifically accurate explanations about the red tide. For instance, an article tried to explain the specificities of *Lingulodinium polyedra* by interviewing scientists, but still mentioned that this organism "*in theory, can kill a human*" and that "*eating contaminated shellfish is like taking a pill of toxins*" (Observador, 2019e).

Wednesday, 19th June 2019 – "*You can bathe in the beaches of Algarve*"

The red tide has now dissipated. The authorities lifted the bathing interdiction at the affected beaches, but they still advise against bathing. Bivalve harvesting is still prohibited.

Thursday, 20th June 2019 – "*Red tide leaves a trail of losses*"

The red tide is over. Restaurant owners complain about the economic losses they suffered due to the red tide. Many reservations were cancelled due to people's fear of contamination, even though the seafood being served at these restaurants was not harvested in the Ria Formosa (SIC, 2019). On a positive note, beaches are open again, just in time for the long weekend ahead, although the water temperature is very low (17ºC) (Observador, 2019c).

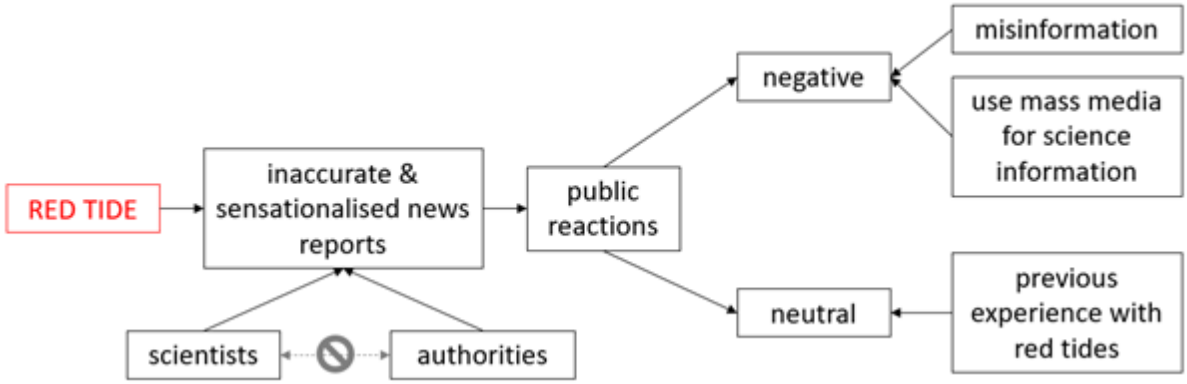
3.2 Public Reaction

The content analysis of people's comments to news published on Facebook that covered the red tide in the Algarve allowed the identification of three main themes: 1) public's awareness of risks associated with the red tide, 2) knowledge about causes and consequences of red tides, and 3) attribution of responsibility for the occurrence of the red tide (Figure 3). Selected quotations from the comments are presented to illustrate each theme.

For many commenters, the red tide is a common event that has no consequences to public health. They regard the red tide as "*a part of sea life, we have to respect it*" and "*it's not the first time, and unfortunately, it will not be the last*". Many individuals remember the occurrence of red tides from their youth, "*when I was a child, we had these red tides… we've always swam in the ocean, no problem*", and reiterate, "*there have always been these red tides, nothing that older people don't know*". Commenters refer that red tides are a common occurrence not only in the Algarve, but in other coastal waters in Portugal as well, "*it's normal for this to happen, I remember this happening many years ago at Costa da Caparica and Carcavelos* (in the Lisbon bay area)". In Africa, red tides also happen "*regularly, and fishing and beach life go on as usual*". Given that red tides are seen by these individuals as normal and recurrent, "*this happens for years*", some of them don't understand why "*this is news now*". Despite being a natural occurrence, "*people are always willing to create panic – it's the 'climategate' in action*".

In contrast, other commenters believe that the red tide is "*terrifying; authorities must take measures immediately, this is a danger for public health*". Yet, other commenters devalue the event and even make fun of worried people, "*Are you pussies? Go to the water, cut the crap, enjoy*". Some people express concern for tourism, which is a main economic activity in the Algarve; they say the red tide is "*very bad for tourism*" and that it is "*better not to say that* (the red tide) *is dangerous for health, so that tourism doesn't suffer*".

Figure 3. Relationships between News Reports on the Red Tide and the Public's Reactions



Source: Own Elaboration

Some commenters expressed curiosity in learning more about the red tide, "*Is this normal? What causes this?*", but other individuals are clearly misinformed about the causes of the event: "*Water smells weird and some people say that the algae turn red because they're dead*", "*This is the result of pollutant discharges to the beach; then, it spreads to other beaches with the tides and wind*", or "*those algae come with the high water*". Many people attributed the blame for the red tide to climate change, saying that this is a "*consequence of global warming*" and "*ocean waters are getting warmer and dragging these phenomena to our coast*".

Finally, commenters expressed their mistrust in scientists and authorities, saying "*Sea of blood? Where have I heard this before? I know… scientists have an 'explanation' for everything*". People also demonstrated that they are aware of the lack of communication between scientists and authorities. A commenter asked, "*Why didn't the university and APA* (the governmental agency responsible for coastal management) *come to an agreement?*", given that University researchers promptly declared that the bloom was not dangerous, but the authorities closed the beaches and interdicted bivalve harvesting. One commenter further expressed their mistrust and disapproval of scientists, saying, "*Yesterday the red tide was not harmful, according to a 'researcher' from the University… clearly she was in need of funding and lied… normal in 'scientists' dependent on grants*". Other people blamed the authorities for the event, as "*they should monitor the coast, (the algae) didn't fall from the sky*".

4. DISCUSSION

This study aimed to analyse the information communicated by news media and subsequent public reactions regarding a red tide event that occurred in June 2019 in the Algarve coast, southern Portugal. Overall, some information published was not scientifically accurate and the news pieces had a negative tone. Many commenters were knowledgeable about the red tide and were aware that it is a common event with no serious consequences to public health, but others demonstrated lack of knowledge and an adverse reaction to the event, most likely influenced by the negative portrayal of the red tide by the news media. Some of

them attributed the responsibility for the red tide to the authorities and manifested their mistrust in scientists.

On the first day of the red tide, researchers promptly identified the dinoflagellate responsible for the event; *Lingulodinium polyedra* has been associated with water discolouration and bioluminescence events along the Atlantic coast of the Iberian Peninsula. In Portugal, the first *L. polyedra* red tide was observed in 1944 in the Peniche area (Pinto, 1949). Blooms of this dinoflagellate are common along the Portuguese coast, particularly in upwelling regions (Amorim et al., 2004). The lipophilic yessotoxins produced by *L. polyedra* have been detected in shellfish along the Portuguese coast, but levels are below regulatory limits (Vale et al., 2008). Oral toxicity of yessotoxins is low and there are no reported cases of human poisoning by yessotoxins (see review by Alfonso et al., 2016 and references therein).

Despite being a well-known event in Portuguese waters with distinct characteristics, the media coverage of the red tide suffered for inadequacies. The stories and headlines were alarmist, had a negative tone, and were not scientifically accurate. It is well known that negative news are more arousing and attention grabbing (Soroka & McAdams, 2015), thus increasing users' engagement with the post. Indeed, this was recognized by one commenter, that used the term "climategate" to refer to the panic that people create around the red tide. The major inaccuracy in the news was the fact that neither journalists nor authorities considered the specificities of the causative organism, the dinoflagellate *Lingulodinium polyedra*. Instead, news focused on dinoflagellates and red tides in general, and the potential serious effects that certain HABs can pose to the ecosystem and to human health. In Florida, local news about the red tide have also been focused on the negative consequences (Li et al., 2015), and the skewed media content acts as a risk amplifier, contributing to a higher risk perception in individuals that are highly exposed to the news (Cahyanto & Liu-Lastres, 2020).

Many commenters reacted negatively to the news and were worried about the red tide, demonstrating that they rely on mass media for science information. Indeed, news posted on social media have become the main source of science news for the general public (Brossard, 2013), but they may also be a source of scientific misinformation (Liang et al., 2014), hampering public's trust in science due to lack of quality control (Weingart & Guenther, 2016). Other commenters were quite knowledgeable about red tides and were aware that HABs are a common occurrence in coastal waters. This accurate knowledge probably stems from their personal experience, as many individuals referred that they have seen red tides since their childhood. Greater awareness of red tides was also associated with life experience in fishermen that have lived for more than 30 years on the coast of Ecuador, where red tides are common (Borbor-Córdova et al., 2018). In Florida, residents have more knowledge about red tides than out-of-state visitors, due to their direct experience with the phenomenon and the extensive local news coverage (Cahyanto & Liu-Lastres, 2020). Past experience with coastal hazards is indeed the most effective source of knowledge and a main driver of risk perception across a variety of coastal hazards (Pagneux et al., 2011; Kung & Chen, 2012; Domingues et al., 2018).

Some commenters expressed their concern with the impacts of the red tide on tourism, given that tourism is a main economic activity in the Algarve, oriented to the specific market of "sun and beach" (Andraz et al., 2015). Thus, closed beaches and interdictions of bivalve harvesting may drive tourists away, although seafood served at local restaurants during the red tide was not harvested in the affected areas. Still, restaurant owners complained about economic losses due to the fear of contamination by consumers. Indeed, red tides, particularly long-lasting events such as *Karenia brevis* red tides in Florida, may have profound effects on tourism and coastal businesses reliant on tourism (Bechard, 2020). Bivalve fishermen are probably the most affected by harvesting interdictions; due to the 5-month harvesting

interdiction of the wedge clam *Donax trunculus* in 2019 in the coast of Algarve, due to the presence of diarrheic toxins (IPMA, 2019), hundreds of fishermen lost their income (SulInformação, 2019).

It was clear from some news pieces that communication between scientists and authorities barely exists. The most appalling example is the fact that scientists identified the dinoflagellate species responsible for the red tide on the first day, whereas authorities claimed, two days after the onset, that samples were still under analysis, the species was not yet identified, and results would be known within a few days. Health authorities also painted a dramatic picture of the potential dangers of the red tide, warning that people who swam in the water in the last days should pay attention to numbness and tingling sensations. Given the lack of an official "culprit" species, authorities and journalists referred to the general dangers of toxic dinoflagellate blooms – instilling fear in less informed public.

Some individuals that commented on the news pieces were aware and critical about the lack of cooperation between scientists and authorities. Other commenters expressed their mistrust in scientists. These reactions are driven by gaps in communication that persist in many contexts and for different types of hazards, eventually leading to mistrust between the public, scientists, and authorities. Indeed, the chain of transmission, understanding, and integration of information is often not effective (Andre et al., 2020). Scientists are in a privileged position to communicate the most accurate information about red tides, but the typical format of peer-reviewed publications is more difficult for the public to access and understand (Hoagland, 2014). Also, scientists may not recognise which information is the most relevant for decision-makers (von Winterfeldt, 2013). Therefore, it is important for scientists to foster collaborative and participatory relationships with the other actors (Marín et al., 2020), given that public's mistrust in risk situations may have adverse impacts not only on risk perception and preparedness, but also on individuals' mental health. One such example are the long-term negative effects on mental health associated with public's mistrust in authorities following the 2011 Fukushima nuclear power plant accident (Fukasawa et al., 2020). News media also played a significant role in people's risk perception and anxiety levels (Guo et al., 2020), and the use of internet sites as source of information was associated with increased anxiety (Nakayama et al., 2019). More recently, and in the context of COVID-19 pandemic, it was observed that mass media contributed to an increase in anxiety and other negative emotions in TV viewers (Basch et al., 2020).

As red tides may, and probably will, happen again in the Algarve coast, journalists, scientists, and authorities should join efforts and strive to offer scientifically accurate and responsible information to the public. Drawing from decades of inaccurate red tide coverage in Florida, Kusek et al. (1999) make several recommendations that should be considered by media professionals for improving coverage of red tide events, of which we highlight:

1. Provide as much explanation as possible. Kusek et al. (1999) advise that it is better to assume that the readers do not know much about red tides; therefore, thorough information should be given in news pieces. For instance, instead of focusing the pieces on dinoflagellates in general, the specificities of the causative organism, *Lingulodinium polyedra*, should have been taken into consideration.
2. Write accurate, non-alarmist headlines, as well as accurate and specific captions to accompany photographs. Headlines such as "*Images of the dangerous sea of algae that covers the Algarve*" (Observador, 2019a) are alarmist and untrue.
3. Avoid being alarmist. Even in the articles that provided scientifically accurate information to the readers, alarmist sentences were still present (*e.g.*, "*in theory,* (the dinoflagellate) *can kill a human*").
4. Make sure the science is correct and ensure that the sources are credible, and not alarmist. This can only be achieved by getting the facts right through expert knowledge.

Scientists that study this type of phenomenon should be the preferred source of scientifically sound information.

5. CONCLUSION

This study provided a first insight into the way red tide events are communicated by news media to the public and the consequent public perceptions of red tides in Portugal. News pieces covering the June 2019 red tide in central Algarve used a sensationalised, negative tone, and many pieces were not scientifically accurate. Social media users commented on the news about the red tide, showing an adverse reaction, most likely influenced by the negative portrayal of the red tide in the news. Other commenters were quite knowledgeable about the red tide, due to their previous experience with these events. The public also showed awareness regarding the lack of cooperation between authorities and scientists and expressed their mistrust in these stakeholders.

Although this study provides a first account into red tide perception in Portugal, some limitations apply, the most significant of which is the sole use of Facebook as *vox populi*. Other social media channels, mainly Twitter, should be included in future analyses. In addition, other media outlets should also be explored.

As harmful algal blooms are becoming a common feature in the Algarve coast, journalists, scientists, and authorities should strive to offer accurate and responsible information to the public. Information provided to the public should be the most accurate as possible, headlines should not be alarmist, and sources should be reliable. In an age of misinformation, it may be a challenge to distinguish between facts and fiction, but all stakeholders should embrace future red tide events as opportunities to educate people about harmful algal blooms, their causes and consequences and, thus, contribute not only to ocean literacy, but also to the protection of marine ecosystems.

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ONLINE PERCEPTION OF ARTIFICIAL REEF RISK AND SAFETY BY STAKEHOLDERS (INCLUDING RESIDENTS AND TOURISTS) VIA THE ANALYTIC HIERARCHY PROCESS

Jorge Ramos[1]

ABSTRACT

Artificial reefs (AR) may be ignored by many people, probably because they are usually unseen structures. Even so, there are users that believe in the value of these structures even without observing them, as is the case of most fishermen and anglers. Divers usually believe in AR and are the ones effectively able to notice them. Based on the previous simple premises, the aim of this paper is to ascertain the perception coastal community people and tourists have on the risks and benefits derived from the presence of AR nearby. AR were deployed off the Algarve from 1990 to 2003. The methodological approach for sampling purposes used a search engine with key-terms following a simple 3-step protocol: identification, screening, and eligibility. The eligible documents were analysed using qualitative data analysis software. Most documents found were from AR promoters named as "institutional" and communication "media" reporting mostly AR by the supply side. Sources from companies named as "firms" and discussion "fora" were mostly on the demand side. The contents of the samples were assigned onto two different categories: risk and safety. These derived into the relevant criteria where alternatives were judged to achieve the goal stated in the analytic hierarchy process (AHP). AHP sensitivity analyses were carried out and the best choices were calculated.

Keywords: Coastal Community, Coastal Management, Multi-Criteria Analysis, Socioeconomics, Wellbeing.

JEL Classification: Q57

1. INTRODUCTION

Artificial reefs (AR) are placed on the seabed and are not visible to most people (Baine, 2001). Only a few people are aware of the existence of AR. These people are usually divers who, for reasons of tourism, leisure, or research, dive into the depths at which the AR are deployed, if these are not very deep, that is, up to a depth of approx. 30 meters (Stolk et al., 2005). For this reason, AR are known as structures perceived from the point of view of the Petrarch principle, that is, people believe in something that cannot be seen (Pitcher & Seaman, 2000).

The divers believe in the existence of the AR, because they dive in the deployment sites and can verify the real existence when seeing and touching the structures. However, fishermen generally do not dive, nor do they go to the bottom to see if the AR are there or not. But fishermen can be aware of AR even if they have not experienced these structures previously (Sreekanth et al., 2019). At first, fishermen can be incredulous or can have doubts about the

[1] Research Centre for Tourism, Sustainability and Well-being (CinTurs), Universidade do Algarve, Faro, Portugal (jhramos@ualg.pt; jormos@gmail.com)

efficiency of AR, if they have no experience with these structures. However, fishermen start to believe in the benefits derived from the existence of the AR, when they make comparisons regarding the catches of fish before and after the deployment. If they catch more fish after deployment of the AR, they believe in the structures as having a positive impact on their activities (Ramos et al., 2019).

All other people who are neither divers nor fishermen, only perceive the impacts of reef deployment if they have solid evidence about it, or if it is transmitted to them by users (Klain et al., 2018). However, there are exceptions; for instance, in AR placed near the coast, people may perceive the AR as providing some coastal protection due to the dissipation of wave energy (Mangi, 2013).

Although the Algarve is the region of Portugal with the highest number of reef structures in place, it is not very easy to gather data on their social impact, namely in terms of the perceptions of local populations. From direct observations there are no signs of change that can be immediately attributed to the AR. From the data collected in the media - whether in print or online - the signs of positive or negative changes perceived by people and which are directly attributable to reef deployment are generally not obvious (Ramos, 2007).

Most people who live in coastal locations where AR were deployed know of their existence, but do not use them. On the other hand, most tourists who visit these coastal locations with AR in their vicinity, generally use them only if there are firms providing services - either diving or sport fishing - in the areas where the AR were deployed (Jensen, 2002).

The aim of this study was to identify the risk and safety perceived by residents and tourists who have used or know about the presence of AR along the Algarve coast. For this purpose, a search engine was used to search non-scientific literature, using the terms "artificial reefs" and "Algarve". The selected texts were recorded on computer support. Subsequently, a software was used to make the qualitative analysis of the data. Finally, the perception of residents and tourists was ascertained using the hierarchical analytical process (AHP).

2. LITERATURE REVIEW

2.1 Risks Associated to AR

In the past, there have been some risks arising from reef deployment and some mistakes have already been made (Pears & Williams, 2005). The literature reports that the risks associated with reef deployment are essentially related to specific factors (Collins et al., 2002), including: the degradation of structures over time, either by natural phenomena or by human origin (Pickering et al., 1999); contamination risks when, for instance, sunken boats are used (they must be cleaned from oils and fuels before sinking) (Johnston et al., 2003); the stability of the structures themselves, i.e., if they are not well placed at the bottom (Barber et al., 2009); or in the usage of scrap tires, a use that proved disastrous in many of these situations, causing risks for some coastal areas (Becker et al., 2018). There is also the case of congestion externalities by fishermen, i.e., if the initial reef intention was fishing, leading to specific overfishing phenomena (Whitmarsh & Pickering, 2000). In the past, it was also thought that AR were a good solution for materials that were wasteful, namely civil construction, or even toxic material that could be incorporated into concrete structures (Stone, 1985).

However, it has been verified that the choice and use of suitable materials to make AR can generate promising results (Relini & Relini, 1989; Falace & Bressan, 2002). Certain structures on fossil fuel exploration platforms have also been used (Guerin et al., 2007). Structures of concrete blocks, or similar materials, vessels, other obsolete transports, or other types of vehicles have been used to make AR (Fowler & Booth, 2012). If properly

prepared after removing oils and fuels, they can be safe choices, either to be enjoyed (e.g., for diving), or because they do not pose risks to coastal populations (e.g., because they do not disintegrate or release toxic waste) (MacDonald et al., 1999). In addition, the materials and design used in AR can be risk mitigators, particularly in carbon sequestration (Callaway et al., 2017).

2.2 Safety from AR Deployment

In general, AR provide ecosystem services and they can be an asset for the improvement of habitats (Jacob et al., 2016). Thus, there are many benefits to reef deployment. In this sense, nearby coastal communities and tourists can take advantage of these services directly or indirectly (Ramos et al., 2021). Among the most important ecosystem services that AR can provide are improving fisheries (i.e., benefiting fishermen) (Methratta, 2020), providing shelter and food to colonizing organisms and habitats in the additional surfaces (Smith et al., 2017), conferring some protection to coastal areas (Jackson et al., 2007), promoting biodiversity (Tessier et al., 2015), and allowing recreational use (e.g., diving or sport fishing) (Stolk et al., 2007; Keller et al., 2017).

2.3 AR in the Algarve

The AR in the Algarve are infrastructures that were implemented between 1989 and 2003 (Santos & Monteiro, 2007). In 1989-1990, only two pilot reefs were deployed (Santos et al., 1995). Then, after positive scientific evidence on biological colonization and other ecological benefits, the reef program was carried out in a broader way (Monteiro & Santos, 2000). From 1998 to 2003, larger AR systems were implemented in other parts of the Algarve coast (Cacela, Tavira, extension of AR Faro-Ancão, Vilamoura, Oura and Alvor; see Methods).

2.4 Impacts derived from AR Deployment in the Algarve

From its completion in 2003, it was important to understand how AR were perceived by the different stakeholders, regarding the deployment of the structures (Ramos et al., 2011). A study carried out in 2002-2003 revealed that there were some negative impacts of AR perceived by several stakeholders (Ramos et al., 2007). It was noticed that there could be silting up of some reef modules due to bottom currents, and there could also be some AR modules entangled with fishing gears (Falcão et al., 2007). This was seen essentially in AR with less monitoring, as in the case of the AR in Cacela, through eyewitnesses' testimonies (pers. comm. Mike Beauchamp, 2008). Another potentially negative impact was the agglomeration of vessels, leading to a high fishing effort at certain times of the year, as was verified by another study in the AR in Oura and Vilamoura (Ramos & Santos, 2015).

In terms of security, it was found that most AR allow professional fishermen and even anglers be more certain about fishing spots, because in reef areas they are generally more likely to catch fish (Whitmarsh et al., 2008). Likewise, AR allow dive operators to diversify their locations to offer to customers (Ramos et al., 2006).

3. METHODS

3.1 Approach

For this study, we used a content analysis of documents found on the internet. This is a non-intrusive method and was used to carry out the data collection. The qualitative document analysis (QDA) was done with specific software tools (Altheide et al., 2008; Drisko, 2013).

The advantages of this methodology are: 1) to observe without being observed; 2) the data is immediately accessible/available on the internet for everyone; 3) reanalysis and replicates are easy to carry out; and 4) it is a low-cost method of obtaining information, which would otherwise have high costs, particularly if carried out with interviews or questionnaires through institutional arrangements for focus groups or group interviews.

The disadvantages of this methodology are: 1) the number of documents available is limited, and some of them are only partial, such as news pieces from newspapers; 2) the documents were written many times for purposes other than this study; 3) some distortions or other biases that may occur; and 4) the causal relationships are difficult to assess, such as whether there is any influence on the search for AR due to the influence of pre-disseminated information (Ramos et al., 2008).

3.2 Research Context

The purpose of AR can vary considerably and is highly dependent on geographical location. In the case of AR in the Algarve, with two different types of concrete modules, they had several objectives, namely, to provide fishing and protection for the smallest species that left the nursery areas of the Ria Formosa and Ria de Alvor (Santos & Monteiro, 1998). In the case of AR made with sunken ships, the objective was more related to the issue of recreative and diving tourism, and to allow biodiversity (Ramos et al., 2019). The deployment of AR implies some risks and security (i.e., benefits after maturation) that can be perceived by the stakeholders, whether they are the institutions that carry out the sinking of the structures, or their expected users, generally fishing and recreational activities (i.e., diving and angling), or in terms of education (MacDonald, 1994; Becker, 2018).

