REM

Profiling Visitors at the Desertas Islands Nature Reserve

INTERNSHIP REPORT

Diana Solange Sousa Pereira
MASTERS IN ECOTOURISM

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ORIENTATION
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The past year has been an exciting journey, dedicated to the last step in finishing my master in ecotourism at the University of Madeira. I would like to express my sincere gratitude to those who helped me during this period.

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ABSTRACT

This report aims to obtain a master's degree in ecotourism. It reflects a set of skills developed during the internship at the Institute of Forests and Nature Conservation (IFCN), IP-RAM, that manages the protected areas of Madeira's Autonomous Region.

Sustainable development is the most significant concern and goal of ecotourism to improve the population's quality of life and guarantee future generations. A way to guarantee a sustainable future is by creating protected areas, which play a significant role in conserving nature. One of the instruments used to define protected areas and usage policies is to characterize their visitors to understand how protected areas are used.

The Desertas Islands Nature Reserve is home to important ecological, natural and landscape values, and the last report on the characterization of its visitors is dated from 2010-2011. Therefore, a new study was carried out in the form of a questionnaire with 20 questions, with the main goal of determining the visitors' profile of this reserve, their satisfaction and opinions related to its management. Subsequently, the results obtained were compared with the previous results.

The questionnaire was carried out between July and September 2020, in Funchal and Machico's Ports, on board of the vessels, and online. A total of 385 anonymous questionnaires were collected, of which 204 were completed by Portuguese and 181 by foreign tourists. After statistical analysis, it was possible to conclude that the visitors are mostly women, between 19 and 40 years old, of Portuguese nationality and higher education.

The typical tourist visits for the first time with family, by a maritime tourism operator. They spend less than 3 hours on land in Deserta Grande, and the most popular activity is wildlife observation. Visitors see the Nature Reserve classification as an important factor and access this information before travelling via the internet, ending up recommending this visit. The observation of wildlife and the quality of seawater were the most important aspects rated for the trip. The aspect that caused the greatest satisfaction was the cleanliness of the reserve, followed by the information presented on the trail.

Keywords: Ecotourism, Marine Protected Area, Desertas Islands Nature Reserve, Visitors' profile, Conservation of Nature.

RESUMO

A elaboração do presente relatório visa a obtenção do grau de mestre em Ecoturismo. Este reflete um conjunto de competências desenvolvidas durante o estágio no Instituto das Florestas e Conservação da Natureza, IP-RAM instituição que gere as áreas protegidas da Região Autónoma da Madeira.

O desenvolvimento sustentável é a maior preocupação e objetivo do ecoturismo, de maneira a melhorar a qualidade de vida das populações e garantir um futuro às gerações vindouras. Uma forma de garantir esse futuro é através da criação de áreas protegidas, que desempenham um papel significativo na conservação da natureza. Um dos instrumentos utilizados para definir as áreas protegidas e as políticas de utilização, passa pela caracterização dos seus visitantes, de forma a entender como são utilizadas as áreas protegidas.

A Reserva Natural das Ilhas Desertas possui importantes valores ecológicos, naturais e paisagísticos, sendo que o último relatório de caraterização dos seus visitantes realizado pelo IFCN, IP-RAM é de 2010-2011. Deste modo, realizou-se um estudo em forma de questionário com 20 perguntas com o objetivo principal de determinar o perfil dos visitantes desta reserva, a sua satisfação e as opiniões relativas à sua gestão. Posteriormente, foi efetuada a comparação dos resultados obtidos com os resultados anteriores.

O preenchimento dos questionários foi realizado entre Julho e Setembro de 2020, nos Portos do Funchal e de Machico, a bordo de embarcações, bem como online. Foram recolhidos 385 questionários anónimos, dos quais 204 foram preenchidos por portugueses e 181 por estrangeiros. Após uma análise estatística, foi possível concluir que os visitantes são maioritariamente mulheres, entre os 19 e os 40 anos, de nacionalidade portuguesa e com ensino superior.