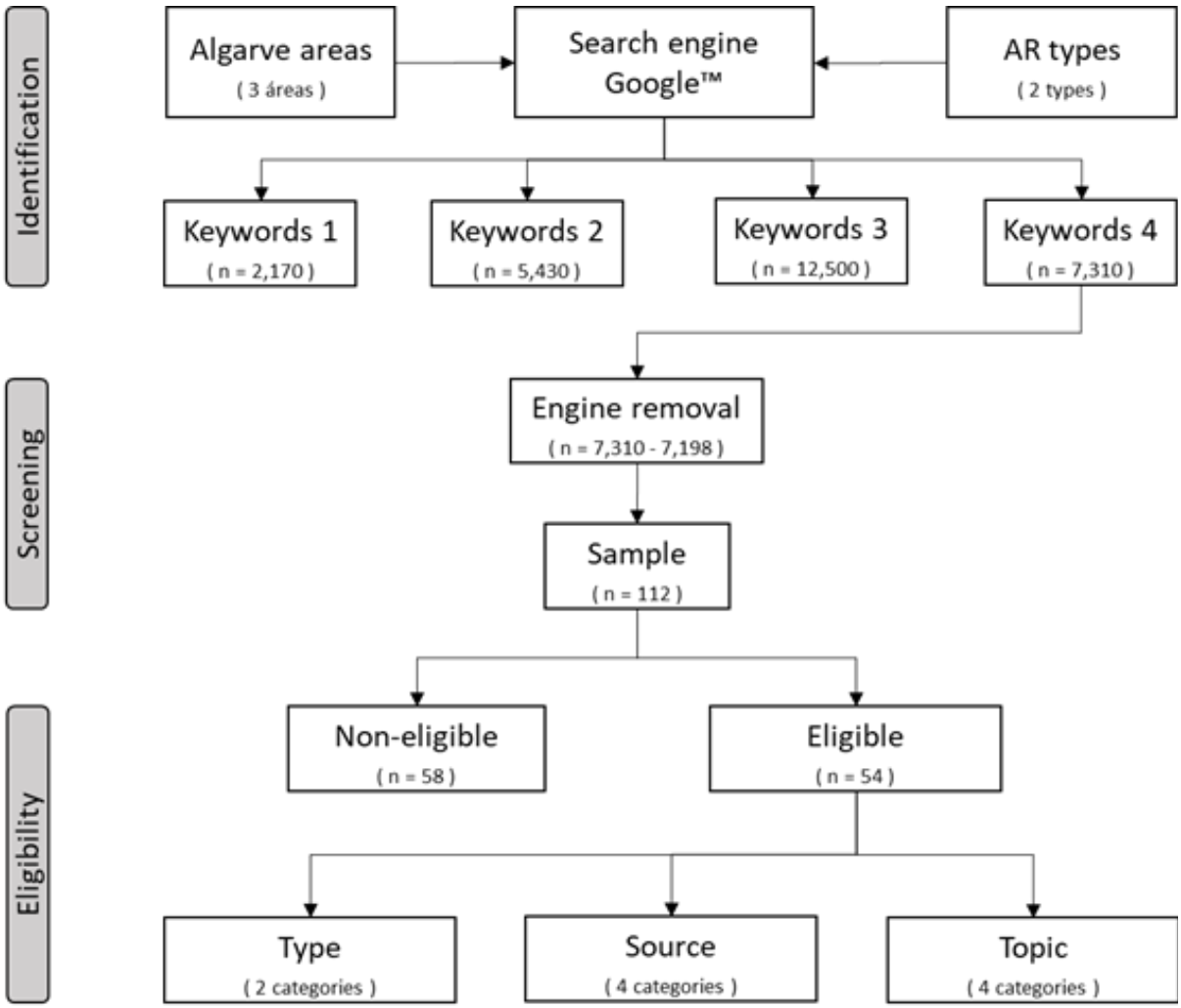
3.3 Research Questions

In the specific case of this study, it was intended to know what the perception of individuals from local communities and tourists is regarding the AR deployed off the coast. In this way, it was evaluated the social importance that the AR have had up to now, about risk and security. The main research questions were: “How have AR been perceived by stakeholders?” and “What is the relative importance attached to structures by the stakeholders, according to the different terms used in the discourse of the documents consulted?”. For this purpose, we searched documents on the internet that could be used as indicators of human use or non-use about AR deployed in the Algarve region.

3.4 Sampling Strategy

A 3-step protocol was used to search for relevant literature (Figure 1).

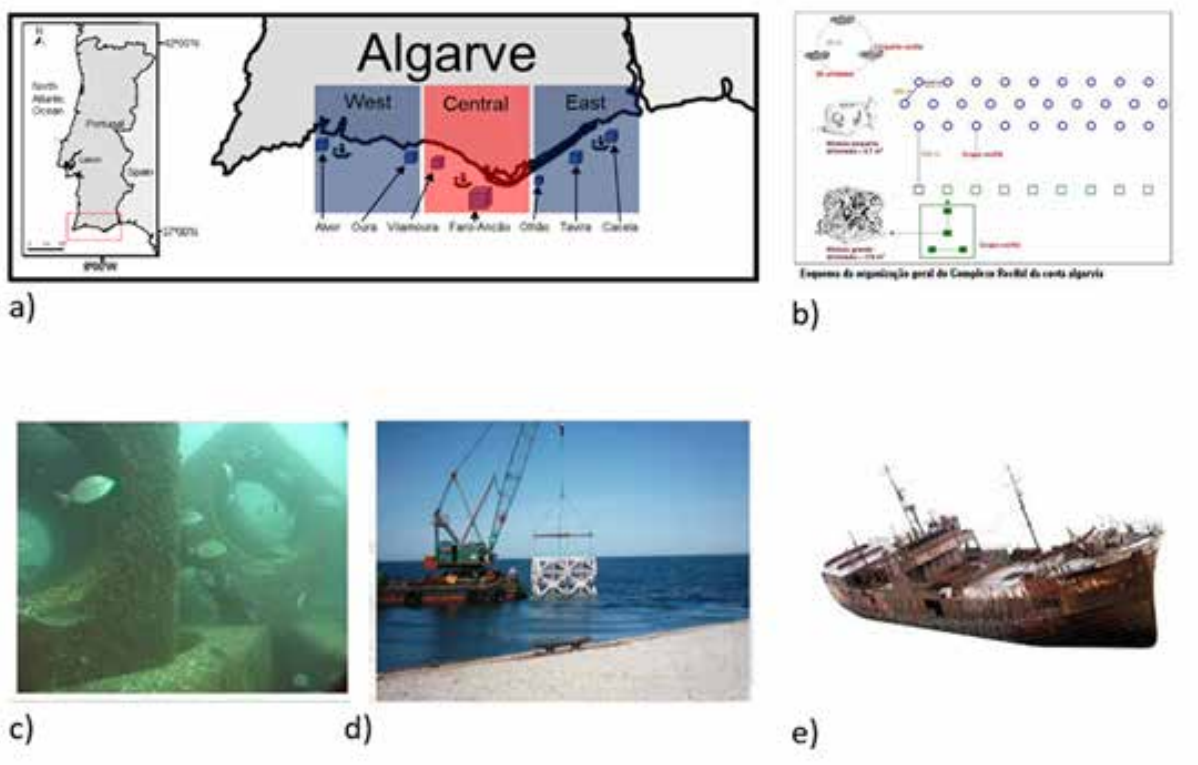
Figure 1. Literature Search with a Three-step Protocol



Source: Adapted from Lima et al. (2019)

Firstly, the "Algarve areas" refer to the places off the Algarve coast where AR were deployed. These AR were allocated into three geographic areas: West, Central and East (Figure 2a). Second, we considered two "AR types", although there are several types of AR (Thierry, 1988; Komyakova et al., 2019): the concrete AR with 2 different shapes deployed by the Portuguese Institute for Sea Research (then IPIMAR, now IPMA) in the period from 1990 to 2003 (Figure 2b, c, d); and sunken structures - essentially ex-vessels - sunk not only by the IPMA, but also by other entities. For example, in 2013, four ships were sunk off Portimão (Figure 2e).

Figure 2. a) Pictorial location of the AR deployed in the West, Central and East areas off the Algarve. The cubes represent the modular AR sites, and the silhouette ships represent the sunken vessels. b) Generalized layout of the reef arrangement with two types of modules. c) Cubic modules. d) Octagonal modules. e) Sunken ship.



Sources: a) Own Elaboration, b) and c) IPIMAR (now IPMA), d) Mota Engil website: www.mota-engil.com, and e) image for non-commercial use from website: www.clipart-library. com

Third, the Google™ search engine was used with four different keyword combinations. The most appropriate keywords were selected: "artificial reefs" and "Algarve". Then the work consisted of identifying all types of content derived from the chosen keywords. The contents found varied and included texts, figures, films, sounds, or in most cases a combination of several. However, they are all encoded as documents. From the total universe found, a sample provided by the search engine itself was selected (by default/omission of the others).

Afterwards, all contents were checked for eligibility. Eligible documents were analysed using qualitative document analysis (QDA) software. The documents were analysed according to the type of market, the source of information, and the topic. The documents were considered ineligible if: 1) the location of the AR was outside the Algarve, 2) the content was scientific, 3) there was repetition of content, 4) it was an advertisement unrelated to the AR.

3.5 Analysis with NVivo™

To carry out the qualitative data analysis, a recent version of the NVivo™ software (Release 1.0) was used. This software is used to analyse qualitative data, namely in the coding of text data, annotations, and to survey, record, and review coded data and documents (Bandara, 2006; Edhlund & McDougall, 2019). This program also allows to manage documents combining them numerically and categorically through the information that already exists. NVivo™ also allows, through a wide range of exploratory tools, to identify coding patterns

and relationships between assigned codes and other numerical and categorical properties (Bazeley & Jackson, 2013).

3.6 Recording Unit

In the context of this content analysis, the focus was on finding a set of text documents - namely with the frequency of occurrence of the relevant terms - in relation to the social dimension of AR in risk and safety contexts that these structures can be perceived by people, in particular residents and tourists. Basically, the registration unit consists of the number of times that concepts - the codes - appear and the selection of texts has been counted. By comparing the number of times and the distribution of concepts, some sensitivity is gained about the modes of discourse that different types of information sources give to the object under analysis, namely in this case study: the artificial reefs deployed off the Algarve coast.

The size of the text varied from sample to sample, as did the size of each recording unit. The validation of the registration consisted of, 1) part or all the selected sentences, and 2) complete paragraphs of the documents that corresponded to the different codes chosen a priori. To do this, it was necessary to examine the context where the registration unit was found, to match the corresponding code.

3.7 Categories for Analysis

One of the categories for analysis was to verify if the "AR market" that the document showed was on the supply or demand side. Another category had to do with the origin of the sources of information, where they were divided into four subcategories: institutional (i.e., the AR promoters), media (i.e., means of communication), firms (i.e., private companies), and discussion fora. In addition to the sources of information, it was also decided that each document could cover (or had a focus on) one of four topics, related to the objective for which AR were implemented: fishing, diving, education and/or museology, or another subject (and/or a combination of the above).

With this information in mind, the analytic hierarchic process technique was used to make a comparative categorical analysis, to understand in each source of information, i.e., institutional, media, firms, and fora, what was the intensity of each one these factors both in terms of risk and safety.

3.8 Analytic Hierarchic Process Analysis

Analytic hierarchic process (AHP) analysis is widely used in decision-making processes (Saaty, 2008). AHP is used with a wide variety of subjects, including those related to coastal zones (Teixeira et al., 2018; Sekovski et al., 2020) and AR (e.g., Tseng et al., 2001; Ramos et al., 2006).

Briefly, the AHP technique consists of a decision tree, where the goal is at the top, in the second row are the criteria and sub-criteria, and in the last row are the alternatives in the decision process (Leung et al., 1998). The analysis consists of an exhaustive process of pairwise comparisons made on a 9-point scale. For the purposes of decision, there must be consistency in the application of the method. Thus, the inconsistency rate must be low (less than 10%), and the eigenvalue must be close to the number of criteria in comparison (Alonso & Lamata, 2006).

In this study, we assume that the objective of the AR deployed off the Algarve coast was derived not only from the IPMA reef program (1989-2003) essentially using concrete modules, but also accidental sunken (barge off Cacela) or on purpose ex-vessels (trawler off Faro, and former navy ships off Portimão). The entities promoting the AR had in mind one objective aimed at people and another at species biodiversity. In other words, that

the concrete modules would be more focussed towards improving fisheries and the sunken ships directed to tourist and leisure diving; and both reef typologies to increase biodiversity (Santos & Monteiro, 2007).

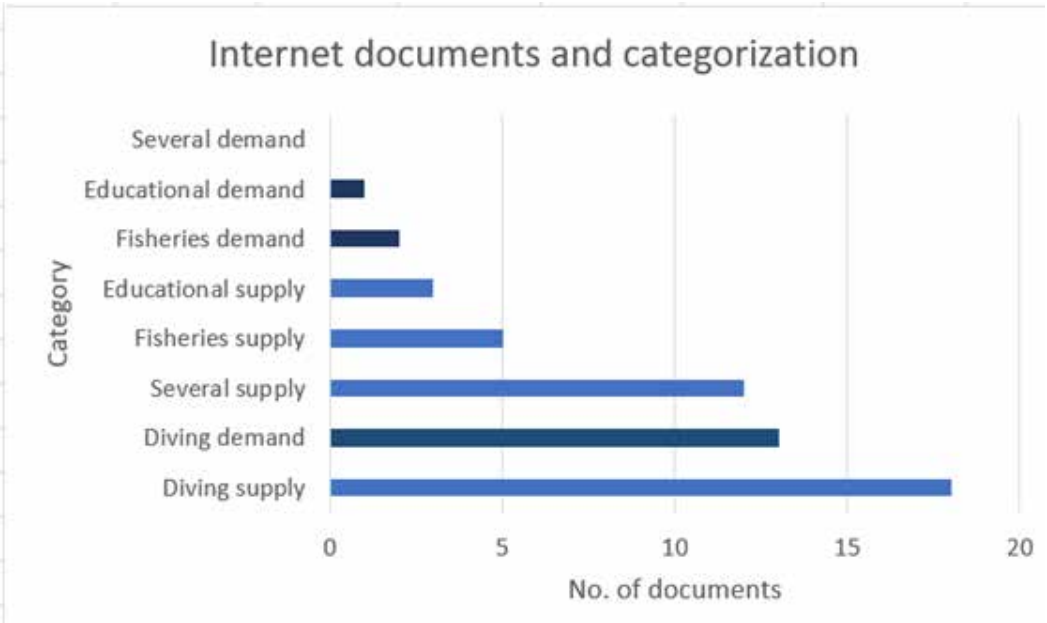
Bearing in mind the objective of the promoting entities, the AHP's goal for this study was to find out if the AR referred above, raised any risk issues (i.e., degradation of structures over time, contamination by materials or fuels not removed, instability in the positioning of structures, overfishing and loss of gear, and toxicity due to the reaction of materials). Likewise, it was aimed to find out if the AR deployed off the Algarve coast gave a perception of security (i.e., improvement in the capture of fisheries, shelter and food for marine species, protection of the coastline, increased biodiversity, additional opportunities in recreational and leisure activities).

4. RESULTS

In March and April 2021, the search engine Google™ was used with the keywords "artificial reefs" and "Algarve" and 7,310 documents were found. From this universe, a sample of 112 internet sites was selected, herein generically identified as documents regardless of their content (i.e., text, photos, illustrations, films, or several combined). From the sample, only 54 documents were considered eligible for this study.

In all 4 topics covered (i.e., fishing, diving, educational, varied), supply has always supplanted demand (Figure 3). Noteworthy are the contents related to diving, which formed the overwhelming majority (18 supply, 13 demand), being more related to AR such as sunken ships. On the supply side of AR for various purposes (12 documents), demand was not matched (zero documents). Fishing had a small number of contents in demand, mainly in the "fora" and on the part of sport fishing. At the educational level, the contents were related to museology associated with the history of former ships and their use as AR.

Figure 3. Supply and Demand (Market) for AR Sunk in the Algarve

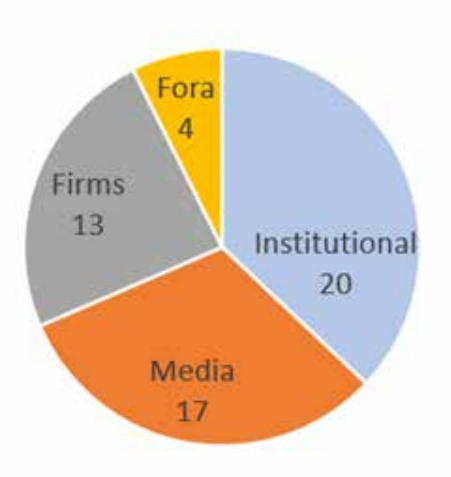


Source: Own Elaboration

Of the 54 documents eligible for the study, it was verified by content analysis that most of them were located mainly on the supply side (38 documents). It was also found

that of the 20 documents classified as coming from "institutional" sources (e.g., central government, tourism region, city councils) all were on the supply side. In the case of the 17 "media" documents (newspapers, magazines, TV), although mostly focused on supply, there was a small portion related to demand (Figure 4). On the demand side, the documents came essentially from "firms". The "fora" chatting about the AR essentially covered matters related to fishing and diving.

Figure 4. Information Sources Related to AR Content in the Algarve



Source: Own Elaboration

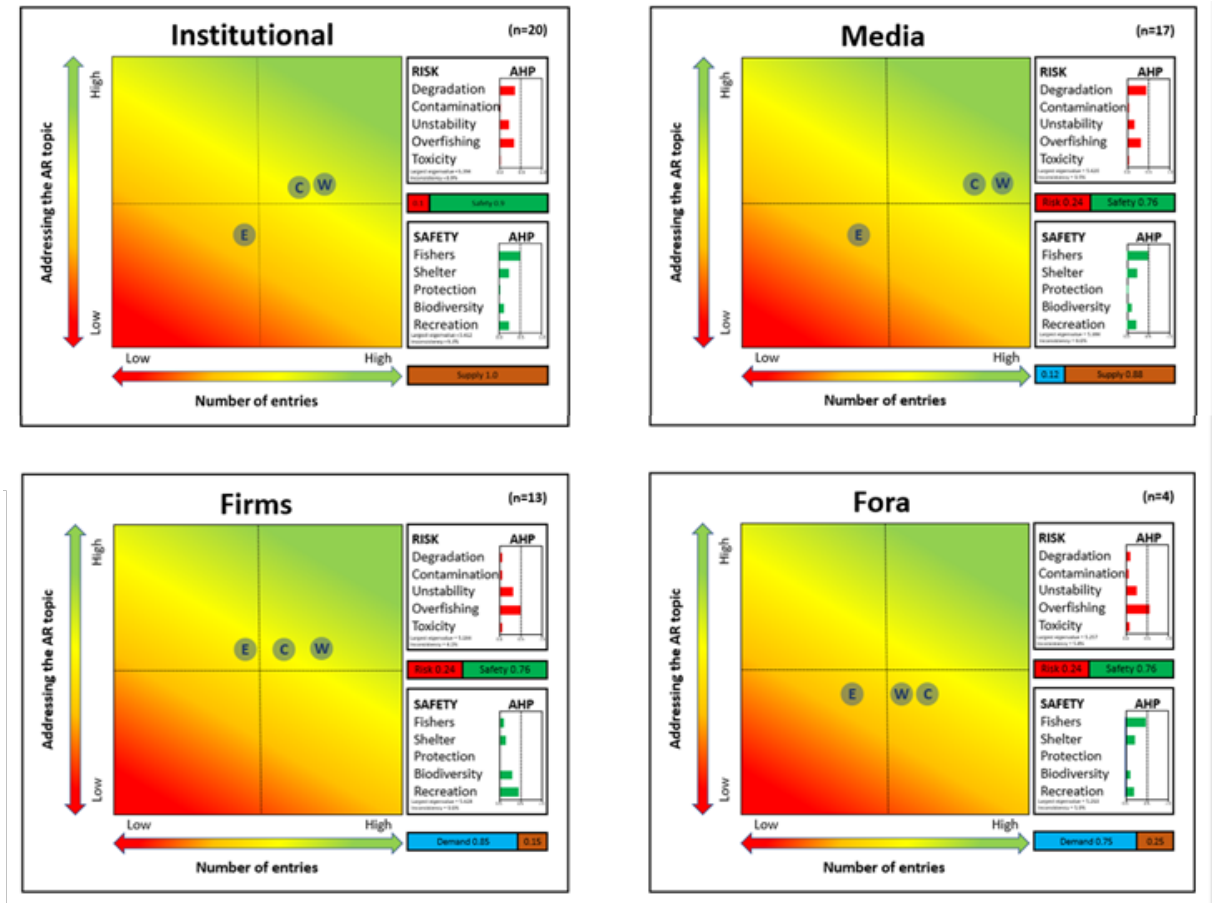
In the documentary analysis it was found that the sources of "institutional" and "media" information are those that were published in greater number (Figure 5). They have a very similar relationship in terms of the safety criteria found in the text and differ slightly more in terms of risks, as can be seen from the results of the AHP analysis. The documents from the "institutional" and "media" sources are essentially part of the supply. In the geography of the Algarve, more documents were found referring to AR in the West (most of them relatively recent and referring to former Ocean Revival ships), followed by the Central area (most of them over 10 years old and referring to the IPMA concrete modules reef program), and in a much smaller quantity to the East. In the adequacy of the topic there was a better coverage also in the part of the first two sources of the geographical areas West and Central Algarve.

The documents whose topics were related to diving, were essentially from the source "firms", originating mostly from diving companies and were generally better represented in the West of the Algarve, followed by the Central zone. In terms of coverage of the topics, they were all very similar, i.e., there were no relevant differences, and they may even be derived from research from "institutional" or "media" sources, which were then only replicated on the website of these firms. This was evident in the AHP analysis, where firms prefer to value their own activity and prefer to have a lot of biodiversity to attract customers.

In the case of "fora" there was also a lot of similarity in risk criteria compared to those of "firms". In the analysis with AHP, the criteria related to safety stand out more than those related to fishing, denoting that there were many spearfishing divers or even sport fishermen. It should be noted that for the AHP analysis the literature highlights that there are two indicators that are used for decision analysis. For example, for 5 criteria/alternatives as in this study, it is important to have an eigenvalue of less than 6 (Costa & Vansnick, 2008). The inconsistency index - regardless of the number of criteria - must be less than 10% (Kułakowski, 2015).

The sensitivity analysis using AHP showed us that the hypothetical risks derived from the implementation of AR constrains the provision of reef services (Figure 6). The best choice derived from the security provided by the AR deployed in the Algarve is most often the alternative "shelter and food" (13 out of 15) and rarely the "improvement of fisheries" (2 out of 15). All other ecosystem services do not develop. This was expected for coastal protection since most of the AR structures off the Algarve were not deployed with this function in mind.

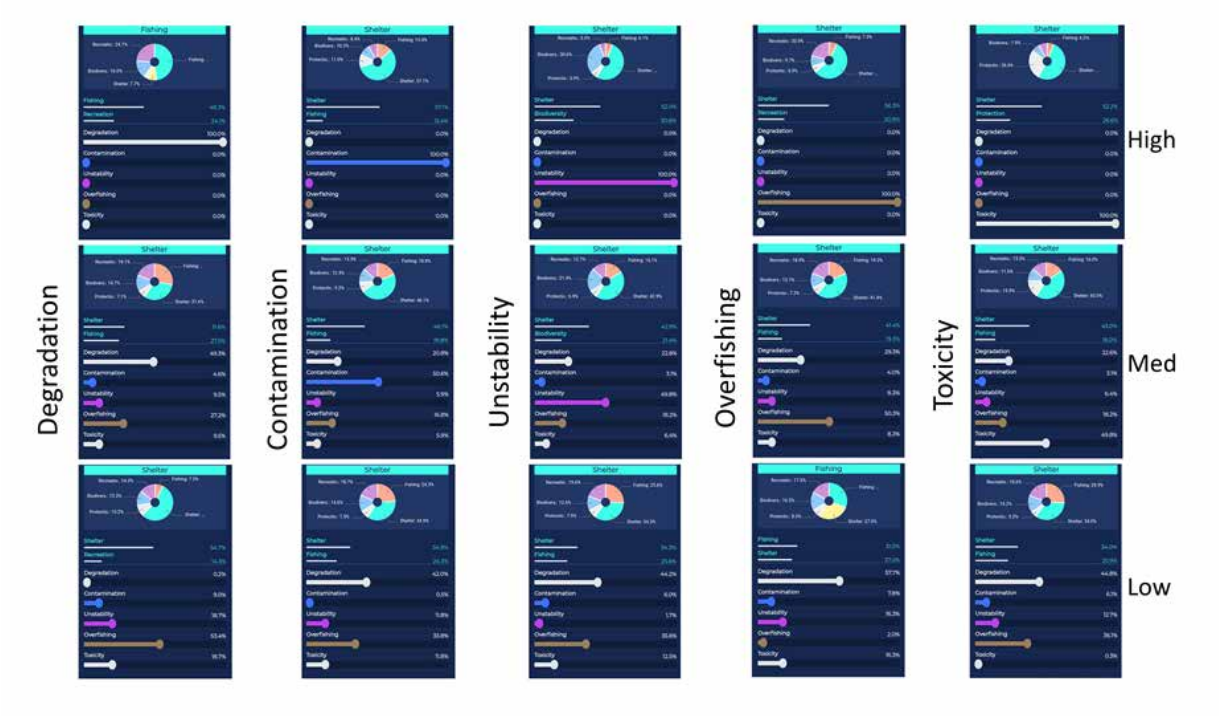
Figure 5. Documentary analysis of the sample selected on Google™ regarding AR deployed in the Algarve



Note: the perceptions were analysed qualitatively with the aid of the NVivo™ software and the prioritization made through an application using the AHP. With NVivo™: The contents were essentially textual or combined with an image; the sources of information were allocated into four groups "Institutional", "Media", Firms "and" Fora"; established the proportion of the market for each type of source (supply and demand). With AHP: Priority was given, according to each source, for both the risk and safety criteria arising from the implementation of AR in the Algarve; the proportion of safety-risk was that obtained by analysing the literature. W, C and E refer to geographical locations (Algarve: West, Central or East) and were relative to each other both in the number of documents found (xx axis) and in the addressing to the topic RA (yy axis).

Source: Own Elaboration

Figure 6. Sensitivity Analysis Carried Out in the Decision Mentor Application Version 5.1.0 (Multi-Criteria Decision Making - MCDM - Based on an AHP Algorithm) (DM, no date)



Source: Own Elaboration

5. DISCUSSION

This study consisted in the identification of online documents related to AR in the Algarve and the perception by stakeholders about the risk and safety derived from the structures. The range of stakeholders identified was not very extensive, but it was possible to perceive AR in terms of supply and demand, depending on the different types of eligible documents analysed.

The AHP allowed to verify that there was some dependence on the activities in relation to the primary objective of the AR. In other words, the institutions that gave prevalence with an objective more directed to fishermen, gave more value to the improvement of fisheries; while the entities that have sunk, for example ships, will give more value to diving activities and eventually environmental education.

The perceptions of risk or security inherent in AR depend on many factors. For example, with the AR there is greater vulnerability or, on the contrary, greater protection, for example, in the event of storms. Kaiser & Kasprzak (2008) describe the case where oil and gas structures destroyed by hurricanes were transformed into AR.

In the case of positive perceptions, it is important to understand if the existence of AR contributes to the development of more profitable economic activities. The perceptions of greater security derived from AR should be interpreted as the benefits inherent in the maturation of the structures. For example, there are undeniable benefits if, after the AR be mature, professional fishing can provide more/better fish, or if the dive operators increase the offer of places to visit for tourism or leisure purposes (Milon et al., 2000). At the security level, AR are associated with ecosystem services. Here it is important to know that AR allows the development of services for direct extractive use, such as in the case of fishing (e.g., catching fish or invertebrates) (de Oliveira Leis et al., 2019), for direct non-extractive use as in the case diving (e.g., visit of habitats with living resources) (Oliveira et al., 2015), of

indirect use (e.g., as in the case of coastal protection, through the attenuation and diversion of the impact force of the waves) (Ghiasian et al., 2021), or use or non-use options (e.g., preservation of biodiversity for future generations).

The "institutions" in a generalized way make known the AR projects or programs. In essence, the documents found reported since the late 1980s, referring to the first AR modules. In this source, the most recent documents reported essentially former military ships that, because they are obsolete, were sunk with the purpose of providing environmental services, namely by promoting biodiversity and allowing recreational diving in an essentially tourist aspect. The topics covered were always diverse (fishing, diving, educational and combined), with a little less predominance in the Eastern part of the Algarve, but always on the supply side.

In their turn, the "media" generally report what the "institutions" say through press releases in an informative way. Coverage was mostly given to the Western and Central parts of the Algarve. The "firms" found in this study were generally resident and essentially linked to diving. Hence, diving as the main activity prevails. Other issues such as biodiversity were very important, as they allow more diving activities to be developed for their clientele (residents, national and foreign tourists). The risks that "firms" posed the most were in the issue of "overfishing", often related to lost fishing gear that, if not cleaned, can damage AR biodiversity. Hence, divers were also predisposed to clean up the AR, namely remove fishing gear. There was a greater reciprocity of the "firms" essentially on the demand side. The "fora" in turn reflect a little on both sides, both residents and tourists. It should also be noted that scuba - associated with tourism and leisure - was the diving most related to spearfishing. The "fora" were also related to recreational fishing vessels that eventually went to the AR areas with the concrete blocks. In the information sources consulted, risks arising from AR in the Algarve were rarely identified. The risks were associated only with the five criteria analysed with the AHP.

6. CONCLUSION

It was possible to find online documents regarding the AR deployed off the Algarve using an internet search engine. Most of these documents referred to the supply side. Most of the documents found came from "institutional" and "media" sources (i.e., derived from press releases). On the demand side, the existing information was related to Portuguese-speaking residents and tourists, namely in documents whose sources were "firms" or "fora".

The methodology used allowed to systematize the study. The use of the NVivo™ software has made it possible to take a more comprehensive approach. The use of the AHP methodology made it possible to list the risks and safety arising from the reef deployment perceived by stakeholders. The sensitivity analysis showed that in the presence of possible risks derived from AR deployment, practically only "shelter and food" for the species that live there allow a positive impact.

From this study it can be corroborated that AR are structures that remain inaccessible to most people (whether residents or tourists). Their social perception is often only based on institutional dissemination or the media.

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RISK AWARENESS AND QUALITY OF LIFE OF A COASTAL COMMUNITY EXPOSED TO ENVIRONMENTAL HAZARDS (LUANDA, ANGOLA)

Patrícia Nogueira[1]
Silvana Faria[2]
Benjamin A. Mosley[3]
Rita B. Domingues[4]

ABSTRACT

Luanda Bay and Mussulo Lagoon, situated in Luanda (Angola), are two coastal ecosystems highly sensitive to environmental issues, such as climate change, water pollution, eutrophication, and harmful algal blooms. These environmental problems can severely affect the quality of life of coastal populations. In this study, we aim to evaluate several psychological variables, such as environmental risk perception and awareness, sense of place, environmental attitudes, and the overall quality of life of the coastal community in these areas, using a comprehensive questionnaire applied to residents and other ecosystem users. Results indicate that most respondents considered that they possess high knowledge about climate change, water pollution, and ingestion of contaminated seafood. However, regarding eutrophication and harmful algal blooms, most participants reported a low/moderate knowledge. Life experience and the media were reported as the most relevant sources of information on environmental problems. Respondents indicated a moderate risk perception towards environmental risks, and a moderate/high emotional attachment to the place. Residents' perceived quality of life was moderate/good in terms of physical and psychological health, and social relationships, but the environmental component was perceived as weak. Results suggest that improvements in the natural environment are needed to increase the quality of life in these ecosystems.

Keywords: Quality of Life, Risk Perception, Risk Awareness, Environmental Risks, Sense of Place, Coastal Community.

JEL Classification: Q54

1. INTRODUCTION

Extensive anthropogenic pressures make coastal ecosystems extremely vulnerable to several environmental problems (Agardy et al., 2005; Lloret et al., 2008). Climate change (Bindoff et al., 2019), water pollution, namely by plastics (Derraik, 2002), eutrophication (Lemley & Adams, 2019), and harmful algal blooms (Glibert & Burkholder, 2018), are some of the most pressing environmental issues in coastal areas. Regardless of the numerous environmental problems, coastal regions remain highly desirable areas for the human population to live and work. However, the environmental surroundings can influence the quality of life of the

[1] CIMA - Centre for Marine and Environmental Research, FCT, Universidade do Algarve, Faro, Portugal (pfnogueira@ualg.pt)
[2] Instituto Nacional de Investigação Pesqueira Marinha (INIPM), Luanda, Angola (silfaria_@hotmail.com)
[3] CIMA - Centre for Marine and Environmental Research, FCT, Universidade do Algarve, Faro, Portugal (bamosley@ualg.pt)
[4] CIMA - Centre for Marine and Environmental Research, FCT, Universidade do Algarve, Faro, Portugal (rbdomingues@ualg.pt)

local population (Perlaviciute & Steg, 2019). Quality of life is defined by the World Health Organization as: *"an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns."* (WHOQOL Group, 1998). Due to the vulnerability of coastal areas to environmental issues it is important to determine the influence these may have on the health and quality of life of coastal populations.

Luanda Bay and Mussulo Lagoon (Figure 1), situated in Luanda (Angola), are two coastal ecosystems particularly sensitive to environmental problems. Luanda is the capital and largest city of Angola, with a total population of over 2.7 million people. The coastal zone of the city has been subject to decades of untreated waste (Leitão et al., 2016; Dinis et al., 2020), both industrial and domestic, discharged from the local municipalities, which has caused an excess of nutrients and various solid waste, including plastics. Harmful fishing activities and vessel presence further threaten the health of the ecosystem and the services it provides. These coastal areas are fundamental to the population, since it is an important economic area, providing the locals several ecosystem services that include food supply via local fisheries, wastewater purification, and nutrient cycling. Mussulo Lagoon also supports mangrove and seagrass growth, and provides shelter to several islands, including an area (Pássaros islet) that was recommended by the first Conference of the Parties to the Convention on Biological Diversity to be classified as an Integral Nature Reserve (Neto, 2020). Due to the biological importance of these ecosystems, they are also relevant from an academic point of view and, as such, are subjected to rigorous scientific research. Luanda Bay and Mussulo Lagoon also provide the population with a large range of cultural services, such as cultural and historical heritage, as well as group identity, connecting locals to their environment. These two areas of Luanda's coastline are also used by tourists and locals for recreational activities. In fact, the recent increase in tourism, coupled with urban expansion, is having a detrimental impact on the mangroves, facilitating an increase in pollution and threatening biodiversity and the health of the ecosystem, which could in turn alter the quality of life of the local community.

Given that the communities in these two coastal locations are exposed to several environmental threats, it is crucial to determine what their level of risk awareness is. Risk awareness refers to possessing information and knowledge about the issue and the subsequent risk (Gifford, 2014; Luís et al., 2016) and it is often considered to be related to risk perception. However, this connection is not always straightforward, since awareness does not always translate into concern about the issue or leads to behavioural changes (Domingues et al., 2018). Risk perception is an emotion-based psychological construct, related to a person's feelings, and an intuitive and subjective judgement people make about a risk (Sjöberg, 2000; Gifford, 2014; Domingues et al., 2021).

The large diversity of ecosystem services provided by these two important areas of Luanda could influence other psychological constructs such as individuals' sense of place, i.e., the emotional attachment between a person and a place (Jorgensen & Stedman, 2001; Domingues et al., 2021), which could in turn influence risk perception (Domingues et al., 2017). There is a severe lack of information regarding all these variables in these locations of Luanda's coast. A better understanding of these variables could provide valuable information for local management to better understand public concerns, and to promote pro-environmental attitudes and behaviours.

In this study, we aim to evaluate several psychological variables, namely environmental risk perception, risk awareness, sense of place, environmental attitudes, and the quality of life of the communities from these two vulnerable coastal ecosystems in Luanda, using a comprehensive questionnaire applied to residents and other ecosystem users.

Figure 1. Location of Luanda Bay and Mussulo Lagoon (Luanda, Angola)

Source: QGIS. 2021

2. METHODS

2.1 Instruments

A self-report questionnaire was developed and distributed to residents of Luanda Bay and Mussulo Lagoon. The questionnaire included sociodemographic data and specific instruments to measure the following variables: sense of place, risk perception and related constructs, environmental attitudes, and quality of life.

Sense of place, defined as an overarching construct that includes four sub-dimensions (*place*, *people*, *time*, *self*) related to the emotional attachment between an individual and a specific place, was measured using a short version of the Sense of Place Scale (SoPS) (Domingues et al., 2021). The questionnaire is composed of 32 Likert-type items, responded on a 5-point rating scale (from 1, *strongly disagree*, to 5, *strongly agree*); a short version composed of 16 items with high factor loadings was used in this study. The 32-item questionnaire has shown adequate psychometric properties, with an excellent internal consistency and good convergent-related and divergent validities (Domingues et al., 2021).

The Coastal Risk Awareness Scales were used to evaluate risk perception, psychological distance (perceiving risks as distant in time and/or space), trust in authorities, externalisation of responsibility regarding coastal problems, and willingness to participate in disaster risk reduction measures (Domingues et al., 2021), using 12 Likert-type items responded on a 5-point rating scale. The Coastal Risk Awareness Scales possess adequate internal consistency and show both convergent and divergent reliabilities (Domingues et al., 2021).

Specific items of the Environmental Attitudes Inventory (Milfont & Duckitt, 2010; Domingues et al., 2019; Domingues & Gonçalves, 2020) whilst scales 5 (confidence in science and technology were used to evaluate respondents' trust in science and technology (scale 5), awareness of environmental threats (scale 6), anthropocentric concern (scale 4),

personal conservation behaviours (scale 8), human dominance over nature (scale 9) and ecocentric concern (scale 11). Scales 6, 8, and 11 are included in the Preservation higher order factor (i.e., belief that nature should be preserved and protected) and scales 4, 5, and 9 in the Utilization higher order factor (i.e., belief that nature can be used and altered for human gain) (Milfont & Duckitt, 2004, 2010; McIntyre & Milfont, 2016).

The questionnaire also included questions to evaluate respondents' perceived knowledge and concern regarding different environmental problems (e.g., eutrophication, climate change, pollution by plastics, etc.). Questions on respondents' main sources of information on environmental problems and their perceived knowledge on environmental issues were also included.

Finally, the World Health Organization Quality of Life questionnaire (The WHOQOL Group, 1998a) was applied. The abbreviated Portuguese version of this questionnaire (WHOQOL-BREF) (Vaz Serra et al., 2006) was chosen to avoid anything too extensive that could have deterred the respondents from participating. This questionnaire provides a self-reported quality of life profile, and to our knowledge, this was the first time these variables were evaluated in these areas, targeting specifically the coastal communities. The questionnaire was comprised of 26 items; two items were evaluated separately and corresponded to questions on overall quality of life *("how would you rate your quality of life?"*) and health *("how satisfied are you with your health?"*). The remaining 24 items were grouped in four main domains: 1) physical health, 2) psychological, 3) social relationships and 4) environment. Each domain was comprised of several facets. Scores of the WHOQOL-BREF are scaled in a positive direction, meaning that higher scores translate into higher quality of life.

2.2 Participants and Procedure

The questionnaire was distributed door-to-door in Luanda Bay and Mussulo Lagoon in January 2019. Enumerators were trained to clarify any questions and to help respondents when needed but did not interfere with the responses. An online version of the questionnaire was also prepared using Google Forms and publicized through social media; the online version was available between January and March 2019. A total of 120 individuals completed the questionnaire (71 in paper, 49 online). Of these, 43.7% were female and 54.6% male. Respondents' age ranged from <18 to >65 years, with 62.5% of them ranging between the ages of 25 to 44 years old. Most participants (54.2%) had completed higher education and most of them (67.5%) have lived in the area for more than 10 years.

2.3 Data Analysis

Descriptive statistics, such as frequency distributions, means and standard deviation, were used to summarize the data. Depending on the number and size of the groups, significant differences were analysed using independent samples t-test or one-way analysis of variance (ANOVA). Effect sizes (Cohen's *d*) were calculated to quantify the strength of the differences between groups; *d* values of 0.2 indicated a small effect size, 0.5 a medium effect size, and 0.8 a large effect size (Cohen, 1992). Pearson's correlations were used to evaluate relationships between variables. All statistical analyses were considered at alpha = 0.05. Analysis on the WHOQOL-BREF followed the instructions provided by the WHOQOL group (WHOQOL Group, 1998a). All analyses were conducted with IBM SPSS Statistics v. 22, with the exception of the effect sizes, that were calculated using an online calculator (https://www.polyu.edu.hk/mm/effectsizefaqs/calculator/calculator.html).

3. RESULTS AND DISCUSSION

This study focused on evaluating several psychological variables in vulnerable coastal communities in two locations of Luanda (Angola): Luanda Bay and Mussulo Lagoon. Each of these variables will be presented and discussed in the following sub-sections: (1) sense of place, (2) risk awareness, (3) risk perception, (4) environmental attitudes, and (5) quality of life profile.

3.1 Sense of Place

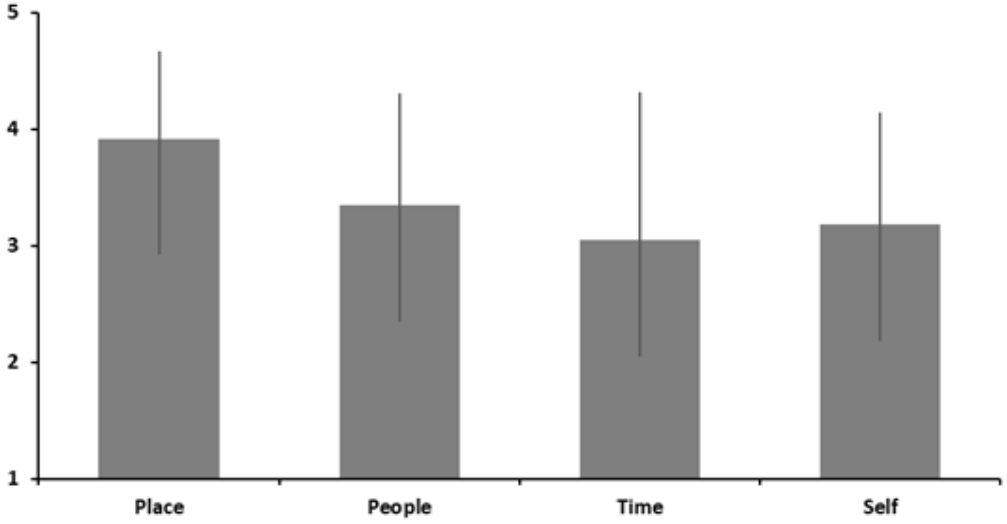
Sense of place was defined as an overarching construct that includes four sub-dimensions: *place*, *people*, *time*, and *self*, related to the emotional attachment between an individual and a specific place (Domingues et al., 2021). The dimension *place* refers to the emotional bond between people and a specific place, and includes items associated with place attachment, place identity, place dependence, and rootedness (Domingues et al., 2021). For this dimension, respondents from Luanda Bay and Mussulo Lagoon indicated moderate to high scores, with a mean value of 3.92 ± 0.75, in a 5-point rating scale (Figure 2). This was similar to values of place attachment found for other coastal communities (Mishra et al., 2010; Domingues et al., 2017, 2021). Place attachment is often thought to be related to risk perception (Hidalgo & Hernández, 2001) but the relationship between these two variables is not straightforward, and can often diverge depending on the research context (Bernardo, 2013). Different examples of positive, negative, or even null relationships between place attachment and risk perception can be found in the literature (see review by Bonaiuto et al., 2016). For instance, positive relationships were found in studies on volcanic eruption risk in Iceland (Bird et al., 2011) or hurricane risk in Louisiana, USA (Burley et al., 2007). On the other hand, negative relationships were found in studies focused on seismic risk in Romania (Armaş, 2006) and volcanic risk in Indonesia (Donovan et al., 2012). Regarding our study, no relevant correlation was found between place attachment and risk perception in the coastal communities of Luanda Bay and Mussulo Lagoon. Non-existing relationships between place attachment and risk perception are less frequent in the literature (Bonaiuto et al., 2016), however, a study in Churchill (Canada) focused on climate change also found no connection between place attachment and climate change risk perception (Groulx et al., 2014).

Three other dimensions of sense of place were evaluated (Figure 2). The dimension *people* (M = 3.35 ± 0.96) consisted of items related to the sense of community. The dimension *time* (M = 3.05 ± 1.27) is related to the length of residency and consisted of items associated with temporality and intergenerational transmission. And finally, the dimension *self* (M = 3.18 ± 0.96) included items associated with distinctiveness and self-esteem, and it is related with place identity (Domingues et al., 2021). A positive correlation ($r = 0.59$, $p = 0.01$, N = 115) between the dimension *time* and residency length of respondents was found. This is in line with the notion that the dimension *time* reflects the importance of residency length and rootedness (Domingues et al., 2021). No other relevant correlations were found for these variables.

Significant differences between sociodemographic groups regarding sense of place were found for education level, age groups, and residency length. Differences were found between people with higher education and people with primary/high school education, for both the *people* ($t(116) = 4.49$, $p < 0.001$, $d = 0.75$) and *self* ($t(116) = 4.73$, $p < 0.001$, $d = 0.75$) dimensions. For both dimensions, respondents with lower education indicated larger values than respondents with higher education levels. Significant differences between age groups <24 and >55 for the dimension *time* were also found ($Z(2,115) = 3.54$, $p = 0.03$, $\omega^2 = 0.04$), with younger respondents reporting moderate values (M = 3.62 ± 1.246)

regarding *time* while older respondents indicated lower values (M = 2.39 ± 1.237) regarding this dimension. This could be related to the fact that the younger respondents indicated a residency length of more than 10 years while the same was not true for the >55 age group, as such, younger respondents, due to their high residency length in these two coastal locations, could have a higher degree of rootedness than some of the older respondents that have lived in these areas for a shorter period. Lastly, significant differences were also found when considering the residency length of respondents. As would be expected, respondents with a residency length of >10 years in either Luanda Bay or Mussulo Lagoon reported higher values for all the dimensions of sense of place (*place*: $t(113) = -2.54$, $p = 0.01$, $d = 0.51$; *people*: $t(113) = -3.83$, $p < 0.001$, $d = 0.77$; *time*: $t(113) = -5.95$, $p < 0.001$, $d = 0.99$; *self*: $t(113) = -3.55$, $p = 0.001$, $d = 0.71$) than respondents living in these areas for a shorter period (Raymond et al., 2010; Anton & Lawrence, 2014).