O indivíduo típico, visita pela primeira vez com a família, por uma operadora de turismo marítimo. Na Deserta Grande, passam menos de 3 horas em terra e a atividade popular é a observação da vida selvagem. Os visitantes veem a classificação da Reserva Natural como um fator importante, e acedem a informação antes da viagem pela internet, acabando por fim recomendar esta visita. A observação da vida selvagem e a qualidade da água do mar foram os aspetos mais importantes classificados para a realização da viagem. O

aspeto que causou maior satisfação foi a limpeza da reserva, seguido pela informação exposta no percurso.

Palavras-chave: Ecoturismo, Área Marinha Protegida, Reserva Natural das Ilhas Desertas, Perfil dos visitantes, Conservação da Natureza.

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LIST OF ABBREVIATIONS

ARM	Autonomous Region of Madeira
CEETO	Central Europe Eco-Tourism
DI	Desertas Islands
DINR	Desertas Islands Nature Reserve
GDP	Gross Domestic Product
IFCN	Instituto das Florestas e da Conservação da Natureza, IP-RAM
IUCN	International Union for Conservation of Nature
MPA	Marine Protected Areas
NR	Nature Reserve
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PA	Protected Area
SPNM	Serviço do Parque Natural da Madeira
TO	Tourism Operator
UNEP-WCMC	United Nations Environment Programme World Conservation Monitoring Centre
UNWTO	United Nations World Tourism Organization
WDPA	World Database on Protected Areas
WTO	World Tourism Organization

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CHAPTER 1 – INTRODUCTION

This report is part of the internship included in the master's degree in ecotourism and took place at the IFCN (Instituto das Florestas e da Conservação da Natureza), IP-RAM. This study aimed to update the Desertas Islands Nature Reserve (DINR) visitors' profile and compare it the previous report from the IFCN, IP-RAM from 2010-2011. Thus, this study's specific objectives were: (i) the characterisation of the types of visitors; (ii) assessing visitation, perception, motivations and opinions related to the reserve management.

Madeira Natural Park Service (MNPS) carried out questionnaire in 2010 and 2011, assessing their services in different protected areas. Therefore, it was essential to update their report to support the reserve's management to improve the services and facilities. From July to September of 2020, a new questionnaire was administered, to Desertas Islands (DI) visitors from different maritime tourism companies.

The internship report is structured in seven chapters. The first chapter consists of the study's objectives and internship description, the second a theoretical framework, through the bibliography review, consulted and relevant to the theme, namely the definition of some concepts. The third chapter is centred on the Autonomous Region of Madeira (ARM), referring to its tourism and protected areas. The fourth chapter presents the methodology followed by the study area. The fifth chapter presents the questionnaire results and the analysis of the data collected, and in the sixth chapter, the discussion of the results obtained and compared to previous years. Finally, chapter seven is dedicated to the conclusion, the study's inherent limitation, and proposals for future investigations.

Tourism can bring significant income to support local community development and conservation, furthermore protected areas can set out purposes of scientific research, biodiversity conservation, and recreation (Jimenez & Lanh, 2004).

The creation of DINR was based by the need to protect the "Mediterranean monk seals (*Monachus monachus)*, which in 1988 was estimated to be 6 to 8 individuals in Portugal" (Oliveira, 2013, p.5). There was also a need to preserve the seabirds and their habitat, which deteriorated and declined due to man's action. Due to the combination of diverse aspects on these islands, their geographic location, isolation, climate, the habitats and species are vital

to the preservation of their biodiversity, particularly in the case of endemics and species that are vulnerable on a worldwide level (Menezes et al., 2005).

The DI contains important "natural habitats for in-situ conservation of biological diversity, containing threatened species of outstanding universal value from the point of view of science or conservation" (Oliveira, 2013, p.3). These islands are an example of a well-preserved natural heritage, with high tourism potential, and economic benefits.

Tourism in the ARM is an established activity, and a large part of it are the protected areas, presenting benefits to these islands. In the DI, land visitation is strictly controlled and restricted to Doca in Deserta Grande, where the logistical and administrative facilities are situated (Oliveira, 2013).

1.1. The internship

The Master's Degree in Ecotourism from the University of Madeira allows students to familiarise themselves with the work environments in institutions that develop activities in the field of ecotourism. Therefore, the opportunity provided offers students to put into practice the techniques and knowledge acquired during the study program, resulting in added value for the institutions and the students.