Figure 2. Four Sub-dimensions of Sense of Place for Respondents in Two Coastal Areas of Luanda (Angola). ***Place***, ***People***, ***Time***, **and** ***Self***. **Vertical Bars Represent Standard Deviation (±1SD)**



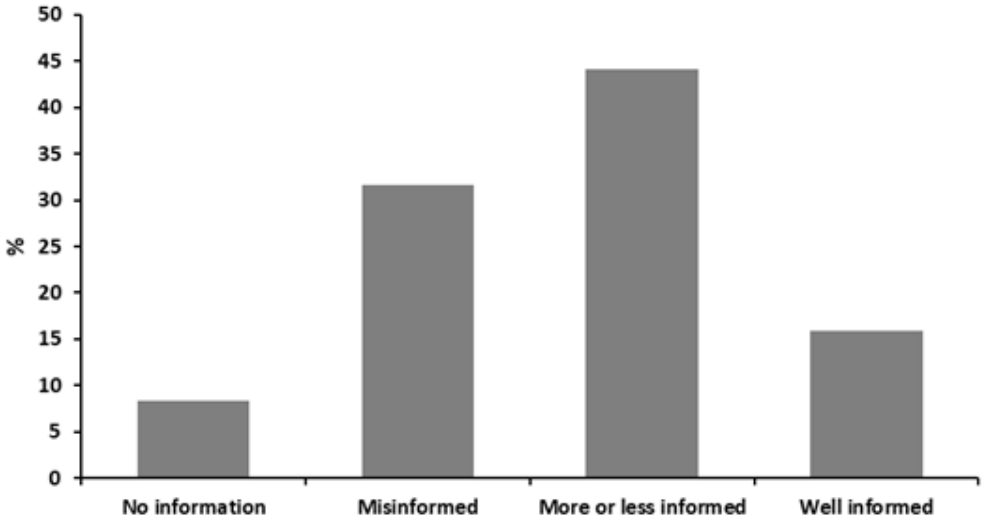
Source: Own Elaboration

3.2 Risk Awareness

Respondents were asked a series of questions intended to evaluate their awareness regarding environmental risks in Luanda Bay and Mussulo Lagoon. When asked how they perceive their overall knowledge regarding environmental risks, respondents were somewhat divided, with 60% reporting to be more or less informed or well informed, while 40% considered to be misinformed or not informed at all (Figure 3). No significant differences were found between different sociodemographic groups and no relevant correlations were found between the level of information and the other variables addressed.

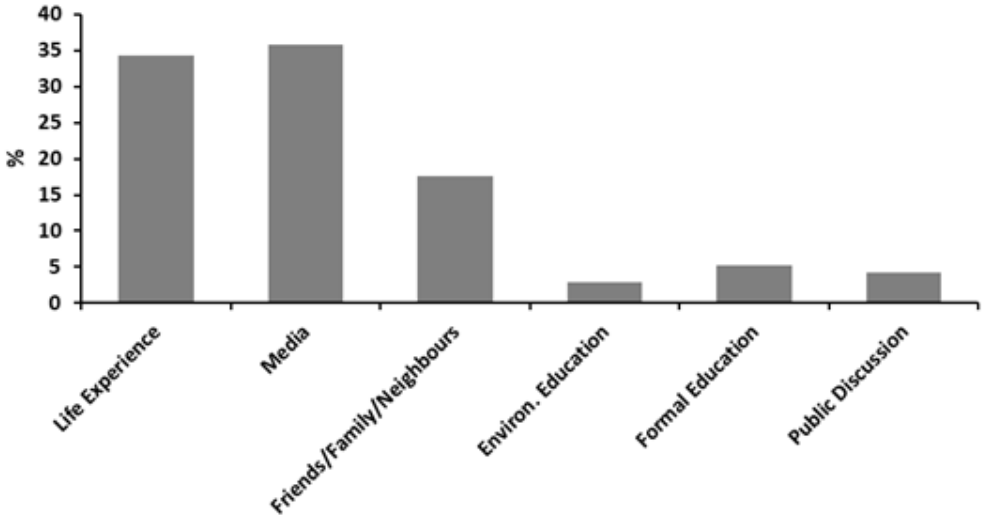
Respondents also indicated their main sources of information regarding environmental risks in these two coastal areas of Luanda. The media (34.7%) and life experience (33.3%) were referred as the main sources of information. Family, friends, and neighbours were also considered to be a relevant source of information (18.5%), while environmental education, formal education and public discussions were less relevant (Figure 4).

Figure 3. Level of information on environmental risks in Luanda Bay and Mussulo Lagoon



Source: Own Elaboration

Figure 4. Sources of information regarding environmental risks in Luanda Bay and Mussulo Lagoon



Source: Own Elaboration

The evaluation of perceived knowledge and concern regarding specific environmental problems that affect Luanda Bay and Mussulo Lagoon, namely climate change, water pollution including plastic-derived, eutrophication, harmful algal blooms, and seafood contamination by toxins, was also included in the questionnaire (Blanco et al., 2010; Castro et al., 2018; Amado et al., 2020) social, and legal contents in a specific Africa country with an approach that combines different scales and different levels of data and information. The paper proposes a framework beginning at the macro scale to integrate and operationalise the definition of GI in an African context, namely for the Luanda metropolitan area. The approach to nature and ecological structure (GI. When asked about climate change, 80% of respondents considered that they know or know very well what climate change is, while only 5.8% indicated to have never heard of it or not knowing very well what it is. Regarding their concern about this issue, most respondents (86.7%) indicated that they are concerned or highly concerned about climate change, while only 8.3% indicated not to be concerned at

all or only slightly concerned (Figure 5a). Significant differences in answers were found for some sociodemographic groups. A higher education level translated into a higher perceived knowledge ($t(116) = -5.92, p < 0.001, d = 0.93$) and concern ($t(78.12) = -5.20, p < 0.001, d = 0.97$) about climate change. Age also affected the answers given in regards to both knowledge ($Z(2,115) = 5.08, p = 0.008, \omega^2 = 0.07$) and concern ($Z(2,115) = 4.64, p = 0.01, \omega^2 = 0.06$), with the younger age group (<24) indicating a moderate knowledge/concern, while respondents above this age group (>24) indicated a high knowledge/concern regarding climate change. Climate change is currently receiving a lot of attention and, as such, it is extremely common to hear about this in the news and on social media (Pianta & Sisco, 2020). Scientists have made a considerable effort to bring attention to this issue during the last decades and governments from all around the world have strategies in place to attempt to reduce carbon emissions and try to mitigate future impacts caused by climate change. Considering the extensive media coverage regarding climate change it is not surprising that most respondents claimed to know what climate change is. In this case, knowledge about the issue translated to concern as well, with over 80% of respondents indicating a high level of concern about this.

Water pollution is a very prominent problem in both Luanda Bay and Mussulo Lagoon; in particular, pollution by plastics is very easily observed in these two coastal areas of Luanda. When asked about their perceived knowledge on water pollution, 90% of respondents indicated to know or know very well what this problem is. In terms of concern, most respondents indicated to be concerned or very concerned about water pollution (92.5%), while only 5.8% indicated no concern or a slight concern about this environmental problem (Figure 5b). When asked specifically about water plastic pollution, most respondents also indicated that they know or know very well what this is (79.1%), with only a small part of respondents (8.3%) indicating they had never heard of this or know little about it. Most respondents indicated to be concerned or very concerned (94.2%) about water pollution due to plastics (Figure 5c). The answers provided by the respondents are aligned with the severity of these issues in the coastal area of Luanda (Nicolau, 2016). Life experience was indicated by respondents as one of the main sources of information regarding environmental problems and, as such, the high exposure these coastal communities to water pollution could justify the high percentage of respondents that claim to be knowledgeable about these issues. Furthermore, just like climate change, water pollution and in particular, pollution due to plastics, receive a lot of attention in the media, with several campaigns existing worldwide to raise awareness to these problems. Once again, high perceived knowledge translated to high concern, with over 90% of respondents expressing a large concern about these issues.

For both water pollution and water pollution by plastics, several significant differences were found between distinct sociodemographic groups. Gender related differences were found for concern about both water pollution ($t(113) = -2.17, p = 0.03, d = 0.41$) and water pollution by plastics ($t(113) = -2.01, p = 0.05, d = 0.38$), with men appearing to be slightly less concerned than women. When considering education level, significant differences were also found for both knowledge (*water pollution*: $t(116) = -6.20, p < 0.001, d = 1.12$; *water pollution by plastics*: $t(116) = -5.25, p < 0.001, d = 0.98$) and concern (*water pollution*: $t(72.42) = -5.68, p < 0.001, d = 0.93$; *water pollution by plastics*: $t(116) = -4.74, p < 0.001, d = 0.88$), with more educated individuals perceiving to be more knowledgeable and concerned than less educated people. Significant differences between age groups were also found, in regards to knowledge about water pollution ($Z(2,115) = 4.27, p = 0.02, \omega^2 = 0.05$) and concern about water pollution by plastics ($Z(2,115) = 4.82, p = 0.01, \omega^2 = 0.06$). In this case, younger respondents (<24) considered to be less informed about water pollution and less concerned about water pollution by plastics than older respondents (>55).

When asked about eutrophication, respondents' perceived knowledge and concern were much lower than scores for climate change and water pollution. Most respondents indicated not knowing what eutrophication is (56.6%), and only 26% of respondents from Luanda Bay and Mussulo Lagoon responded that they know or know very well what this is. However, when questioned about their concern regarding this problem, most respondents are concerned or very concerned (55.2%) (Figure 5d). Gender significantly influenced respondents' concern about this issue ($t(109) = -2.70$, $p = 0.008$, $d = 0.52$), with women indicating a slightly higher level of concern about eutrophication than men. Education was also relevant, with respondents with a higher educational level expressing a higher level of concern regarding eutrophication than less educated people ($t(112) = -3.09$, $p = 0.002$, $d = 0.58$). Eutrophication is a very specific topic in marine and aquatic sciences, and even though it is very concerning, it is much more uncommon to hear about this issue in the news or social media. The media and life experience were considered by the respondents as the most relevant sources of information regarding environmental issues and, as such, it is expected that many respondents were unaware of what this problem. Interestingly, regardless of the lack of information about eutrophication by most respondents, over 50% of them expressed concern about eutrophication. It is possible that respondents attempted to give a socially desirable answer, meaning they responded in the way that they perceived to be socially desirable (Holtgraves, 2004; Domingues et al., 2021), which in this case was an expression of concern about environmental issues affecting Luanda Bay and Mussulo Lagoon, even though they might not be knowledgeable about them.

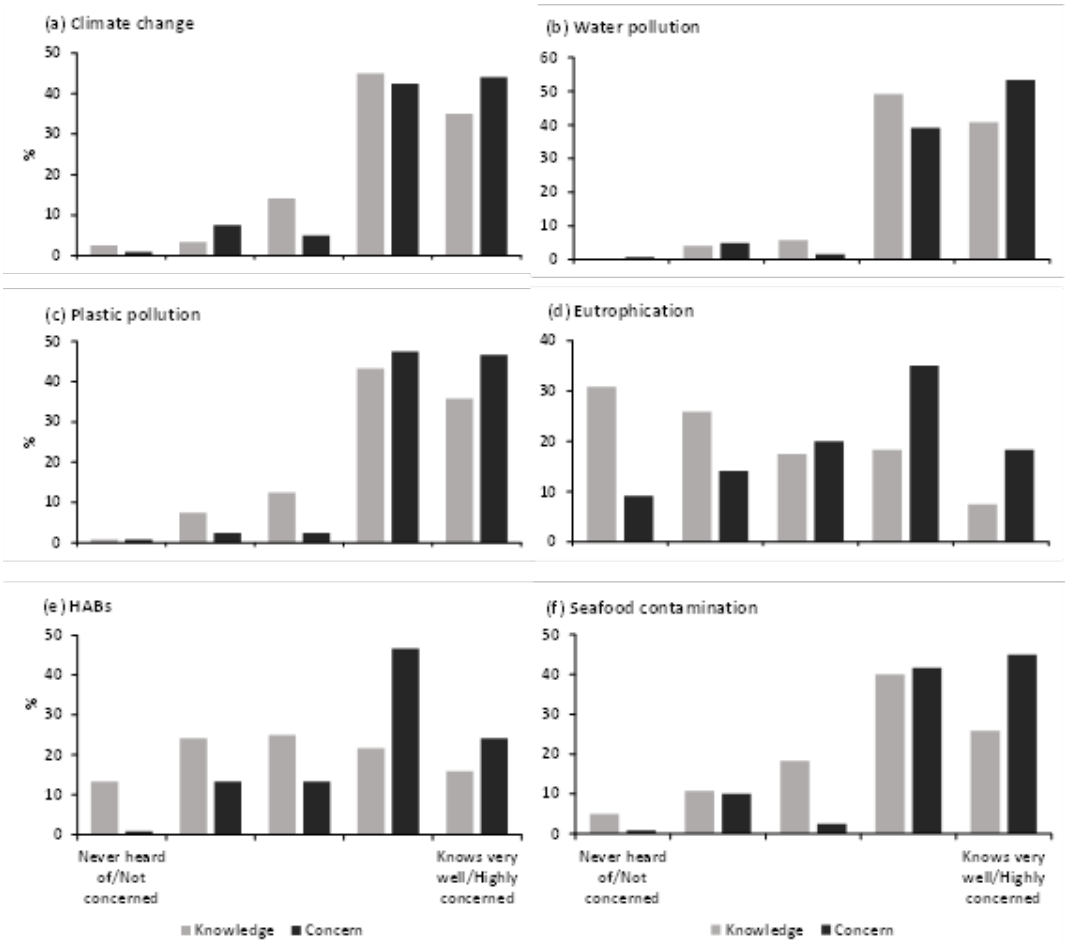
The occurrence of harmful algal blooms (HABs) or red tides was also addressed. Respondents were equally divided between knowing or knowing very well (37.5%) and never having heard of it or not knowing much about it (37.5%). However, like for eutrophication, when asked about their concern regarding this issue, 72.1% of respondents indicated they were concerned or very concerned about HABs (Figure 5e). Both HABs and eutrophication are topics that do not receive as much media attention as climate change and water pollution, which could explain the large difference in perceived knowledge between these issues in the coastal communities of Luanda Bay and Mussulo Lagoon. HABs are an environmental problem highly relevant in these areas, and can strongly influence both local economy and human health (Rangel & Silva, 2007; Blanco et al., 2010); however the knowledge of the community on this issue is apparently still low. Eutrophication and HABs are very specific topics and, therefore, it may be difficult for people with no formal education to understand what these issues are. However, regardless of the lack of understanding about HABs, respondents expressed once more a high concern about this topic (over 70%). It is possible that respondents attempted to give an answer that they perceived as socially desirable (Holtgraves, 2004; Domingues et al., 2021). The terminology used could be a factor influencing response, since the word "harmful" has a negative association, so regardless of not fully understanding what this is, people may be concerned about it. Gender differences were found, with women indicating a higher level of concern than men ($t(110.70) = -2.31$, $p = 0.02$, $d = 0.39$). More educated people also reported a greater perceived knowledge ($t(112.51) = -1.94$, $p = 0.06$, $d = 0.36$) and concern ($t(114) = -2.73$, $p = 0.007$, $d = 0.51$) about HABs than less educated people.

Lastly, respondents were also asked about ingestion of seafood contaminated by toxins. Most respondents indicated that they know or know very well what this is (65.8%). Once more, when asked about their concern regarding this topic, 86.7% indicated to be concerned or very concerned, and only 10.8% indicated not being concerned or slightly concerned (Figure 5f). Gender influenced the concern level expressed by respondents ($t(113) = -2.51$, $p = 0.01$, $d = 0.48$), with women reporting a higher level of concern than men. Education also affected responses, with more educated people indicating both a higher knowledge

($t(116) = -2.89$, $p = 0.005$, $d = 0.54$) and higher concern ($t(88.99) = -5.23$, $p < 0.001$, $d = 0.98$) than less educated people. Seafood contamination and HABs are two intertwined environmental problems, since the toxins produced by HAB species are the cause of seafood contamination (Anderson, 2018) commonly called "red tides". Knowledge on HABs was lower than that of seafood contamination, which indicates that respondents may be aware of the potential for seafood to be contaminated by toxins but are less aware of what causes the occurrence of toxins. Other studies have also addressed the lack of knowledge the public has on the causes and consequences of red tides (Kuhar et al., 2009; Nierenberg et al., 2010; Borbor-Córdova et al., 2018) yet shifts in its dynamics can pose climate-ecological risks, such as harmful algal blooms (HABs. Public misinformation regarding these risks could create issues for local management when attempting to implement mitigation measures. Seafood contamination is a very serious threat for local economics, due to shellfish harvest interdictions that can last for long periods of time, and for human health, if not properly monitored. As such, efforts should be made to provide the public with accurate and useful information on these events.

Most of the environmental issues addressed in the questionnaire showed positive correlations among each other. Knowledge about the issue was always positively correlated to concern, except for seafood contamination, where knowledge and concern presented a weak correlation. The relationship between knowledge and concern and is not always straightforward since more awareness about an issue does not always translate into more concern about it. In certain cases exposure to environmental risks could increase knowledge on environmental issues, but it may weakened the concern levels, due to the process of risk normalization (Luís et al., 2016; Domingues et al., 2018). In general, answers given in this questionnaire indicate that the coastal communities in Luanda Bay and Mussulo Lagoon are aware of the environmental issues they face and are, in general, concerned about them, which is in line with other studies focused on coastal populations (Schmidt et al., 2014; Domingues et al., 2018).

Figure 5. Respondents self-reported knowledge and concern regarding several environmental problems that affect Luanda Bay and Mussulo Lagoon. (a) climate change, (b) water pollution, (c) water pollution due to plastics, (d) eutrophication, (e) occurrence of harmful algal blooms (or red tides) and (f) ingestion of seafood contaminated by toxins. Graph bars are presented from the least knowledge/ concern to the highest knowledge/concern (left to right).



Source: Own Elaboration

3.3 Risk Perception

Respondents were asked a series of questions about their risk perception (and associated variables) towards environmental risks in Luanda Bay and Mussulo Lagoon. A moderate to high risk perception was reported, with a mean value of 3.64 ± 0.81, on a 5-point rating scale (Figure 6). Overall, our results show that respondents are aware of the environmental risks they face, with most of them recognising that those risks may pose a threat. Contrary to other studies where risk perception showed either positive (Bird et al., 2011; Stain et al., 2011) or negative (Armaş, 2006; Donovan et al., 2012) correlations with place attachment, for our sample no correlations were observed; in fact, risk perception showed no relevant correlations with any of the other variables addressed in this study. The relationship between risk perception and place attachment is not always straightforward and can vary depending on other factors (Bernardo, 2013). Regardless, respondents from Luanda Bay and Mussulo Lagoon indicated a relatively high risk perception towards environmental risks in general.

Potential determinants of risk perception were also addressed, such as psychological distance (i.e., perception of threats as distant in time or space). Overall, respondents' psychological distance was low, with a mean value of 2.47 ± 0.65 (Figure 6). Psychological

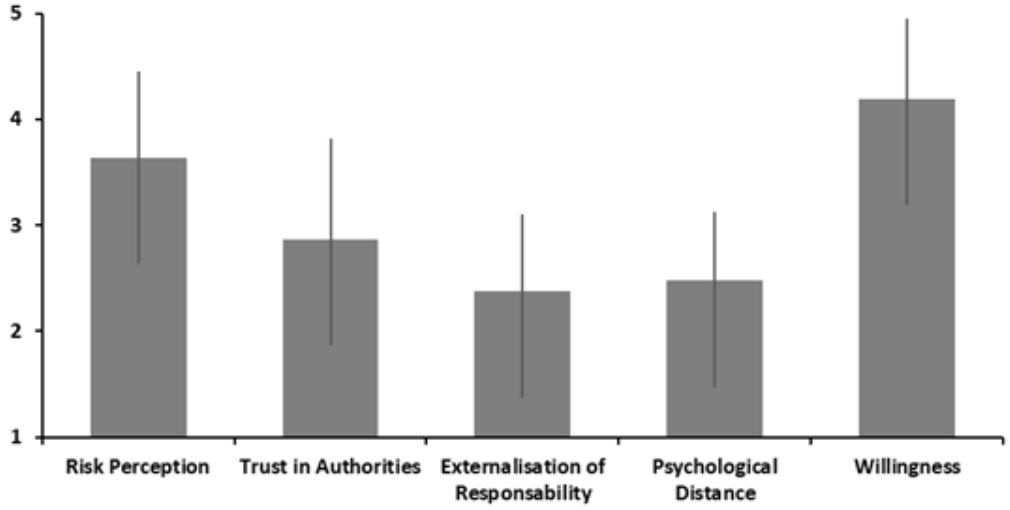
distance can be problematic when the time comes to take action to deal with environmental risks (Domingues et al., 2018). If risks are seen as distant in time then it is more likely that they could be perceived as less relevant; this is common when addressing climate change, an environmental risk that is typically seen as distant in time, i.e., people perceive that climate change may be a problem in the future, but not now (Spence et al., 2012; McDonald et al., 2015). However, our results show that for Luanda Bay and Mussulo Lagoon psychological distance does not appear to be an issue, since most respondents indicated that they felt they were at risk currently.

Variables that may be influenced by risk perception, such as trust in authorities, externalisation of responsibility, and willingness to participate in the implementation of disaster risk reduction (DRR) measures, were also addressed. Respondents' trust in authorities was low, with a mean value of 2.86 ± 0.96, on a 5-point rating scale (Figure 6). Regarding the externalisation of responsibility for environmental risks, most respondents disagreed or strongly disagreed, with a mean value of 2.37 ± 0.73 on 5-point rating scale (Figure 6). Lastly, when asked about their willingness to participate in the implementation of DRR measures, most respondents either agreed or strongly agreed, with a mean score of 4.19 ± 0.76 (Figure 6). The low trust in authorities that residents expressed is similar to other coastal communities (Domingues et al., 2017, 2018; Cumiskey et al., 2018). Mistrust in authorities could prevent behavioural changes and actions by the community, which could prove to be a challenge when attempting to implement DRR measures. However other variables, such as externalisation of responsibility (i.e., belief that authorities should be responsible for solving environmental problems) could also influence behavioural changes (Gifford, 2011). For respondents from Luanda Bay and Mussulo Lagoon, externalisation of responsibility does not seem to be an issue since it was low, indicating that respondents are aware that they must play an active role in mitigating the environmental problems they face. This is further emphasized by respondent's high willingness to participate in the implementation of DRR measures.

Some significant differences between sociodemographic groups were found for risk perception related variables. Gender differences were found only for psychological distance ($t(111) = 2.15$, $p = 0.03$, $d = 0.41$), with men (M = 2.58, SD = 0.64, N = 63) scoring higher than women (M = 2.32, SD = 0.64, N = 50). Education influenced responses for trust in authorities ($t(114) = 2.35$, $p = 0.02$, $d = 0.44$), psychological distance ($t(114) = 3.23$, $p = 0.002$, $d = 0.61$), and willingness to participate in DRR measures ($t(113.9) = -2.66$, $p = 0.009$, $d = 0.50$). Respondents with less education expressed a higher trust in authorities and a higher psychological distance than respondents with higher education levels, but for willingness to participate in DRR measures the opposite was observed. Age groups influenced responses only for trust in authorities ($Z(2,113) = 4.84$, $p = 0.01$, $\omega^2 = 0.06$), with younger respondents (<24) being more trusting of authorities than respondents from the intermediate age group (25 to 54).

Overall, our results indicate that respondents from Luanda Bay and Mussulo Lagoon have a moderate/good level of risk perception, and even though their trust in authorities is low, respondents still reported to be willing to participate in the implementation of DRR measures and appear to understand that they must play an active role protecting the environment.

Figure 6. Mean values of risk perception, potential determinants of risk perception (psychological distance), and potential outcomes of risk perception (trust in authorities, externalisation of responsibility, and willingness to participate in the implementation of DRR measures). Vertical lines represent standard deviation (±1SD).



Source: Own Elaboration

3.4 Environmental Attitudes

Environmental attitudes can be roughly defined as an individual's concern about the natural environment as something deserving of protection, understanding, or enhancement (Gifford, 2014). Respondents were questioned on specific items of the Environmental Attitudes Inventory (Milfont & Duckitt, 2010; Domingues et al., 2019; Domingues & Gonçalves, 2020) to evaluate different attitudes towards the environment.

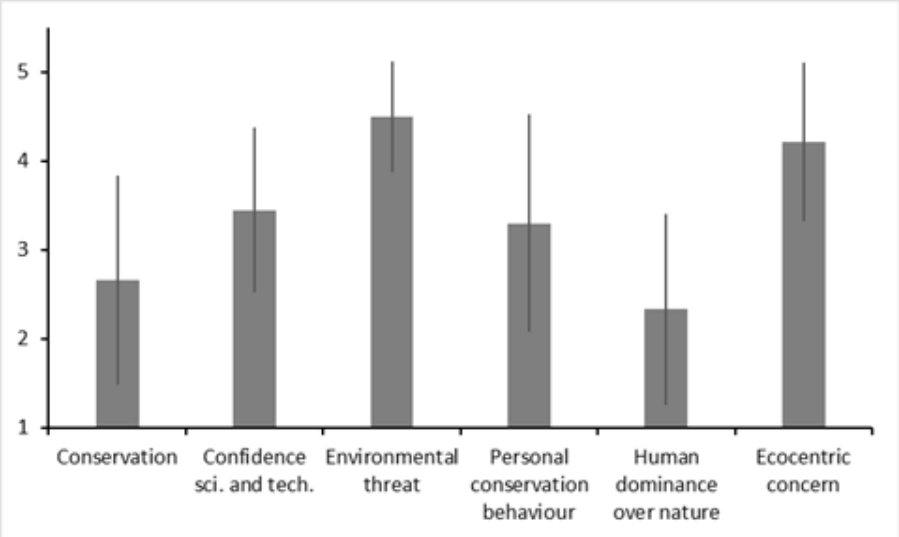
Regarding nature conservation motivated by anthropocentric concern, respondents were asked *"do you think one of the most important reason to keep Luanda Bay and Mussulo Lagoon clean is so that people can practice water sports?"*. Most respondents did not agree, with a mean value of 2.67 ± 1.18 (Figure 7), indicating that nature conservation is not motivated by potential human utilisation of the natural environment. To evaluate confidence in science and technology, respondents were asked *"do you think scientists and engineers will be capable of solving these and other environmental problems?"*. Respondents showed a moderate trust in the ability of science and technology to solve the environmental problems of their ecosystems (M = 3.45 ± 0.92) (Figure 7). Respondents were also asked if they *"think human beings are severely abusing the environment"*, to evaluate their awareness regarding environmental threats. Most respondents agreed, with a mean value of 4.50 ± 0.62 (Figure 7), indicating a high awareness of environmental threats. Regarding personal conservation behaviour, respondents were asked if they *"normally make an effort to save resources (recycling, save water, save electricity, etc.)"*. Responses for this item were moderate, with a mean value of 3.30 ± 1.22 (Figure 7). Regarding the human dominance over nature, respondents were asked if they *"think human beings should dominate nature"*. Most respondents disagreed, with a mean value of 2.33 ± 1.07 (Figure 7). Lastly, respondents were asked if they *"think one of the most important reasons to keep Luanda Bay and Mussulo Lagoon clean is to preserve the animals (e.g., fishing resources) and plants that inhabit there"*, to evaluate ecocentric concern. Most respondents agreed, with a mean value of 4.22 ± 0.89 for this scale (Figure 7).

Some significant differences across sociodemographic groups were found. Personal conservation behaviour was the scale where more differences between sociodemographic groups were found, namely for gender ($t(113) = -2.42$, $p = 0.02$, $d = 0.46$), education level

($t(116) = 6.95$, $p < 0.001$, $d = 1.30$), age ($Z(2,115) = 13.33$, $p < 0.001$, $\omega^2 = 0.17$), and residency time ($t(113) = 3.98$, $p < 0.001$, $d = 0.80$). Women indicated a higher personal conservation behaviour than men, and so did respondents with a higher education level, and those that lived in these areas for less than 10 years. For age groups, the answers from the younger age group (<24) significantly differed from those older than 25 years, with younger respondents indicating a much lower personal conservation behaviour than older respondents.

Interpretation of these results must be done carefully, since we were only able to include a few items from the Environmental Attitudes Inventory, to avoid a questionnaire too extensive that would increase the rate of drop-out. However, these results provide a general view on environmental attitudes in Luanda Bay and Mussulo Lagoon, with respondents appearing to have a more ecocentric and less anthropocentric view of nature. Overall, considering responses given in other parts of our questionnaire, such as high environmental concern regarding risks, and a high willingness to participate in DRR measures, it appears that respondents in these coastal areas of Luanda are willing to engage in actions to increase the quality of their environment.

Figure 7. Mean values for specific scales of the Environmental Attitude Inventory (Milfont & Duckitt, 2010; Domingues et al., 2019; Domingues & Gonçalves, 2020): conservation motivated by anthropogenic concern, confidence in science and technology, environmental threat, personal conservation behaviour, human dominance over nature, and ecocentric concern. Vertical lines represent standard deviation (±1SD).



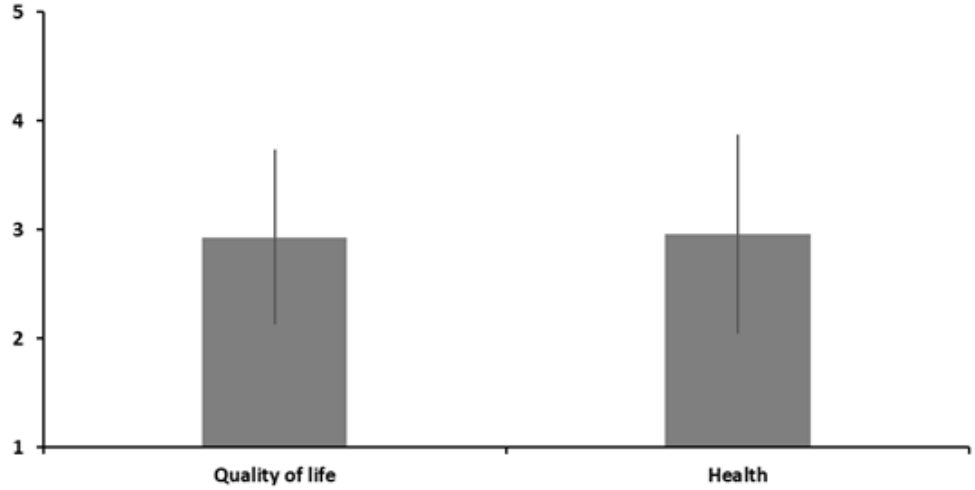
Source: Own Elaboration

3.5 Quality of Life Profile

The coastal communities of Luanda Bay and Mussulo Lagoon are exposed to several environmental risks, which can have an impact in the quality of life of these communities (Silva et al., 2012; Perlaviciute & Steg, 2019). However, the quality of life profile for the communities living and working in these coastal areas of Luanda has never been addressed. Two independent items of the WHOQOL-BREF questionnaire allowed to determine the overall quality of life and health satisfaction of the communities in Luanda Bay and Mussulo Lagoon. Results indicated a moderate quality of life (M = 2.93 ± 0.80, in a 5-point rating scale) and a moderate satisfaction with health (M = 2.96 ± 0.92, in a 5-point scale) (Figure 8). Regarding the four main domains (physical health, psychological, social relationships,

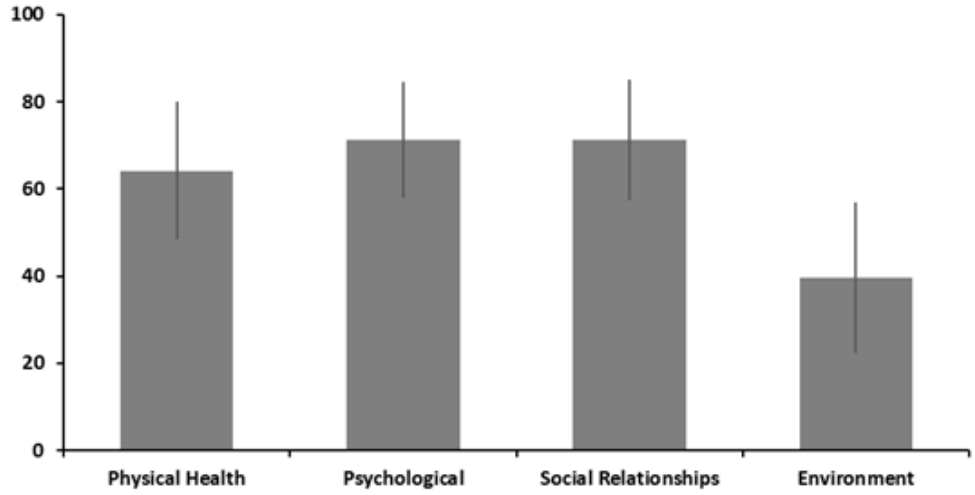
and environment) evaluated in a scale from 0 to 100, results showed a moderate to good quality of life in terms of physical (M = 64.2 ± 15.9) and psychological health (M = 71.1 ± 13.3), and social relationships (M = 71.3 ± 13.8). However, scores were much lower for the environmental component (M = 39.6 ± 17.2) (Figure 9). The lower values for the environmental component were anticipated, given that respondents also expressed that they are aware and concerned about the environmental risks they face. These results further emphasise that the physical environment plays an important role in a population's quality of life. If the physical environment in Luanda Bay and Mussulo Lagoon improves we would expect to see an increase in the overall quality of life of the communities that live or work in these areas. However, if no action is made to improve the environment and it continues to further deteriorate, the quality of life of these coastal communities may decrease even more.

Figure 8. Overall self-reported quality of life and satisfaction with health of the respondents in two coastal areas of Luanda (Angola), obtained by the application of the WHOQOL-BREF. Vertical lines represent standard deviation (±1SD).



Source: Own Elaboration

Figure 9. Scores for the four domains of QoL, namely (1) physical health, 2) psychological, 3) social relationships, and 4) environment), obtained through the application of the WHOQOL-BREF. Vertical lines represent standard deviation (±1SD).



Source: Own Elaboration

4. CONCLUSION

The questionnaire applied to residents and other ecosystems users of Luanda Bay and Mussulo Lagoon (Luanda, Angola) allowed the evaluation, for the first time, of several important psychological variables in these regions. These two coastal areas are exposed to several environmental issues, and results from our questionnaire indicate that the coastal communities are, in general, aware, and concerned about the environmental problems they face. Respondents were more familiar with some environmental problems than others. Most respondents perceived to be highly knowledgeable about climate change, water pollution (including by plastics), and ingestion of contaminated seafood. However, their self-reported knowledge on eutrophication and harmful algal blooms or red tides is more limited. Risk perception towards environmental risks was moderate, and a moderate/high sense of place was reported by respondents. Residents' quality of life was perceived as moderate/good in terms of physical and psychological health, and social relationships, but the environmental component was perceived as weak.

These results suggest that improvements in the natural environment are needed to increase the quality of life in these ecosystems. If the natural environment is allowed to further deteriorate, the impact in the quality of life of these coastal communities could increase. Steps should be taken by local management to attempt to improve the quality of the physical environment in these areas. Participants in this study indicated a high willingness to participate in disaster risk reduction measures, which could be very useful for local management if they attempt to implement measures to improve environmental quality.

This study presents some limitations, mainly related to the low number of respondents. In future work, a larger sample should be sought to strengthen the results. Regardless, this study is a relevant contribution to understanding how the physical environment may be influencing the quality of life of coastal communities in Luanda Bay and Mussulo Lagoon. It is also pertinent for local management to better comprehend public concerns about environmental problems in these two coastal areas.

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CHARACTERIZATION OF SMALL-SCALE FISHING ACTIVITY IN LUANDA BAY (ANGOLA)

Silvana Faria[1]
Marisa Macuéria[2]
Benjamin A. Mosley[3]
M. Alexandra Teodósio[4]
Vânia Baptista[5]

ABSTRACT

Luanda Bay, the second largest bay and one of the most important ecosystems of the Angolan coast, supports many human activities. This bay supports a range of marine biodiversity that serves as a means of livelihood and source of income for more than fifty small-scale artisanal fisheries and collectors of worms and bivalve molluscs. The present study is the first record of this fishing activity in Luanda Bay and the objective was to characterize the resource exploitation in this bay based on field data obtained by distributing self-reported and structured questionnaires to the two fishing communities (fishermen and shellfish harvesters) in Luanda Bay: Luanda Island and Luanda Commercial Harbour. The results revealed that the two fishing communities used different vessel types during fishing activity. In the Luanda Island fishing community, the fishermen used rowboats ("Chata") and motorboats, and in the Commercial Port of Luanda fishing community, they used an adapted vessel made of Styrofoam boards. The main gears were line/hooks (34.1%), shovel (25.0%), seine (9,1%), gillnet (6.8%), trawl (4.5%) and traps (2.3%). According to the local fishing communities, *Pomadasys jubelini*, *Mugil cephalus*, *Dentex* spp., *Senilia senilis*, *Mactra glauca*, *Donax* spp., *Perna perna*, and *Lucinella divaricata* were the predominant species. In relation to the earnings by fishing day, the Luanda Island community had a higher income (average: 14.4 ± 8.3 euros; maximum: 39.0 euros) than Luanda Commercial Harbour community (average: 8.4 ± 5.1 euros; maximum: 24.2 euros). Thus, the quality of life of the fishing communities seems to be highly depending on this activity.

Keywords: Artisanal Fisheries, Fishing Community, Molluscs, Crustaceans, Fish, Coast of Angola.

JEL Classification: Q22

1. INTRODUCTION

Millions of people throughout the world, particularly in Asia, Africa, and Latin America, rely on small-scale artisanal fisheries as a major source of food, income or as a contribution to their livelihoods (McGoodwin, 1990; Kent, 1997; Berkes, Mahon, McConney, Pollnac & Pomeroy, 2001; FAO, 2003; Viswanathan, Nielsen, Degnbol, Ahmed, Hara & Abdullah, 2003). Characteristics of small-scale artisanal fisheries include smaller vessels and engines,

[1] Instituto Nacional de Investigação Pesqueira e Marinha (INIPM), Luanda, Angola (silfaria_@hotmail.com)
[2] Instituto Nacional de Investigação Pesqueira e Marinha (INIPM), Luanda, Angola (marisa.macueria@gmail.com)
[3] Centre for Marine and Environmental Research (CIMA), Universidade do Algarve, Faro, Portugal (bamosley@ualg.pt)
[4] Centre of Marine Sciences (CCMAR), Universidade do Algarve, Faro, Portugal (mchichar@ualg.pt)
[5] Centre of Marine Sciences (CCMAR), Universidade do Algarve, Faro, Portugal (vcbaptista@ualg.pt)

simple or more traditional gear, proximity to the coast, smaller crews, family or locally owned, and importance for local livelihoods and subsistence (Kittinger, 2013; Smith & Basurto, 2019).

The sector represents half the world's fishing effort (Rousseau, Watson, Blanchard & Fulton, 2019), over one quarter of the volume of catches (Watson, 2018) and 90% of employment in the fisheries sector (FAO, 2015). There are an estimated 32 million directly employed as small-scale fishermen, an additional 76 million employed in post-harvest jobs, and 81% of catch is used for local human consumption (World Bank, 2012). Despite the central role of small-scale fisheries in contributing to food security, poverty mitigation and rural development, this sector has been neglected by fisheries managers over the years in favour of the commercial fisheries sectors (McGoodwin, 1990; Kent, 1997; Berkes et al., 2001; FAO, 2003; Viswanathan et al., 2003). The lack of understanding of the dynamics and nature of small-scale artisanal fisheries has contributed to their neglect and failure to design and implement appropriate policies and management systems to cater for their specific characteristics (Sowman, 2006). However, in recent decades, there has been an increase in effort to collect data regarding small-scale artisanal fishers through innovative methodologies to combat inaccuracies in existing data and the subsequent disregard of the sector. The Food and Agriculture Organization (FAO) has been collaborating with the World Bank and WorldFish researchers to generate better global estimates of small-scale artisanal fishers independent of self-reported national fisheries statistics (World Bank, 2012; WorldFish, FAO & Duke University, 2018).

The fishing sector is the third-most important to the Angola national economy after the oil and mining industries and supplies about 25% of the total animal protein intake of the Angolan population (FAO, 2011). Fishing is seen as playing a key role in combating hunger and poverty and ensuring national food security, with marine fisheries providing work and income-generating opportunities for coastal communities (e.g., Aquatic Biological Resources Law No. 6-A/04 of October 8 of Ministry of Fisheries, Angola, 2004; POPES, 2005; POPA, 2018). In Angola, small-scale artisanal fisheries have played a critical role in the livelihood and food security of coastal communities, particularly in the Luanda province, where, in recent decades, hundreds of unemployed youth and local fishermen have used Luanda Bay as a livelihood and source of income. Currently, the Angola coastline has about 102 artisanal fishing settlements, largely concentrated in the northern provinces, and the Angolan Institute for the Development of Artisanal Fisheries (IPA) estimates that approximately 35,000 artisanal fishermen and 6,600 artisanal fishing boats operate in its coastal waters (Duarte, Fielding, Sowman & Bergh, 2005). Since the 1990s, the Angolan government has adopted policies to promote both the industrial and artisanal fishing sectors in line with its national development objectives, establishing in 1994 the IPA for the development and support of the sector (Sowman & Cardoso, 2010). However, despite redoubled efforts, there is still little specific information and data on the artisanal fisheries operating in the coastal region of Angola, as well as their contribution to the food and livelihoods of hundreds of coastal communities.

Luanda Bay, a semi-enclosed body of saline water, is located on the Luanda providence, northern coast of Angola (Figure 1). This postcard of Luanda City is protected by Luanda Island, and contain in its area a commercial harbour, a refinery, a fuel station, cargo terminals, and a naval base that contributes to water pollution (Leitão, Santos & Boaventura, 2016; Baptista et al., 2021). Despite the multiple anthropogenic pressures that are threatening Luanda Bay (e.g., solid waste, domestic wastewater, and industrial effluents without treatment; Leitão et al., 2016), this ecosystem works as an area for growth, recruitment and feeding for many species of fish, crustaceans, bivalve molluscs, cephalopods, etc., as well as for livelihood and income for the local fishing communities (Cox, 2013).

In this context, the current work aims to characterize the small-scale artisanal fishing activity in Luanda Bay, as a livelihood and source of income for its users. For this purpose, self-reported and structured questionnaires were distributed in two fishing communities of Luanda Bay, namely, Luanda Island and Luanda Commercial Harbour communities. Beyond the sociodemographic data, the questionnaire included data related to the fishing activity, such as the main species caught, fishing gear, seasons, and income.

Figure 1. Location of the Luanda Bay (Luanda, Angola), the two fishing communities (Luanda Island and Luanda Commercial Harbour), and the main landing sites (Praia dos Pescadores, Luanda Commercial Harbour, Ministério do Interior and Floresta/Salga).

Source: Map retrieved from Google Earth; Edited by the authors

2. METHODS

The study is based on a descriptive research, with a qualitative approach although it includes quantitative elements, based on field data obtained by distributing self-reported and structured questionnaires to the fishing community of the Luanda Bay. The questionnaire included sociodemographic data and data related to the fishing activity, such as the main species caught, fishing gear, seasons, and income.

The questionnaire was distributed in May 2021 to two fishing communities (fishermen and shellfishermen) in Luanda Bay: Luanda Island and Luanda Commercial Harbour communities (Figure 1). Enumerators clarified any questions and helped respondents when needed, without interfering with the responses.

A total of 30 individuals (13 in Luanda Island and 17 in Luanda Commercial Harbour) answered the questionnaire. All of these were male (100.0%). Respondents' age ranged between 18 to >65 years old, with 13.3% of them ranging between 18 and 24 years old, 30.0% between the ages of 25 to 34 years old, 40.0% between 35 and 44 years old, 10.0% between 45 and 54 years old, and 6.7% with ≥65 years.

Descriptive statistics were used to summarize the data.

3. RESULTS AND DISCUSSION

In the two fishing communities of Luanda Bay studied in the present work, the activity was characterized by small-scale artisanal fishing (100.0%), using smaller and traditional vessels, operate non-industrialized and traditional methods (Figure 2), such as passive gear and manually hauled, with low impact on the ecosystem, and provides livelihoods for local communities (Cox, 2013; Kittinger, 2013; Smith & Basurto, 2019).

Figure 2. Vessels and gears used by fishermen in fishing communities of Luanda Island and Luanda Commercial Harbour in Luanda Bay (Luanda, Angola): rowboat and trawl net (a), rowboat and seine (b), Styrofoam board (c), line/hook (d, f), Styrofoam board and line/hook (e), cast net (g).

Source: Own Elaboration

The two fishing communities used different vessel types (Table 1). In the fishing community of Luanda Island, the predominant vessel types were rowboats (called "Chata";

N = 8; Figures 2a,2b), and motorboats (N = 4). The total length of motorboats varied between 3.0 and 4.0 m and support a payload of 240.0-360.0 kg and 4 and 6 crew members. The motorboats include an inboard engine of 40-100 hp and can reach 14.0 m in length (Sowman & Cardoso, 2010). In the rowboats, the total length varied between 3.0 and 6.0 m, supporting a payload of 80.0-360.0 kg and 2 to 6 fishermen. The rowboats or "Chatas" are characterized by a flat bottom, with a maximum of 7.0 m in length, with or without a motor (Sowman & Cardoso, 2010; POPA, 2018). In the fishing community of Luanda Commercial Harbour, the respondents solely used an adapted vessel made of Styrofoam boards (N = 17; Figures 2c, 2e). These rudimentary and adapted vessels are not described yet, and they are probably improvised by locals to provide some income for their families. In fact, they had small length (1.6 and 1.7 m), supporting small payload (20.0–40.0 kg) and just one to two fishermen. Contrarily to the artisanal fishing on the coast of Africa, where it is estimated that for every person involved in artisanal fishing, four additional jobs are created, including fisher processors and fish traders (Cox, 2013), all the fishermen answered that they or some family members are responsible for processing and selling the fish on land.