The internship was held at the IFCN, IP-RAM, in Funchal at Rua João de Deus, to gain work experience and acquire essential skills. IFCN, IP-RAM (Figure 1) was created on 13 May 2016 and currently belongs to the Regional Secretary for the Environment, Nature Resources and Climate Change.

Figure 1: IFCN, IP-RAM Logo. Source: IF-IP RAM, 2020.

The institution resulted from the merging of Madeira Natural Park Service (MNPS) and the Regional Directorate of Forests Nature Conservation, and its creation "added value to the integrated management of landscape, forest, biodiversity, natural spaces and protected

areas of the Madeira Archipelago" (IFCN, IP-RAM, 2020). Its mission is to "promote nature conservation, planning and sustainable management of bio and geodiversity, landscape and forest, as well as associated resources and management of protected areas" (IFCN, IP-RAM, 2016). The internship took place between October 2019 and September 2020 (Annexe I) in Jardim Botânico da Madeira – Eng.º Rui Vieira, supervised by Carolina Santos, manager of DINR.

IFCN, IP-RAM coordinates the measures and actions necessary for the protection, conservation and recovery of forest and ecosystems. Furthermore, ensures the management of protected areas and the Natura 2000 Network, as well as proposing the creation of new areas to classify and promote their implementation.

1.2. Objectives of this study

This study's main goals were to update DINR visitors' profile and compare it to the previous report from the IFCN, IP-RAM during 2010-2011. The internship at IFCN, IP-RAM, allowed learning in several working environments necessary for carrying out the specific objectives. Starting from competences in analysing and reviewing previous literature; composing questionnaires and defining question goals; doing in-situ questionnaires in boats and the required communication skills, to finally analysing the results with statistical analysis and data processing.

All these experiences contributed to answering the study's objectives:

(1) To study the visitors' profile and collect information on the tourists' background (gender, age, nationality and level of education);

(2) To identify visitors' awareness of the reserves' classifications and respective relationship with the decision for visiting;

(3) Understand how tourists acceded to the reserve, by what means of transportation and with whom the visit was made;

(4) Registry of the length of the visit, if it was their first time and if they would recommend it;

(5) To assess the visitors' willingness to pay to visit the area and how much it would be;

(6) To explore what aspects and recreational activities were captivating to tourists;

(7) To explore what opinions visitors had related to the management of the reserve;

(8) Compare the 2020 results with those from 2010 and 2011.

This study is essential for better identification of visitors' profile. Also, the "management of recreational ecosystem services depends on how people perceive them so that to improve their management it is necessary to consider the perception of their users" (Petrosillo et al., 2007, p.29).

CHAPTER 2 – LITERATURE REVIEW

2.1 Tourism

Around the 1960s and early 1970s, tourism was recognised as an impressive force for economic development, and a tool to encourage understanding amongst nations and cultures. Until the mid-1970s, tourism was regarded predominantly as a social phenomenon that could result in employment, that if communities and states advertised their attractions people would visit, spend money and leave residents wealthier (Bosak & Mccool, 2015). Hence, several countries invested efforts in increasing tourist arrivals and develop the essential infrastructure. At that moment, there was no thought about the need to measure tourism's negative economic, social-cultural and environmental impacts.

The world of the twenty-first century has changed from the one in which the notion of sustainable tourism first occurred. Awareness for sustainable development issues was set by the 1987: Brundtland Report, highlighting the non-sustainable forms of consumption and production and set strategies for what is now known as sustainable development. As Burton (1987, p.105) mentioned, the "conservation of living natural resources - plants, animals, and micro-organisms, and the non-living elements of the environment on which they depend - is crucial for development" of ecosystems.

With the turn of the century, the world became more globalised, with interactions and connections happened over time and space at a pace that is hard to recognize (Bosak & Mccool, 2015). Also, there has been a change in the role of women, making them who "determines the choice of travel destination and many of them are interested in protected area recreation opportunities" (Eagles et al., 2002, p.15).

During 2018, tourism in natural destinations comprised "around 50% of all international tourism and is increasing at a rate of 10-30% per year, much faster in comparison to the industry as a whole" (CEETO, 2018, p.34). In 2019, tourism registered "a 4% increase which is also forecast for 2020, confirming tourism as a leading and resilient economic sector" (World Tourism Organization, 2020).

In 2020 the coronavirus (COVID-19) pandemic caused a crisis in the tourism sector, given the immediate and enormous shock to the economy. According to the UNWTO (United

Nations World Tourism Organisation, 2020) online dashboards for 2020, the international tourist arrivals dropped 74% globally, reaching up to 97% drops in April comparative to the previous year.

TAP, a Portuguese national airline carrier, rescheduled 2500 flights in April to May, after cancelling 1000 flights. AHRESP (*Associação da Hotelaria, Restauração e Similares de Portugal*) indicated that half of the accommodation companies listed occupancy drops above 40%, a percentage that also applied to the catering companies (OECD, 2020a).

In order to help the tourism sector, various international measures were put in practice to promote post-pandemic safe tourism, such as promoting safe destinations by publicising countries with lower transmissibility rates, having tests done at the airport arrivals. At the same time, governments also supported this industry with measures and policies to reduce taxes and operational costs in some cases (OECD, 2020b). All to ensure tourists would feel measures are being taken to protect them from others, and vice-versa.

In 2019, Portugal registered a rise in hotel and hospitality overnight stays of 7.9% while Madeira decreased 1.9% relative to the previous year (2018), which also showed a decrease in 0.7% (Silva, 2020). According to Silva (2021), the tourism sector in Madeira also suffered during the beginning of 2020, having improved towards the summer and then being hit again as Portugal faces the second more aggressive wave of COVID-19 cases and daily deaths.

In Madeira, during 2020, the number of overnight stays diminished in -64.6% (Silva, 2021). With the vaccine's appearance and the plans to have group immunity by mid-2021, the "tourism sector sees a rise, with many reservations being made six months in advance, as citizens anticipate safer 2021 summer vacations"(Mulfati, 2021).

With the COVID-19 disturbance in the numbers, previous years' prediction models become obsolete when faced with the current situation. "Based on the gradual opening of national borders and lifting of travel restrictions on different dates forecasts, it will take some years to get back up to similar numbers as pre-COVID-19" (UNWTO, 2021).

The UNWTO Panel of Experts anticipates the domestic demand to recover sooner than international demand (Figure 2). "Based on previous crises, leisure travel is expected to recover quicker, particularly travel for visiting friends and relatives, than business travel" (UNWTO, 2021).

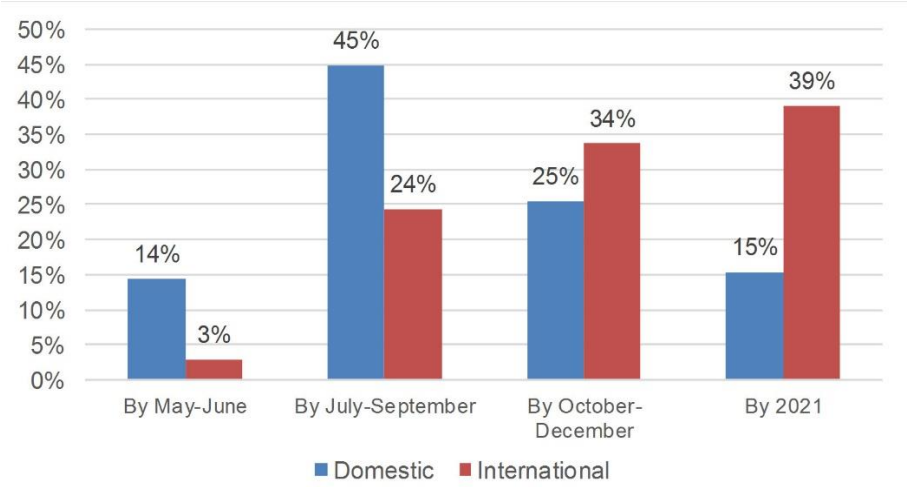


Figure 2: Estimates regarding tourism demand. Source: UNWTO, 2021.