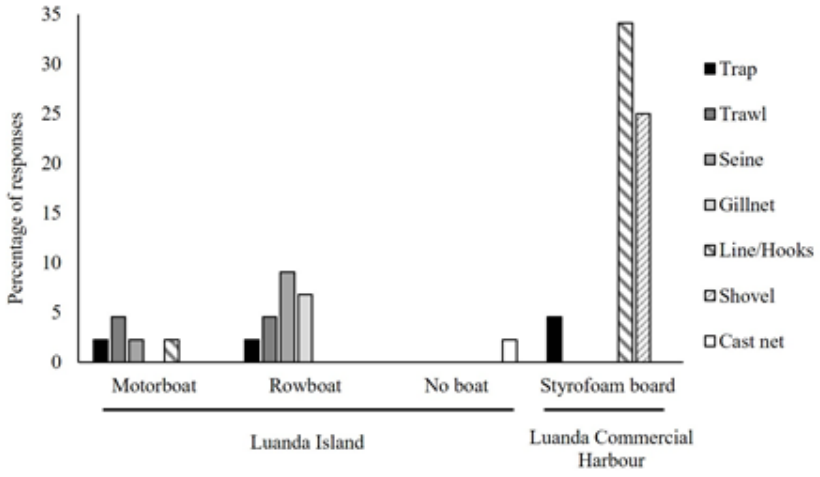
Table 1. Characteristics of vessels used by fishermen in fishing communities of Luanda Island and Luanda Commercial Harbour in Luanda Bay (Luanda, Angola)

Vessel type	Luanda Island				Luanda Commercial Harbour			
	Number	Total length (m)	Number of fishermen	Payload (kg)	Number	Total length (m)	Number of fishermen	Payload (kg)
Motorboat	4	3.5 ± 0.6 (3.0–4.0)	5.0 ± 1.2 (4.0–6.0)	320.0 ± 56.6 (240.0–360.0)	-	-	-	-
Rowboat	8	4.1 ± 0.8 (3.0–6.0)	3.6 ± 1.3 (2.0–6.0)	245.0 ± 101.3 (80.0–360.0)	-	-	-	-
Styrofoam board	-	-	-	-	17	1.6 ± 0.0 (1.6–1.7)	1.1 ± 0.3 (1.0–2.0)	28.2 ± 10.1 (20.0–40.0)

Source: Own Elaboration

The fishing gear used in the fishing activity in Luanda Bay varied according to fishing communities and vessel types (Figures 2, 3). In the Luanda Island community, trawl (4.5%), traps, seine, and line/hooks (2.3%) were used in motorboats, and seine (9,1%; Figure 2b), gillnet (6.8%), trawl (4.5%; Figure 2a), and traps (2.3%) were used by rowboats. The cast nets were used without a support vessel (2.3%; Figure 2g). In the Luanda Commercial Harbour community, the main gear used in Styrofoam boards was line/hooks (34.1%; Figure 2d, 2e, 2f), followed by shovel (25.0%) and traps (4.5%). This is in accordance with the small-scale artisanal fisheries' methods described for Angolan coast, that include handlines, gillnets, seine, traps, longline, beach seine and lift nets (Sowman & Cardoso, 2010; POPA, 2018).

Figure 3. Fishing gear by vessel type used by fishing communities of Luanda Island and Luanda Commercial Harbour in Luanda Bay (Luanda, Angola)



Source: Own Elaboration

In the Luanda Island community, the fishing site was in Section I of Luanda Bay (Figure 1) for all the vessel types (N = 13), while in Luanda Commercial Harbour community, the fishing site varied between Sections I (N = 14), II (N = 1), and III (N = 2) of Luanda Bay. The fishing activity occurred mainly inside the bay, with the exception of the two fishermen who carry out their activity outside the bay, near its entrance (Section III). In relation to the landing site, the fishermen of Luanda Island answered that they landed on Praia dos Pescadores (Section I; motorboats- N = 4; rowboats- N = 8) and Luanda Commercial Harbour (Section II; No vessel- N = 1), while fishermen of Luanda Commercial Harbour (Styrofoam boards) landed on Luanda Commercial Harbour (Section II; N = 12), Ministério do Interior (Section I; N = 4) and Praia dos Pescadores (Section I; N = 1). As an alternative landing site, the fishermen of Luanda Island reported Floresta/Salga (Section II; motorboats- N = 3; rowboats- N = 7).

The predominant species (most frequently reported by fishermen) were *Pomadasys jubelini* (matona, N = 15; Figure 4g), *Senilia senilis* (mabanga, N = 10; Figure 4o), *Mactra glauca* (quingole, N = 10; Figure 4p), *Mugil cephalus* (tainha, N = 9; Figure 4j), *Donax spp*. (conquilha, N = 8), *Perna perna* (mexilhão, N = 8), *Lucinella divaricata* (ameijoinha, N = 6) and *Dentex spp.* (*Dentex canariensis* or *Dentex macrophthalmus*, cachucho, N = 6; Figure 4m) (Table 2). Reported fish species, such as *P. jubelini* (N = 11), *Dentex spp.* (N = 6) and *M. cephalus* (N =5), were mainly caught by line/hooks and with Styrofoam boards as support vessels. *Pomadasys jubelini* was also caught by seine and gillnet (motorboat and rowboat) and *M. cephalus* by trawl and seine (motorboat and rowboat). Trawl and seine (motorboat and rowboat) were also used to catch *Sardinella spp.* (*Sardinella aurita* and *Sardinella maderensis*, sardinelas; Figure 4c) and *Sarda sarda* (quimbumbo; Figure 4k). Cast net only captured one species, the *Oreochromis niloticus* (cacusso; Figure 4b). This species is one of the most exploited species in inland waters of Angola (POPA, 2018). Bivalve molluscs (*S. senilis*, *Donax spp*., *L. divaricata*, *M. glauca* and *P. perna*) and gastropods (*Perrona quinteni*, *Hexaplex rosarium* – búzios; and *Paratectonatica tigrine* – caracol) were caught by shovel, with Styrofoam boards as the support vessel. Cephalopods (*Sepia spp.* – choco; Figure 4q) were caught by trap, trawl, seine, and gillnet (motorboat and rowboat), and crustaceans (*Callinectes marginatus* – caranguejo; Figure 4r) were caught by trap and line/hooks (motorboat and rowboat). Target species varied according to fishing community, for example, *Sardinella spp.*, *S. sarda* and *Sepia spp*. were exclusively caught in the Luanda Island community, and bivalves, gastropods,

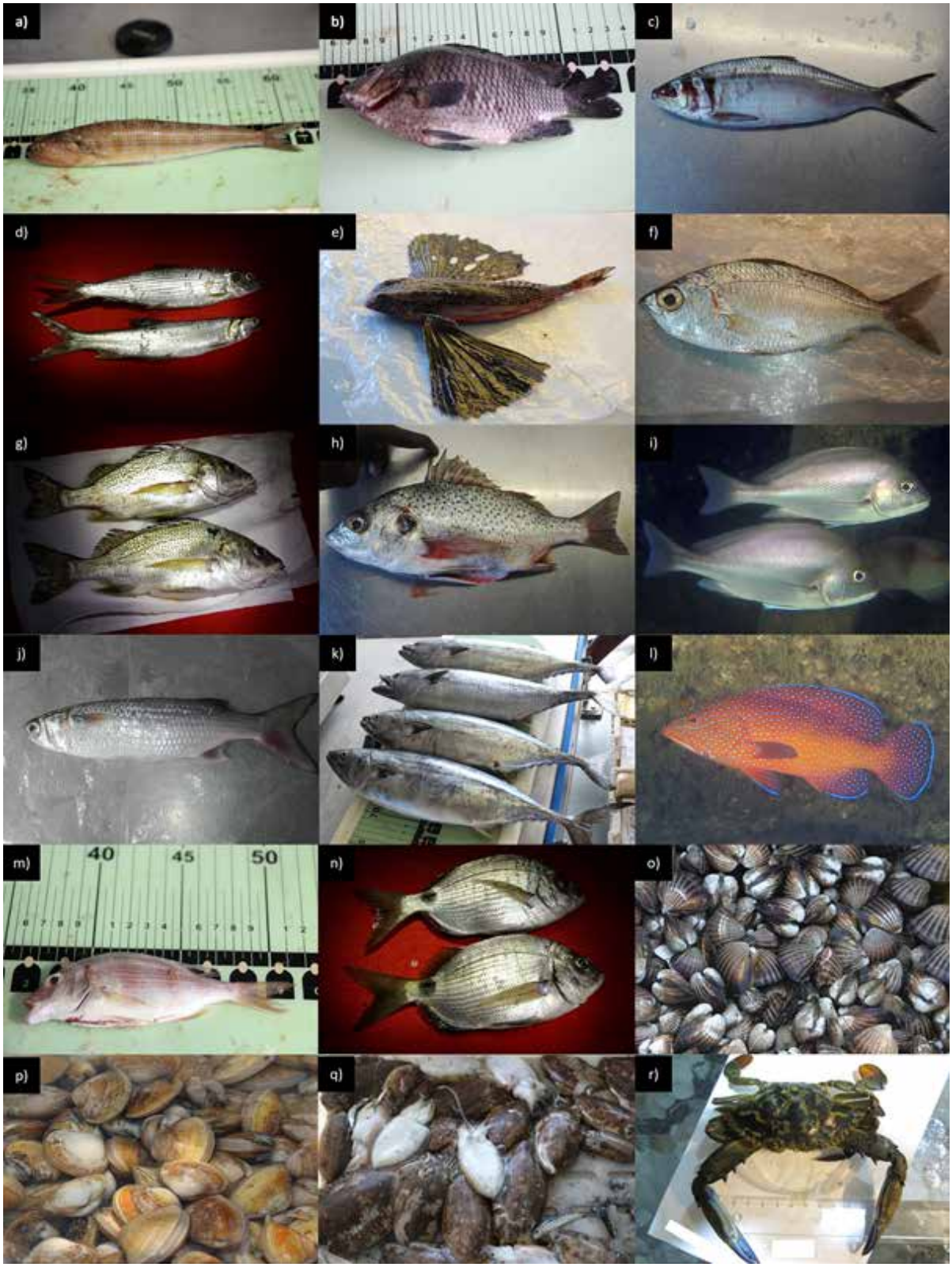
and a large number of fish species were only caught in the Luanda Commercial Harbour community.

Table 2. Species caught in Luanda Bay (Luanda, Angola) by fishing communities of Luanda Island and Luanda Commercial Harbour, considering vessel and gear types

Family	Scientific name	Common name	Vessel				Gear						
			Motorboat	Rowboat	Styrofoam board	No vessel	Trap	Trawl	Seine	Gillnet	Line/ Hooks	Shovel	Cast net
Fish													
Acropomatidae	*Kaperangus microlepis*	Peixe-sabonete			1						1		
Carangidae	*Caranx hippos*	Macoa			2						2		
Cichlidae	*Oreochromis niloticus*	Cacusso			1	1					1		1
Clupeidae	*Sardinella spp.*	Sardinelas	2	2				3	2				
Elopidae	*Elops lacerta*	Peixe-banana			4						4		
Dactylopteridae	*Dactylopterus volitans*	Peixe-voador			1						1		
Gerreidae	*Eucinostomus melanopterus*	Mussosso			2						2		
Haemulidae	*Pomadasys incisus*	Mabolobolo			1						1		
	Pomadasys jubelini	Matona	1	3	11				1	3	11		
	Pomadasys perotaei	Roncador			2						2		
	Plectorhinchus mediterraneus	Peixe-burro			4						4		
Mugilidae	*Mugil cephalus*	Tainha	2	2	5			2	3		5		
Scombridae	*Sarda sarda*	Quimbumbo	1					1	1				
Serranidae	*Cephalopholis taeniops*	Garoupa-das-pedras			3						3		
	Epinephelus spp.	Garoupa			4						4		
Sparidae	*Dentex spp.*	Cachucho			6						6		
	Diplodus capensis	Mariquita			4						4		
	Pagrus spp.	Pargo			1						1		
	Pagrus auriga	Pargo-rosa			3						3		
Bivalves													
Arcidae	*Senilia senilis*	Mabanga			10							10	
Donacidae	*Donax spp.*	Conquilha			8							8	
Lucinidae	*Lucinella divaricata*	Ameijoinha			6							6	
Mactridae	*Mactra glauca*	Quingole			10							10	
Mytilidae	*Perna perna*	Mexilhão			8							8	
Cephalopods													
Sepiidae	*Sepia spp.*	Choco	3	2			2	3	2	1			
Crustaceans													
Portunidae	*Callinectes marginatus*	Caranguejo	1		3		3	1			1		
Gastropods													
Clavatulidae	*Perrona quinteni*	Búzios			1							1	
Muricidae	*Hexaplex rosarium*	Búzios			1							1	
Naticidae	*Paratectonatica tigrina*	Caracol			1							1	

Source: Own Elaboration

Figure 4. Species caught in Luanda Bay (Luanda, Angola): *Kaperangus microlepis* **(a)**, *Oreochromis niloticus* **(b)**, *Sardinella maderensis* **(c)**, *Elops lacerta* **(d)**, *Dactylopterus volitans* **(e)**, *Eucinostomus melanopterus* **(f)**, *Pomadasys jubelini* **(g)**, *Pomadasys perotaei* **(h)**, *Plectorhinchus mediterraneus* **(i)**, *Mugil cephalus* **(j)**, *Sarda sarda* **(k)**, *Cephalopholis taeniops* **(l)**, *Dentex canariensis* **(m)**, *Diplodus capensis* **(n)**, *Senilia senilis* **(o)**, *Mactra glauca* **(p)**, *Sepia* **spp. (q), and** *Callinectes marginatus* **(r).**



Source: Own Elaboration

The species listed as being of greatest commercial interest in Luanda Bay varied according to fishing communities, with greater diversity recorded in the community of Luanda Commercial Harbour (Table 3). *Pomadasys jubelini* was the species reported as having a greater commercial interest in both communities of Luanda Island (N = 5) and Luanda Commercial Harbour (N = 15), followed by *Sardinella spp.* (N = 3), *Caranx hippos*, *O. niloticus*, *M. cephalus* and *S. sarda* (N = 1) in Luanda Island; and by *Dentex spp.* (N = 7), *Epinephelus spp*., *Eucinostomus melanopterus* (N = 2; Figure 4f), *Kaperangus microlepis* (Figure 4a), *Pomadasys perotaei* (Figure 4h), *Plectorhinchus mediterraneus* (Figure 4i) and *Pagrus auriga* (N = 1) in Luanda Commercial Harbour. In relation to bivalve species, *M. glauca* (N = 1) was the only reported species with major commercial interest in the Luanda Island community, having been the most reported species (N = 10) in the Luanda Commercial Harbour community, followed by *S. senilis* (N = 9), *Donax spp*., *P. perna* (N = 6) and *L. divaricata* (N = 4). Cephalopods (*Sepia spp.*) had the same commercial importance in the two communities (N = 5) and crustaceans (*C. marginatus*) were only commercially important in Luanda Commercial Harbour (N = 1).

Table 3. Species with High Commercial Importance in Fishing Communities of Luanda Island and Luanda Commercial Harbour, Luanda Bay (Luanda, Angola)

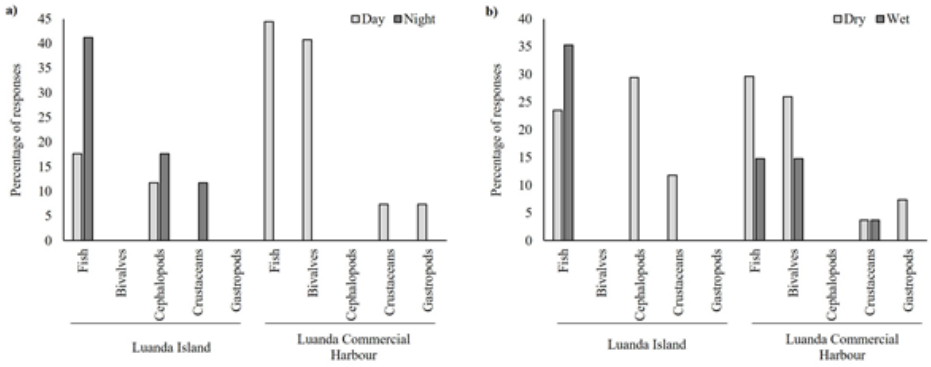
Family	Scientific name	Common name	Luanda Island	Luanda Commercial Harbour
Fish				
Acropomatidae	*Kaperangus microlepis*	Peixe-sabonete		1
Carangidae	*Caranx hippos*	Macoa	1	
Cichlidae	*Oreochromis niloticus*	Cacusso	1	
Clupeidae	*Sardinella spp.*	Sardinelas	3	
Gerreidae	*Eucinostomus melanopterus*	Mussosso		2
Haemulidae	*Pomadasys jubelini*	Matona	5	15
	Pomadasys perotaei	Roncador		1
	Plectorhinchus mediterraneus	Peixe-burro		1
Mugilidae	*Mugil cephalus*	Tainha	1	
Scombridae	*Sarda sarda*	Quimbumbo	1	
Serranidae	*Epinephelus spp.*	Garoupa		2
Sparidae	*Dentex spp.*	Cachucho		7
	Pagrus auriga	Pargo-rosa		1
Bivalves				
Arcidae	*Senilia senilis*	Mabanga		9
Donacidae	*Donax spp.*	Conquilha		6
Lucinidae	*Lucinella divaricate*	Ameijoinha		4
Mactridae	*Mactra glauca*	Quingole	1	10
Mytilidae	*Perna perna*	Mexilhão		6
Cephalopods				
Sepiidae	*Sepia spp.*	Choco	5	5
Crustaceans				
Portunidae	*Callinectes marginatus*	Caranguejo		1

Source: Own Elaboration

In the fishing community of Luanda Island, fishing activity occurred mainly during the night for fish (41.2%), cephalopods (17.6%) and crustaceans (11.8%) (Figure 5a). However, in the fishing community of Luanda Commercial Harbour, fishing activity occurred for all species groups during the daytime (fish 44.4%, bivalves 40.7%, cephalopods 7.4%, and crustaceans 7.4%).

When questioned about the major fishing season, the fishermen from the two communities answered in different ways (Figure 5b). In Luanda Island, fishermen said that the major fishing season was the wet season, with hot weather (summer) for fish species (35.3%), and dry season, with cold weather (named "cacimbo"), for cephalopods (29.4%) and crustacean species (11.8%). In Luanda Commercial Harbour, the dry season was reported as the best season for fish (29.6%), bivalves (25.9%) and cephalopod species (7.4%), and for crustaceans there was no distinction reported between seasons (3.7%).

Figure 5. Species Groups caught in Lunda Bay (Luanda, Angola) by Fishing Communities of Luanda Island and Luanda Commercial Port, according to Daytime (a) and Season (b)



Source: Own Elaboration

The number of fishing days per week was similar in the two communities, varying between four and seven in Luanda Island, and between three and seven in Luanda Commercial Harbour (Table 4). The number of fishing events per day was also similar in two communities, varying between one and two in Luanda Island, and between one and three in Luanda Commercial Harbour. The number of fishing events per day depended on the income generated by each event, at least until the fishermen reached the minimum necessary to support their families. The number of hours spent fishing per day was higher in Luanda Commercial Harbour community (4.8 ± 1.3; 1.0-7.5 hours) than in Luanda Island community (3.0 ± 1.0; 1.0-5.0 hours).

Table 4. Characteristics of fishing activity in fishing communities of Luanda Bay (Luanda, Angola)

		Luanda Island	Luanda Commercial Harbour
Fishing days per week		5.3 ± 0.9 (4.0–7.0)	5.7 ± 1.2 (3.0–7.0)
Number of fishing events per day		1.4 ± 0.5 (1.0–2.0)	1.6 ± 0.6 (1.0–3.0)
Hours spent fishing per day		3.0 ± 1.0 (1.0–5.0)	4.8 ± 1.3 (1.0–7.5)
Earning (€) by fishing day	Fish	17.2 ± 8.6 (5.2–39.0)	6.6 ± 1.8 (4.2–10.9)
	Bivalves	-	5.5 ± 3.0 (4.2–14.4)
	Cephalopods	9.5 ± 3.6 (5.9–13.0)	-
	Crustaceans	-	9.1 ± 0.0 (9.1)

Source: Own Elaboration

In relation to the earnings by fishing day, the Luanda Island community had the higher average (14.4 ± 8.3 euros) and maximum values (39.0 euros) than Luanda Commercial Harbour community (average: 8.4 ± 5.1 euros; maximum: 24.2 euros) (Table 4). Fish species represented the higher average values in the Luanda Island community (17.2 ± 8.6 euros), reaching the maximum value of 39.0 euros, followed by cephalopods with an average value of 9.5 (± 3.6) euros and a maximum of 13.0 euros. In the Luanda Commercial Harbour community, the crustaceans generated a higher average daily income (9.1 euros), followed by fish species (average: 6.6 ± 1.8 euros; maximum: 10.9 euros), and by bivalves (average: 5.5 ± 3.0 euros; maximum: 14.4 euros). In 2018 and 2019, the average monthly income per person in Angola was 20.09 euros (Faria, 2021), and the minimum wage in 2020 was 43.68 euros (Presidential Decree No. 13/19 of January 09 of Ministry of Fisheries, Angola, 2019). Thus, the quality of life of the fishing communities of Luanda Bay is highly depending on the fishing activity in the bay.

In relation to the gender, the questionnaire revealed gender inequality in fishing activity of Luanda Bay, with all the respondents being male and when questioned about their perception of local fishing activity, all responded that, in Luanda Bay, fishing activity is performed exclusively by men. The women wait for the fishermen to return, to help sell the catch in the market. In fact, the Assessment Report on Small Scale Fisheries in Africa (Cox, 2013) reported that African women are marginalised in the small-scale fishing sector, not only in fishing related activities but also in decision-making processes.

Although fishing in Luanda generates income for the local communities, the legislation only allows fishing in the bay for subsistence (Aquatic Biological Resources Law No. 6-A/04 of October 8 of Ministry of Fisheries, Angola, 2004; Presidential Decree No. 41/05 of June 13 of Ministry of Fisheries, Angola, 2005). Moreover, according to Presidential Decree No. 28/15 of January 13 of Ministry of Fisheries, Angola (2015), the capture of mollusc bivalves is prohibited in closed areas of Luanda Bay. However, there is no control of this activity in the bay, and the legislation is poor, encouraging undeclared landings, that makes resource management difficult. Even information about the number of fishermen and boats operating in the bay does not exist, as determined by fishermen perception. When questioned about the number of fishermen and vessel harvesting in Luanda Bay, the respondents' answers varied between more than 30 to more than 150, with many responses concentrated between more than 30 to more than 75 (N = 24) fishermen and boats. Other problems caused by the lack of control of fishing activity in Luanda Bay come from the consumption of captured species. The bay is highly impacted by a growing population of the city of Luanda, intense urbanization, and the presence of industrial and harbour complexes, that negatively affect the water quality, and fish species, and consequently the quality of life of the local communities (Santos, 2012; Leitão, Santos & Boaventura, 2014; Leitão et al., 2016). The appearance of biotoxins has also been reported in Luanda Bay, contaminating mostly bivalves and some fish species, and causing health problems in humans, like intoxication with neurotoxic effects – Amnesic Shellfish Poisoning (ASP) and Paralytic Shellfish Poisoning (PSP) (Vale, Rangel, Silva, Coelho & Vilar, 2009; Branco, Livramento & Rangel, 2010).

4. CONCLUSION

The present study revealed that the small-scale artisanal fishing activity in Luanda Bay varied between the fishing communities of Luanda Island and Luanda Commercial Harbour. Moreover, the quality of life of the fishing communities of Luanda Bay seems to be highly dependent on fishing activity in the bay. Despite the small sample size, this is the first study that characterizes the fishing activity and mollusc harvesting in Luanda Bay, describing

fishing vessels, including an adapted vessel made of Styrofoam boards, fishing gear, as well as the main species caught. Further studies related to these activities in the Bay should be carried out, namely on the specification of the characteristics of fishing gear used in Luanda Bay, as well as referring to the fisheries' assessment and biology of fishing resources. Catches must be monitored in the bay so that solid data on landings can be obtained, and consequently resources can be managed properly in a suitable way. Thus, this study could provide a foundation for further studies of fisheries in the Bay of Luanda.

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MEASURING SENSE OF PLACE: A NEW PLACE-PEOPLE-TIME-SELF MODEL

Rita B. Domingues[1]
Gabriela Gonçalves[2]
Saúl Neves de Jesus[3]

ABSTRACT

Many models of place attachment and sense of place have proliferated in the last decades, and a consensus on the conceptualisation and operationalisation of these constructs is yet to be reached. We aim to contribute to this discussion, by proposing a new model and measurement of sense of place as an overarching construct, using exploratory and confirmatory analyses. Results suggested that sense of place is a second-order factor with four first-order factors: 'place', 'people', 'time', and 'self'. The 'place' dimension integrates emotional content associated with the place and can be loosely compared to the unidimensional place attachment in other models. The 'people' dimension corresponds to the sense of community construct, whereas the 'time' dimension reflects the importance of length of residence and intergenerational transmission. Finally, the 'self' dimension is more internally focused than the other dimensions, reflecting the role of the place for an individual's distinctiveness and self-esteem. Our 32-item Sense of Place Scale is thus a valid and reliable measure based on a quadripartite structure of the sense of place construct.

Keywords: Place Attachment, Sense of Place, Scale Development, Length of Residence, Sense of Community, Exploratory Analysis.

JEL Classification: C83

1. INTRODUCTION

1.1 Place Attachment, a Puzzling Construct

Place attachment, the emotional bond between people and specific places (such as houses, neighbourhoods, cities, regions, countries, etc.), is a current topic in the social sciences, and it has been so for the last 40 years. However, perusing the literature on place attachment can be a cumbersome endeavour. First, place attachment has been studied and theorized across disciplines, including environmental psychology, sociology, human geography, cultural anthropology, urban studies, architecture and planning, economics, leisure sciences and tourism, among others (Lewicka, 2011). More recently, the concept of place attachment has been used in the environmental and natural sciences, particularly focusing on its role as predictor of conservation behaviours (e.g., Poe, Donatuto, & Satterfield, 2016; Admiraal et al., 2017; Jones et al., 2018). Second, a multitude of somewhat differing conceptualisations of place attachment and related constructs can be found in the literature. For instance, place attachment is frequently simply referred to as an affective bond between people and places, but Altman and Low (1992) provided a broader definition of the construct, suggesting an

[1] Centre for Marine and Environmental Research (CIMA), Universidade do Algarve, Faro, Portugal (rbdomingues@ualg.pt)
[2] Psychology Research Centre (CIP), Universidade do Algarve, Faro, Portugal (ggoncalves@ualg.pt)
[3] Research Centre for Tourism, Sustainability and Well-being (CinTurs), Universidade do Algarve, Faro, Portugal (snjesus@ualg.pt)

interplay between the emotional content and beliefs, knowledge, behaviours, and action in relation to the place. Third, expressions such as place attachment and sense of place are often used interchangeably, but different meanings can be allocated to each, as sense of place may be considered an overarching concept that includes place attachment and other place-related constructs (Jorgensen & Stedman, 2001). Fourth, the multitude of terminological and conceptual ambiguity is reflected in many different operationalisations of the constructs (Hidalgo, 2013). Hidalgo (2013) proposed a consensus regarding the measurement of place attachment by classifying the different available measures (also reviewed by Giuliani, 2003; Lewicka, 2011; Hernández, Hidalgo, & Ruiz, 2013) and integrating them in the well-established person-place-process model of Scannell & Gifford (2010). Despite the standardization attempts, place attachment is still a puzzling construct to study.

1.2 Place Attachment, Identity, Dependence, and Sense of Place

Place attachment has been loosely defined as an affective bond between people and specific places. Drawing from the attachment theory (Bowlby, 1969; Ainsworth & Bell, 1970), Hidalgo and Hernández (2001) suggested that the main distinctive characteristic of place attachment is the desire to maintain closeness to the object of attachment, redefining place attachment as a positive affective bond between an individual and a specific place, characterized by the desire to maintain closeness to that place. Scannell and Gifford (2010) proposed a person-place-process model that defines place attachment as a bond between an individual or a group and a place with specific social and physical characteristics, and is manifested through affective, cognitive, and behavioural processes.

Besides place attachment, two other concepts appear frequently in the people-place literature: place identity and place dependence. Earlier models considered these constructs as distinct conceptualisations of place attachment. Place dependence was first theorized as an individual's perceived strength of association between them and specific places (Stokols & Shumaker, 1981). It is considered a type of functional attachment, reflecting the importance of the place in providing conditions that sustain specific activities and goals (Stokols & Shumaker, 1981; Williams & Roggenbuck, 1989; Williams & Vaske, 2003).

Place identity was described as a substructure of the self-identity that includes cognitions about the physical world surrounding the individual (Proshansky et al., 1983). It is usually considered as a dimension at the same level as attachment or dependence, but it has also been conceptualized as a driver of place dependence and attachment, rather than an element that is formed at the same temporal plane (Kyle, Jun, & Absher, 2014). Other scholars, however, have found that place identity develops after place attachment (Hernández et al., 2007). Twigger-Ross and Uzell (1996) operationalized place identity following Breakwell's four identity principles, namely distinctiveness, continuity, self-esteem, and self-efficacy (Breakwell, 1993). According to Twigger-Ross and Uzell (1996), distinctiveness is the desire to maintain personal uniqueness, summarizing a person's lifestyle; distinctiveness is evidenced when the individual uses an identification to distinguish them from people from other places. Continuity refers to the desire to preserve continuity of the self-concept; continuity can be divided into place-referent continuity, when the place becomes a marker for emotionally significant past events and actions, and place-congruent continuity, when the individual feels that a particular place fits with aspects of the self (Twigger-Ross & Uzell, 1996). Self-esteem refers to the fact that one's self-identity is linked to the places that are important for the individual; it is observed when the individuals have a positive feeling about themselves related to their place of attachment (Twigger-Ross & Uzell, 1996; Scannell & Gifford, 2014). Finally, self-efficacy refers to the ease that the individual may

feel in carrying out their daily activities in the place; self-efficacy is maintained if the place facilitates or does not hinder a person's everyday lifestyle (Twigger-Ross & Uzell, 1996).

Sense of place is another expression that frequently appears in the environmental psychology and human geography literature, and it is usually considered a more general concept or umbrella term that may include other constructs (Shamai, 1991). Drawing from the tripartite framework of attitudes, Jorgensen and Stedman (2001) described sense of place as an attitude towards a spatial setting, encompassing place attachment, place identity, and place dependence, which correspond to the affective, cognitive, and conative components of attitudes, respectively. Sense of place appeared as a general dimension expressed through emotions, thoughts and behavioural beliefs of individuals, rather than a multidimensional construct comprising three univariate dimensions (attachment, identity and dependence) (Jorgensen & Stedman, 2001). Although both place attachment and sense of place can be used as overarching, second-order factors, sense of place is more inclusive and allows for negative relationships with the place, while attachment implies a positive relationship (Trentelman, 2009). In addition, the term place attachment is more frequently used in studies conducted in recreational contexts with visitors/non-residents, whereas sense of place has been more used with individuals, usually residents, with an extensive history with the place in question (Kyle, Graefe, Manning, & Bacon, 2004). In our study, we retained Jorgensen and Stedman's (2001) conceptualisation of sense of place as an overarching construct that includes other dimensions such as place attachment, and allows for both positive and negative attitudes towards the place.

1.3 Other Recurring Constructs in the People-Place Literature

Many other constructs related to place attachment can be found in the literature, such as topophilia, community attachment, place congruence, or urban identity. Rootedness, community attachment, and sense of community are three of the most addressed variables in the context of place attachment research. Rootedness is a time-related concept described as a psychological state that results from long habitation at one locality (Tuan, 1980). It is associated with residence length, and it may be reinforced by memories, intergenerational transmission, and heritage (McAndrew, 1998; Kelly & Hosking, 2008; Michel-Guillou & Meur-Ferec, 2017; Poljanec-Borić et al., 2018). Lewicka (2013) suggested that rootedness might be equivalent to place attachment, as research consistently shows that place attachment is predicted by length of residence, strength of neighbourhood ties, and home ownership, i.e., factors that root a person in a place. The concept of rootedness has also been included in Hummon's (1992) typology of people-place relationships, which includes five different types of community attachment or sentiment. According to Hummon (1992), everyday rootedness and ideological rootedness are positive attachments to residence place, whereas alienation, place relativity, and placelessness describe lack of attachment.

Sense of community reflects the connections to local social networks and the interactions between them (Kasarda & Janowitz, 1974); it can be considered one of four dimensions of place attachment, along with place identity, place dependence and nature bonding (Raymond et al., 2010). Another theoretical framework considers sense of community as a feeling of belonging and connectedness to a group, comprising four distinct elements, namely membership, influence, integration and fulfilment of needs, and shared emotional connection (McMillan & Chavis, 1986). Membership is the feeling of belonging or of sharing a sense of personal relatedness, and influence refers to the sense that the individual matters to the group and the group matters to its members; integration and fulfilment of needs expresses the feeling that members' needs will be met through the community, and the

belief that members share history, common places, time together, and similar experiences defines the shared emotional connection (McMillan & Chavis, 1986).

1.4 Dimensions of Place Attachment

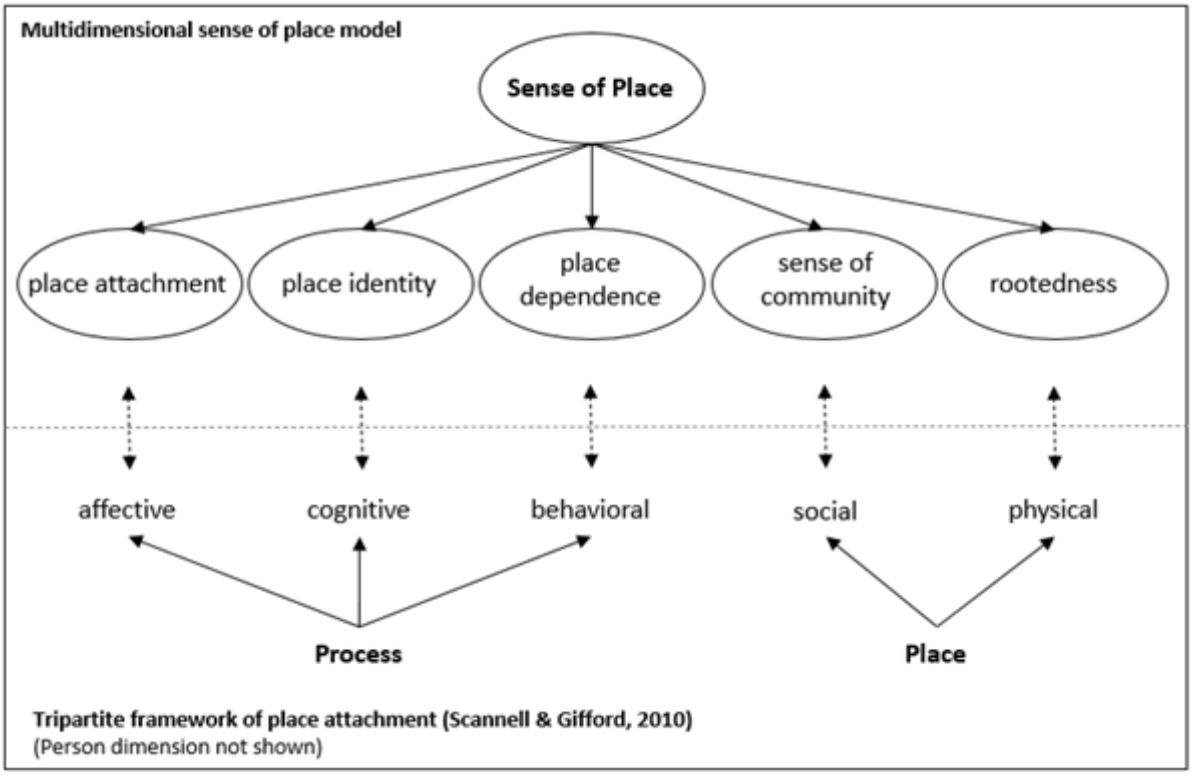
This wealth of concepts related to place attachment translates, as seen above, into different structures of this construct, namely 1) a unidimensional construct related with place identity and place dependence; 2) a multidimensional construct with three to five factors; or 3) a dimension of a more general concept, such as sense of place (see Hidalgo, 2013 and references therein). Despite the multitude of approaches to conceptualize and operationalize place attachment, systematic theories of place attachment are still largely missing. To fill that gap, Scannell and Gifford (2010) reviewed and synthetized the various definitions of place attachment into a three-dimensional organizing framework that considers person (individual or group level), place (social and physical characteristics), and process (place attachment expressed as affect, cognition, or behaviour) as the primary dimensions of place attachment.

1.5 The Present Study: Objectives and Rationale

Hidalgo (2013) has advised that researchers in this field should halt the proliferation of proposals and attempt to reach a consensus on place attachment conceptualisation and operationalisation. However, we aim to contribute further to the discussion on the structure and measurement of place attachment, by developing and testing a new instrument to measure sense of place as an overarching multidimensional construct. Our rationale for doing so was to expand on Scannell and Gifford's (2010) tripartite framework of place attachment and Jorgensen and Stedman's (2001) tripartite model of sense of place, given that concepts such as sense of community and rootedness have not been well defined or operationalised in these models.

Our hypothetical model is based on Jorgensen and Stedman's (2001) model of sense of place, but we added rootedness and sense of community as dimensions on the same level as place attachment, place identity, and place dependence (Figure 1). The latter three dimensions can be considered as the affect, cognitive, and behaviour components of the process dimension in Scannell and Gifford's (2010) tripartite model. Sense of community and rootedness were added to express the place dimension in the tripartite model, in accordance with Riger and Lavrakas (1981), who suggested a social bonding dimension consisting of social ties, as well as a physical rootedness dimension predicted by length of residence and plans to stay. Therefore, in our study, rootedness is conceptualized as a time-related dimension influenced by residence length, memories, and intergenerational transmission (Michel-Guillou & Meur-Ferec, 2017), and sense of community as a feeling of belonging and connectedness to a group (McMillan & Chavis, 1986). Specific constructs that could be incorporated on Scannell and Gifford's (2010) person dimension were not included in our model, so as not to over-represent it, as most indicators for each construct are already on the individual level, and some on the group level.

Figure 1. Hypothetical Multidimensional Model of Sense of Place and Comparison with the Tripartite Framework of Place Attachment Proposed by Scannell and Gifford (2010)



Source: Own Elaboration

Our approach involved three studies with Portuguese samples. In study 1, we developed the Sense of Place Scale to measure the five proposed dimensions of sense of place (place attachment, place identity, place dependence, sense of community, and rootedness) and explored its dimensionality using principal component analysis. In study 2, we tested different measurement models based on the factorial structure obtained in study 1, using confirmatory factor analysis. Finally, in study 3 we assessed the test-retest reliability of the final Sense of Place Scale.

2. STUDY 1: DIMENSIONALITY OF THE SENSE OF PLACE SCALE

The first study aimed to develop a new instrument to measure sense of place, conceptualized as an overarching construct consisting of five dimensions: place attachment, place identity (distinctiveness, self-esteem, self-efficacy, place-referent continuity, place-congruent continuity), place dependence, sense of community (membership, influence, integration and fulfilment of needs, shared emotional connection), and rootedness (temporality, memories, heritage, and intergenerational transmission) (Figure 1). The factorial structure was investigated using factor analysis with varimax rotation.

2.1 Methods

2.1.1. Instrument, Participants, and Procedure

A 42-item scale in Portuguese was created to evaluate sense of place in non-specific places, i.e., the questionnaire asked respondents to consider in their answers the place to which they feel an emotional connection, be it a neighbourhood, a location, or a city. Some

questionnaire items were created for this study, whereas others were modified from previous research (Williams & Vaske, 2003; Stokburger-Sauer, 2011; Sakip et al., 2012). Replicate and positive/negative items were included to detect random answers and to prevent acquiescence bias. A back-translation procedure was used to adapt items into Portuguese. Item order was randomized and a 5-point rating scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used. Participants were recruited through non-probability sampling techniques, using a snowball sample obtained through social media; no compensation was given to participants for their participation in the study. Participants responded to an online version of the questionnaire where responses to all items were mandatory. A total of 466 participants completed the online questionnaire; after removal of multivariate outliers (see next section), a final sample of 432 participants was obtained. Of these, 94.9% are female and 5.1% male, with a mean age of 39.2 ± 8.6 years, ranging between 18 and 73 years old. More than 87% of respondents have higher education studies and the majority lives in Lisbon (35.4%), Porto (13.7%) and Setúbal (10.0%) districts (includes urban, suburban, and rural dwellers).

2.1.2 Data Analyses

Before proceeding to factor analysis using the principal components method, several data screening methods were used to evaluate data's appropriateness for a factor analysis. Data normality was assessed by computing skewness and kurtosis for each scale of SoPS; absolute values higher than 2 for skewness and 7 for kurtosis are indicative of significant deviations from normality (West et al., 1995). Multivariate outliers were identified and subsequently removed using Mahalanobis distance. Descriptive statistics (mean, standard deviation, skewness, and kurtosis) were calculated for SoPS and each sub-scale. Scale reliability was evaluated using Cronbach's alpha; alpha coefficients higher than 0.80 indicate good reliability or internal consistency (Nunnally & Bernstein, 1994). Mean inter-item correlations (MIIC) were also calculated to assess homogeneity; MIIC between 0.20 and 0.40 suggest acceptable homogeneity (Briggs & Cheek, 1986).

A factor analysis was conducted to identify underlying dimensions from the data set. Factor rotation was used to help discriminate between factors; given that some components may not be correlated and to maximise the dispersion of loadings within factors (Field, 2009), an orthogonal rotation (varimax) that keeps factors independent was used. Before performing the PCA different criteria were used to evaluate item factorability, namely inter-item correlations, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Regarding inter-item correlations, all items should have at least one correlation >.3 with another item (Field, 2009); items that did not meet this criterion were removed. Kaiser's (1974) criteria for KMO values were used to assess data factorability; KMO > 0.7 was considered good. Bartlett's tests the null hypothesis that the original correlation matrix is an identity matrix (Field, 2009), i.e., all correlations are zero, meaning that the variables are not related and factor analysis is not appropriate; therefore, Bartlett's test should be significant ($p < .05$) to proceed with factor extraction.

Further analyses included the examination of the diagonals of the anti-image correlation matrix (KMO for individual variables) and the communalities to assess if each item shared common variance with other items. Finally, different criteria (eigenvalue, percentage of variance explained, visual inspection of the scree plot, and interpretability) were taken into consideration to decide on the number of factors to retain. A parallel analysis was also conducted to evaluate the number of factors to be extracted, using Monte Carlo PCA for parallel analysis software (Watkins, 2006). All other analyses were performed with IBM SPSS Statistics v. 25.

2.2 Results

An initial data screening based on skewness and kurtosis of each sub-scale of SoPS suggested no deviations from normality. A total of 34 multivariate outliers were identified and removed from the data set, resulting in a final sample of 432 cases. The factorability of the 42 items of SoPS was then examined. Inspection of the correlation matrix showed that all 42 items correlated >.3 with at least another item. KMO was .904 and Bartlett's test of sphericity was significant ($X^2(946) = 13394.6$, $p < .001$). The diagonals of the anti-image correlation matrix were all >.7.

After a five-factor forced extraction based on the hypothetical model of sense of place with five dimensions (place attachment, pace identity, place dependence, sense of community, rootedness), the communalities of seven of the forty-two items were <.4, indicating that these items did not share common variance with other items; these items were removed, and another extraction was forced. A thorough analysis of the rotated component matrix and factor interpretation suggested the removal of three more items, either because loadings were small (<.5) or to aid interpretation of each factor. The items removed were the three items intended to measure the self-efficacy sub-dimension of place identity (e.g., "*My daily life here is easier than if I live elsewhere*"), two items for the place-referent continuity sub-dimension of place identity (e.g., "*I don't care if I live here or elsewhere*"), two items of the integration and fulfilment of needs sub-dimension of sense of community (e.g., "*I don't identify with the community that lives here*"), one item for place dependence ("*The things I do here I could also do with the same satisfaction elsewhere*"), and two items of rootedness, one for temporality ("*I don't even know what it is like to live elsewhere*") and one for memories ("*I don't have good memories of this place*").

A final four-factor structure with 32 items explained 61.57% of the total variance; items and respective factor loadings are presented in Table 1. However, this solution is different from the initially proposed structure of sense of place (Figure 1); four dimensions were identified as place, people, time, and self (Table 1). Items for distinctiveness and self-esteem sub-dimensions of place identity were included in the factor *self*, items for temporality and intergenerational transmission of rootedness were placed in the *time* factor, and items of sense of community were included in the *people* factor. The *place* factor is the largest and includes items of place attachment, place identity (continuity), place dependence, and rootedness (memories).

Descriptive statistics and internal reliability for the final, 32-item Sense of Place Scale are presented in Table 2 (the Portuguese items can be found in the Appendix 5). Overall, the scale and its sub-scales (people, place, time, self) presented high internal consistency, with Cronbach's alpha >0.8. MIIC varied between 0.2 and 0.6, indicating that some scales exceeded the recommended upper limit of 0.4. Skewness and kurtosis absolute values (<2.00) indicated no deviations from normality.

Table 1. Principal component analysis of the Sense of Place Scale (English version; see Supplementary Material for the original Portuguese version), with factor loadings for each item, eigenvalues and percentage of variance explained for each factor, and indication of the dimension and sub-dimension in which each item was initially included according to the proposed hypothetical five-factor model of sense of place (see Figure 1). R = reverted item.

Factor/item	Factor loading	Item previously included in
Place (eigenvalue = 10.06; variance explained = 31.43%)		
1. I am very attached to this place.	.77	place attachment
2. This place is important to me.	.74	place attachment
3. I feel more comfortable here than in any other place.	.77	place attachment
4. I want to keep living here.	.79	p. identity – continuity
5. I feel well integrated in this place.	.76	p. identity – continuity
6. I feel that I fit in here.	.81	p. identity – continuity
7. I feel that this place is a part of me.	.79	p. identity – continuity
8. This place is the best place for what I like to do.	.70	place dependence
9. I get more satisfaction out of being here than in any other place.	.77	place dependence
10. I have good memories of this place.	.62	rootedness-memories
11. This place brings me bad memories. R	.61	rootedness-memories
People (eigenvalue = 4.32; variance explained = 13.50%)		
12. I know the name of most of the people who live near me.	.73	SC – membership
13. I feel like everyone knows each other here.	.63	SC – membership
14. I don't know the name of most of the people who live near me. R	.67	SC – membership
15. I value the opinion of my neighbors and community.	.60	SC – influence
16. Whenever there are problems regarding this place, the neighbors/community join to solve the problems.	.74	SC – influence
17. The community doesn't come together to try and solve the problems. R	.78	SC – influence
18. I can trust the members of this community.	.69	SC – integrat. fulfil. needs
19. People here care about each other.	.69	SC – emotional connection
20. Here, we help each other.	.81	SC – emotional connection
21. In this community, it's every man for himself. R	.82	SC – emotional connection
Time (eigenvalue = 2.99; variance explained = 9.36%)		
22. I've been living here for a long time.	.71	rootedness – temporality
23. I feel life all my life was spent here.	.77	rootedness – temporality
24. I live here because my family (parents, grandparents) also live here.	.88	rootedness – intergen. trans.
25. Most of my family is from here.	.86	rootedness – intergen. trans.
26. Most of my family also lives here.	.86	rootedness – intergen. trans.
Self (eigenvalue = 2.33; variance explained = 7.29%)		
27. I am more similar to the other people who live here, than people from other places.	.76	p. identity – distinctiveness
28. People who live in other places are very different from me.	.75	p. identity – distinctiveness
29. People who live here are more similar to me than people who live in other places.	.82	p. identity – distinctiveness
30. When someone criticizes the place where I live, it feels like a personal insult.	.56	p. identity – self-esteem
31. When someone praises the place where I live, it feels like a personal compliment.	.46	p. identity – self-esteem
32. I really don't like when I hear someone criticizing the place where I live.	.47	p. identity – self-esteem

Source: Own Elaboration

Table 2. Internal consistency (Cronbach's alpha), homogeneity (mean inter-item correlations, MIIC) and descriptive statistics (mean, standard deviation SD, skewness, and kurtosis) for the Sense of Place Scale (SoP) and sub-scales (place, people, time, self), obtained in Study 1. n = 432.

Scales	Alpha	MIIC	Mean	SD	Skewness	Kurtosis
SoP	.915	.267	3.10	0.60	-0.04	0.03
Place	.935	.567	3.63	0.82	-0.47	-0.31
People	.900	.488	2.81	0.76	0.05	-0.48
Time	.897	.629	2.85	1.26	0.28	-1.25
Self	.803	.402	2.82	0.75	-0.02	0.03

Source: Own Elaboration

3. STUDY 2: CONFIRMATORY FACTOR ANALYSIS

Study 2 aimed to test different measurement models of sense of place based on the 4-factor structure obtained in study 1, using confirmatory factor analysis with maximum likelihood estimation. Three measurement models were tested: model 1) four first-order factors (place, people, time, self) and one second-order factor (sense of place); model 2) four correlated first-order factors; and model 3) one first-order factor (sense of place). The three models were tested unconstrained (A) and modified according to modification indices (B).

3.1 Methods

3.1.1 Participants and Procedure

The 32-item Sense of Place Scale (SoPS) obtained in study 1 was administered to a different sample of participants. The Oviedo Infrequency Scale was interspersed in the SoPS to detect and remove participants that may have responded randomly, pseudorandomly, or dishonestly to the questionnaire (Fonseca-Pedrero et al., 2009). A snowball sample was collected through social media and participants responded to an online version of the questionnaire, where responses to all items were mandatory. Paper-and-pencil questionnaires were also administered to University students. A total of 359 participants completed the questionnaire (161 online and 198 in paper); after removal of multivariate outliers (n = 36) and participants who responded randomly, pseudorandomly, or dishonestly (n = 2), a final sample of 321 respondents was obtained. Of these, 72.6% are female and 27.4% male; 52.8% of respondents were between 18 and 35 years old, and 32.1% were between 36 and 50. More than 58% of respondents have higher education studies and the majority lives in Faro (47.5%) and Lisbon (16.1%) districts (includes urban, suburban, and rural dwellers).

3.1.2 Data Analysis

Data screening to examine the shape of data distribution and the presence of multivariate outliers was conducted prior to the CFA. Skewness and kurtosis were calculated to evaluate normality, and multivariate outliers were identified and removed, as described in section 2.1.2. As CFA requires complete data sets, missing values (0.26%) in the paper questionnaires were estimated through multiple imputation using the expectation maximization algorithm (McLachlan & Krishnan, 1997).

Several fit indices were used to test model fit, namely the normed chi-square (X^2/df), the root mean square error of approximation (RMSEA), the standardized root mean square residual (SRMR), the comparative fit index (CFI), and the consistent akaike information criterion (CAIC). X^2/df between 1 and 5 (Jöreskog, 1970), RMSEA < 0.06 and SRMR < 0.08 (Hu & Bentler, 1999), and CFI ≥ 0.90 (Carlson & Mulaik, 1993) are considered as indicators of good model fit. When comparing models, lower CAIC values reflect the better-fitting one (Schermelleh-Engel et al., 2003). In addition, confidence intervals for RMSEA were computed to assess the precision of the estimates.

Finally, the factors' convergent related validity and discriminant validity were also assessed. The average variance extracted (AVE) and composite reliability (CR) were computed to evaluate convergent related validity, i.e., to assess if the items of each factor converge on that factor; AVE ≥ 0.5 and CR ≥ 0.7 are indicative of construct convergent related validity (Hair et al., 2005; Marôco et al., 2014). Discriminant validity was evaluated as proposed by Fornell and Larcker (1981), to assess if different factors evaluate different constructs; two constructs show discriminant validity if both AVE are higher than the determination coefficient between them. All analyses were performed with IBM SPSS Statistics v. 25 and AMOS v. 22.

3.2 Results

Skewness and kurtosis values suggested no deviations from normality. Fit indices for the three measurement models tested are presented in Table 3. Unconstrained models 1A, 2A and 3A presented unacceptable fit. Post-hoc modifications, based on the modification indices, were performed to obtain better fitting and parsimonious models. Model fit was improved by adding co-variances to pairs of errors in the same factor. For models 1B, 2B and 3B, seventeen, fifteen and forty-nine co-variances were added, respectively. These modifications improved fit indices for all models, but model 1B (Figure 2) presented the best fit, with X^2/df (2.362), SRMR 0(.0792), RMSEA (0.065) and CFI 0(.02) values within acceptable ranges. Fit indices for models 2B (X^2/df = 2.502, SRMR = 0.1042, RMSEA = 0.069, CFI = 0.892) and 3B (X^2/df = 2.857, SRMR = 0.1055, RMSEA = 0.076, CFI = .875) suggest a poorer fit. Comparison of CAIC values between the three models (model 1B = 1622.103; model 2B = 1684.053; model 3B = 1946.759) further indicate the model 1B is the most adequate.

Composite reliability for each of the four factors (place, people, time, self) was >0.8, and the average variance extracted was >0.5, suggesting a good convergent-related validity (Table 4). Comparison of AVE for each factor and determination coefficients between factors indicated divergent validity between all factors, given that AVE (range 0.43 - 0.67) was higher than R^2 (range 0.070 - 0.329, n = 321) for all cases.

Table 3. Fit indices for different measurement models of the Sense of Place Scale. Model 1) four first-order factors (place, people, time, self), one second-order factor (sense of place); model 2) four correlated first-order factors; model 3) one first-order factor (sense of place). Model A) unconstrained, model B) modified according to modification indices. The better-fitting model is in bold.

Model	X^2/df	SRMR	RMSEA (90% CI)	CFI	CAIC
1A	3.923	.103	.096 (.091-.100)	.781	2266.398
1B	**2.364**	**.079**	**.065 (.060-.070)**	**.902**	**1631.671**
2A	3.935	.103	.096 (.091-.100)	.782	2276.214
2B	2.502	.104	.069 (.063-.074)	.892	1684.053
3A	7.623	.146	.144 (.139-.148)	.500	3971.430
3B	2.857	.106	.076 (.071-.081)	.875	1946.759

Note: X2/df – chi-square/degrees of freedom; SRMR – standardized root mean square residual; RMSEA – root mean square error of approximation; CFI – comparative fit index; CAIC – consistent Akaike information criterion; 90% CI – 90% confidence interval

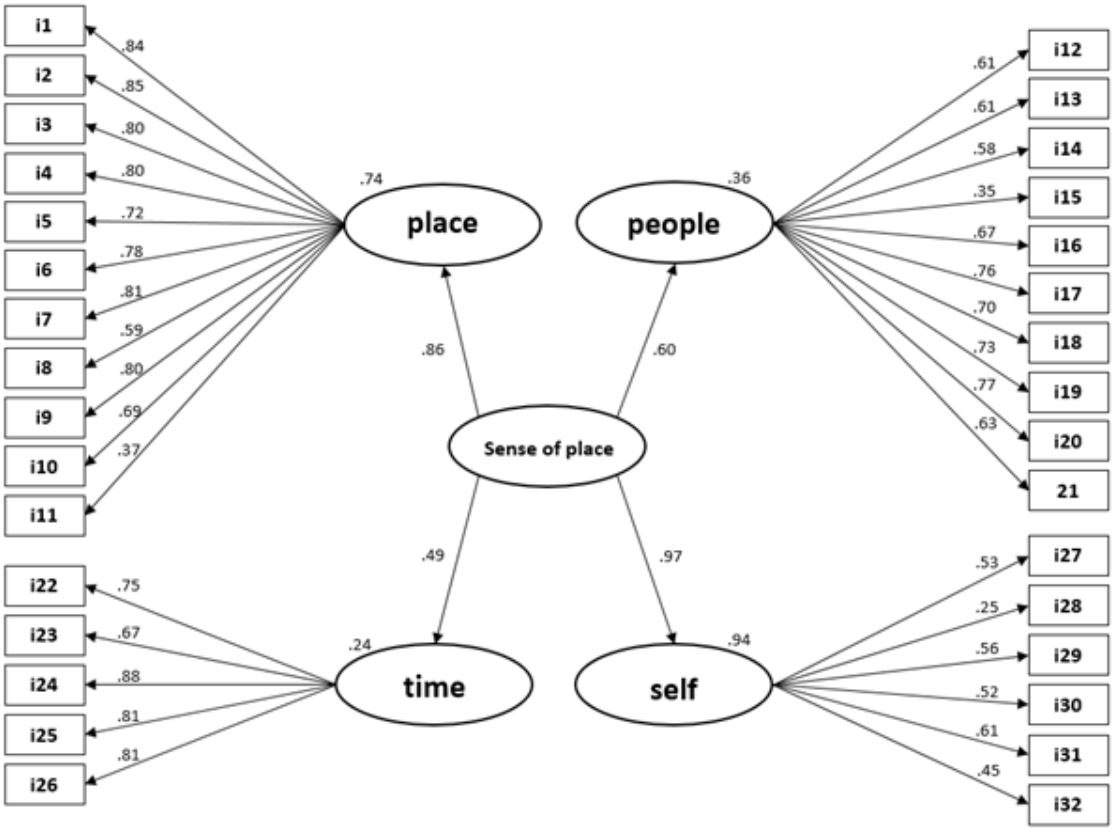
Source: Own Elaboration

Table 4. Composite reliability (CR) and average variance extracted (AVE) for each factor of SoPS

Factor	CR	AVE
place	.93	.54
people	.91	.51
time	.91	.67
self	.81	.43

Source: Own Elaboration

Figure 2. Standardized estimates for the better-fitting model of sense of place (model 1B), consisting of four first-order factors (place, people, time, and self) and one higher-order factor (sense of place), obtained through confirmatory factor analysis.



Source: Own Elaboration

4. STUDY 3: TEST-RETEST RELIABILITY OF THE SENSE OF PLACE SCALE

Study 3 aimed to analyse the test-retest reliability and agreement of the 32-item Sense of Place Scale.

4.1 Methods

A 2-month test-retest design was used to evaluate the temporal stability of the 32-item Sense of Place Scale (obtained in study 1), assuming that participants would not remember their previous responses and that their level of emotional bonds with their place of attachment would not change in this time interval. Paper-and-pencil questionnaires were administered to a convenience sample of University students in October and December 2017. On both sampling occasions, participants were asked to identify the questionnaire with a specific code, so that pairing of questionnaires would be possible. A total of 166 students completed the questionnaires at both moments. Participants were asked for how long they have been living in the place they referred to in the questionnaire, given that many are dislocated from their family home and living close to the University temporarily and for a short period of time. For the test-retest, we only considered participants that were living in a given place for 5 or more years. After removal of multivariate outliers (as described in section 2.1.2), a final sample of 97 participants was thus obtained; of these, 78.9% are female and 21.9% male, and the majority (94.3%) are between 18 and 35 years old. Approximately 55% of the

participants reside in Faro district, and 71.9% are undergraduate students and 28.2% are graduate students.

Test-retest reliability and agreement were evaluated as suggested by Berchtold (2016). Pearson's correlation coefficient was used to evaluate reliability between the two moments of questionnaire administration, and Lin's concordance correlation coefficient (Lin, 1989) was used to evaluate agreement, for the whole SoPS and for each of the four dimensions (place, people, time, self). Analyses were performed with IBM SPSS Statistics v. 25.

4.2 Results

Test-retest reliability at 2 months for SoPS was good, with $r = 0.790$ ($p < 0.001$). Test-retest reliability for the four dimensions of SoPS were all significant (p <0 .001), and excellent for the *place* dimension (0.833), good for *people* (0.765) and *time* (0.646) dimensions, and moderate for the *self* dimension (0.544). Lin's concordance correlation coefficient for SoP was 0.813 for the whole scale, 0.833 for *place*, 0.768 for *people*, 0.710 for *time*, and 0.786 for *self*.

5. DISCUSSION

In this study, we developed a new multidimensional model of sense of place, an overarching construct with four dimensions: place, people, time, and self. We also validated a 32-item self-report questionnaire to measure this construct and its quadripartite structure.

The *place* dimension had the highest explanatory power; this factor is comprised of eleven items that reflect different facets of the relationship between the individual and the place. Items 1 to 7 express the emotional attachment to the place and the desire to never leave it, in accordance with Hidalgo and Hernández's (2001) definition of place attachment as an affective bond characterized by the desire to maintain closeness to the place of attachment. Indeed, items 1-3 were intended to measure the emotional bond, whereas items 4-7 were meant to measure continuity as a sub-dimension of place identity. However, all items carry emotional content, globally expressing the affective bond between the individual and the place. Functional attachment is measured by item 8, which reflects the importance of the place in supporting important or desired activities and goals. Item 9, adapted from Williams and Vaske's (2003) place dependence questionnaire, was intended to measure place dependence, but this item seems to be more similar to items with emotional content (items 1-7) rather than expressing a functional attachment to the place. The attachment measured by items 1-9 is associated with the memories of the place, measured by items 10 and 11, as these items refer specifically to good/bad memories, hence bringing up emotional content. Inter-item correlations are high for the eleven items, further suggesting that the different theoretical concepts of attachment, dependence, and continuity are closely related and should form one dimension expressing the relationship between the individual and a specific place. Overall, this *place* dimension is equivalent to place attachment as an emotional bond between people and specific places.

Other models have considered place attachment as a unidimensional construct that expresses an emotional connection with the place. The components of this connection, however, vary among authors. For instance, Lewicka (2005) included feelings of security in the place, missing the place, and being proud of the place in a unidimensional place attachment scale. Another unidimensional model of place attachment included general, social and physical attachments to the house, to the neighbourhood and to the city (Hidalgo & Hernández, 2001). Contrasting with these and other models that consider place attachment, place identity and place dependence as separate dimensions (Jorgensen

& Stedman, 2001; Hammitt et al., 2006; Raymond et al., 2010), our analysis suggests that place attachment, identity and dependence may exist as facets of a place-related dimension, rather than independent constructs.

The *people* dimension includes items that were intended to measure specific facets of sense of community, namely membership, influence, integration and fulfilment of needs, and shared emotional connection, according to McMillan and Chavis' (1986) model. Only two of the original twelve items were removed, as suggested by the principal component analysis. Other than that, the *people* factor coincides with the sense of community construct, reflecting a feeling of familiarity and closeness to the members of the community (items 12-14), a feeling of valorisation of the community (items 15-17), a feeling of trust between community members (item 18), and a sense of concern for community members (items 19-21).

Although many models of people-place relationships emphasize a bi-dimensional view of place attachment, with identity and dependence as dimensions, many others have included a social-cultural dimension that refers to the characteristics of the inhabitants of the place and how those people influence place attachment. For instance, Riger and Lavrakas (1981) have identified a sense of community comprised by social bonding between individuals and their neighbours, and behavioural rootedness, associated with length of residence. Raymond et al. (2010) included items to measure friend bonding/belongingness that reflect social ties between the individual and other people from the place. McMillan and Chavis' (1986) model of sense of community has provided a framework for the evaluation of this construct, either independently from place attachment or as a dimension of place attachment. For instance, Peterson, Speer, and McMillan (2008) provided empirical support for a sense of community scale based on the multidimensional model of sense of community. Other studies have used scales based on this model to evaluate sense of community in specific settings (Sakip et al., 2012; El-Ekhteyar & Furlan, 2016). McMillan and Chavis' (1986) sense of community model is indeed very robust, expressing a well differentiated construct that, in our proposed model, can be considered as a dimension of sense of place.

The social context of place attachment has been conceptualized and operationalized in different ways; many models include rootedness and time-related variables as components of community attachment. However, our results suggest that a *time* dimension is separate from the community or *people* dimension. This temporal dimension is related not only to the length of residence at the place, expressed by items 22 and 23, but also to an intergenerational transmission, assessed by items 24-26. The importance of length of residence and intergenerational transmission for the development of place attachment has also been suggested by other scholars. For instance, Lin and Lockwood (2014) observed that locals and long-term non-local visitors of protected areas in Australia developed strong emotional bonds when their families had resided in or visited the areas for generations. Positive correlations between length of residence and place attachment and identity were found in Israeli cities' residents (Casakin et al., 2015), and in natives and non-natives of the Canary Islands (Hernández et al., 2007). A family bonding dimension was also considered by Raymond et al. (2010), reflecting the importance of intergenerational transmission for the development of place attachment; for instance, family bonding item "*I live in the Adelaide and Mount Lofty Ranges because my family is here*" is similar to our items 24-26. Other authors have considered length of residence as a predictor of place attachment (Anton & Lawrence, 2014; Scannell & Gifford, 2014; Karacor & Parlar, 2017) rather than its component; nonetheless, strong relationships between the two variables are repeatedly found (see review by Lewicka, 2011 and references therein).

Finally, the *self* dimension includes items intended to measure the distinctiveness and self-esteem sub-dimensions of place identity. The six items are more internally focused than

items in the other dimensions, that reflect relationships with the place itself, the people in the place, and the time spent in the place. Items 27-29 compare the self with other people, reflecting the self's desire to be different from others; this emphasis on comparison between different types of people is labelled as place identification by Twigger-Ross and Uzell (1996). Items 30-32 reflect the self-esteem associated with the place, i.e., an individual's positive or negative feelings about themselves associated to the place, rather than a positive or negative evaluation of the place. These items mostly express a sense of pride for the place, identified as the self-esteem component of place identity (Twigger-Ross & Uzell, 1996). The continuity and self-efficacy components of place identity were also measured in the first SoP questionnaire (study 1), but these items were either removed or included in another SoP dimension. Indeed, the three items intended to measure self-efficacy were removed due to their low communalities, suggesting that the feeling of self-efficacy is not associated with attachment to a specific place. Items measuring continuity loaded on the *place* factor, given that these items refer to the relationships between the individual and the place, specifically the fit between the place and the individual, and the desire never to leave the place. These items seem more externally focused than distinctiveness and self-esteem items, hence their high loadings on the *place* factor.

The identification of an overarching sense of place construct with four dimensions has some important implications for place-people research, in agreement with other theoretical frameworks that consider sense of place an overarching or second-order factor. However, Jorgensen and Stedman (2001) concluded that a one-factor model (sense of place) was better fitting than their initial proposal of a three-factor structure (place attachment, place identity, place dependence) for sense of place. Conversely, our results suggest that sense of place is a second-order factor composed by four first-order factors (place, people, time, self). Analysis of convergent and divergent validity confirmed the empirical distinctions between the four factors, highlighting their inter-independence.

People-place relationships is a highly interdisciplinary field of research, and a myriad of theoretical frameworks of place attachment are available throughout the literature, lacking, however, corresponding empirical advancements (Lewicka, 2011). Other constructs may be components of an overarching "sense of place", and each may increase the explanatory power of people-place models. For instance, a "place discovered" variable that reflects an individual's agency to become attached to the place, which is equivalent to Hummon's (1992) ideological rootedness (Lewicka, 2013b), was not included in our instrument. Our proposal shows other limitations, of which the most striking is probably the strongly biased sample in terms of gender and education, with most respondents being female and highly educated. Nonetheless, the relationship between gender and education, and place attachment and related constructs, is not well established (e.g., Lewicka, 2013b; Bonaiuto, Mao, Roberts, Psalti, & Ariccio, 2016).

6. CONCLUSION

Proposing a new model of sense of place and a new instrument to measure this elusive construct is not a straightforward task. To conclude our article, we will use "the good, the bad and the ugly" framework to address the strengths and limitations of our model and instrument. Firstly, we begin with the good. Contrary to other place attachment/sense of place instruments, our Sense of Place Scale is not location-specific; therefore, this instrument has potential for a broad range of applications, as it can be used as is, or it can be adapted to specific locations. Our model also provides a new factorial structure of sense of place; by

operationalising sense of place in terms of place, people, time, and self, we contribute to its validity as a psychological construct.

Secondly, the bad. Although model fit is within an acceptable range, it is not as good as we would like, and an adequate fit was only obtained with post-hoc modifications. In addition, acquiescence bias might be a problem in the application of the instrument, as most items are worded in the same direction. A cross-cultural validation is also necessary, particularly to corroborate our claim of a broad applicability of the SoP instrument.

Third and last is the ugly. We are aware that a myriad of conceptualisations and operationalisations of sense of place/place attachment are already in place. Despite the important contributions of our study to the arena of people-place research, it also adds more entropy to an already chaotic environment. Nevertheless, it may also spark further discussion on place attachment theory and provide avenues of future research.

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Supplementary Material

Portuguese (original) items of the final 32-item Sense of Place Scale obtained in study 1 and questionnaire instructions. Reverted items are indicated with R.

As questões seguintes relacionam-se com o sítio onde vive. Assim, para responder a estas questões, considere o sítio onde vive; pode ser a sua cidade, bairro, ou uma zona da localidade, mas escolha um sítio ao qual se sinta emocionalmente ligado. Por favor, leia cada frase cuidadosamente e escolha a opção que melhor reflete a sua opinião, usando a escala seguinte:

1 = discordo fortemente
2 = discordo
3 = não concordo nem discordo
4 = concordo
5 = concordo fortemente

Lugar

1. Sinto-me muito ligado a este lugar.
2. Este sítio é muito importante para mim.
3. Sinto-me mais confortável aqui que noutros sítios.
4. Quero continuar a viver aqui.
5. Sinto-me bem integrado neste sítio.
6. Sinto que combino com este sítio.
7. Sinto que este lugar faz parte de mim.
8. Este sítio é o melhor sítio para fazer as coisas de que gosto.
9. Dá-me mais prazer estar aqui do que noutro sítio qualquer.
10. Tenho boas memórias deste sítio.
11. Este sítio traz-me más recordações. R

Pessoas

12. Conheço pelo nome a maioria das pessoas que vivem ao pé de mim.
13. Sinto que nos conhecemos todos aqui.
14. Não sei o nome da maioria das pessoas que vivem ao pé de mim. R
15. Valorizo a opinião dos meus vizinhos e da minha comunidade.
16. Quando temos problemas relativamente a este sítio, os vizinhos/comunidade juntam-se para os resolver.
17. A comunidade não se junta para resolver os problemas. R
18. Posso confiar nos membros desta comunidade.
19. As pessoas daqui preocupam-se umas com as outras.
20. Aqui, ajudamo-nos uns aos outros.
21. Nesta comunidade, é cada um por si. R

Tempo

22. Vivo aqui há muito tempo.
23. Sinto que toda a minha vida foi passada aqui.
24. Vivo aqui porque a minha família (pais, avós) já vivia aqui.
25. A maior parte da minha família é daqui.
26. A maior parte da minha família também vive aqui.

Self

27. Sou mais parecido com as outras pessoas que vivem aqui, do que com pessoas que vivem em locais diferentes.
28. As pessoas que vivem noutros sítios são muito diferentes de mim.
29. As pessoas que vivem neste sítio são mais parecidas comigo do que pessoas que vivem noutros locais.
30. Quando alguém critica o local onde vivo, sinto-me como se me estivessem a insultar.
31. Quando alguém elogia o local onde vivo, sinto-me como se fosse um elogio a mim próprio.
32. Não gosto nada quando ouço alguém a criticar o local onde vivo.

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Authors

Benjamin A. Mosley
Gabriela Gonçalves
Jorge Ramos
M. Alexandra Teodósio
Marisa Macuéria
Patrícia Nogueira
Rita B. Domingues
Saúl Neves de Jesus
Silvana Faria
Vânia Baptista

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