2.2 Environment impacts of tourism

Tourism affects the social conditions, local environment and cultures, putting pressure on the environment and natural resources, resulting in a decrease in tourism benefits to the economy. It is crucial to ponder the possible adverse impacts of tourism on biological resources and their diversity. According to CEETO (2018, p.37), tourism can have the following negative impacts on natural resources:

> Disturbance to the behaviour of animals, through misbehaviour of tourists, missing or inadequate visitor management and exceeded carrying capacity. In certain cases, the mere presence of people is enough to disturb mating, breeding, feeding or any other natural activity of species; Alteration to wildlife habitats and ecosystems, fragmentation and loss of habitats; infrastructure developments that are impassable for plants and animals, can cut off breeding and feeding areas or migration routes, or in case of changing circumstances, the population is unable to move to other, more appropriate location – this makes the preservation of ecological corridors and stepping stones extremely important; Risk of introducing alien species, leading to the

disturbance or even disappearance of some elements of the local flora and fauna; Disposal of untreated sewage; Disposal of waste; Air pollution and noise.

Tourism in protected areas may also cause trampling. In certain areas with low levels of trampling, only fragile vegetation can be damaged. However, with a moderate trampling intensity, vegetation is lost except for the most resilient plants, and the mineral ground gets exposed as the organic layer is eroded (Jimenez & Lanh, 2004).

Several impacts result from careless behaviour. However, visitors can be educated in order to reduce high impact conduct (such as starting fires or shortcuts outside the paths) and promote low-impact actions. As mentioned by Jimenez & Lanh (2004), large groups of visitors have more detrimental capability than the same number in smaller groups, limiting the size to less than 12 people is unavoidable to minimise impacts.

One positive impact of tourism is its important contribution to the economy by creating substantial revenue. Therefore, tourism is often regarded by the policymakers as a valuable source of wealth in the majority part of the world (Aryal, Ghimire & Niraula, 2019). Additional positive impacts come from people who pay to travel, to use accommodation and other services, bringing different degrees of economic benefits to a certain destination. Consequently, an economic value may be given to these resources to remain conserved. The impacts from tourism in protected areas are diverse, counting "the conservation of natural resources, funding for infrastructure, employment opportunities, supplementary livelihood opportunities, and human development opportunities" (Gale, 2009, p.23).

2.3 Ecotourism

Ecotourism has long been considered a synonym of wildlife conservation. According to the International Ecotourism Society (TIES), ecotourism is defined as "responsible travel to natural areas that conserves the environment, sustains the well-being of the local people and involves interpretation and education with the specification that education is to staff and guests." (TIES, 2015). The nature-oriented niche of tourism, ecotourism, is described differently by numerous authors.

Explained by the International Union for Conservation of Nature (IUCN), ecotourism is "environmentally responsible travel and visitation to relatively undisturbed natural areas, to enjoy and appreciate nature (and any accompanying cultural features) that promotes conservation, has low visitor impact, and provides for beneficially active socio-economic involvement of local populations".

Sustainable travel, bonding communities and protection of the environment are all synonyms of ecotourism. One who participates and implements market ecotourism activities should follow the principles of Ecotourism from TIES (2015):

> Minimise physical, social, behavioural, and psychological impacts; Build environmental and cultural awareness and respect; Provide positive experiences for both visitors and hosts; Provide direct financial benefits for conservation; Generate financial benefits for both local people and private industry; Deliver memorable interpretative experiences to visitors that help raise sensitivity to host countries' political, environmental, and social climates; Design, construct and operate low-impact facilities; Recognise the rights and spiritual beliefs of the Indigenous People in the community and work in partnership with them to create empowerment.

The authors Jimenez & Lanh (2004), saw a necessity to add to the list the visitors experience, the appreciation and knowledge of the resident culture. Nonetheless, ecotourism was often overlooked as an economic activity established on travelling to natural areas to admire nature. In addition, ecotourism can only exist if there is well-preserved nature to appreciate, including a nature-based attraction to visitors.

Figure 3 illustrates the connection between different forms of tourism and ecotourism, in which the latter "is seen entirely as a subset of natural area tourism, incorporating elements of wildlife and adventure tourism" (Gale, 2009, p.6). Ecotourism is distinct from mass and alternative tourism, although there is a common ground between them.

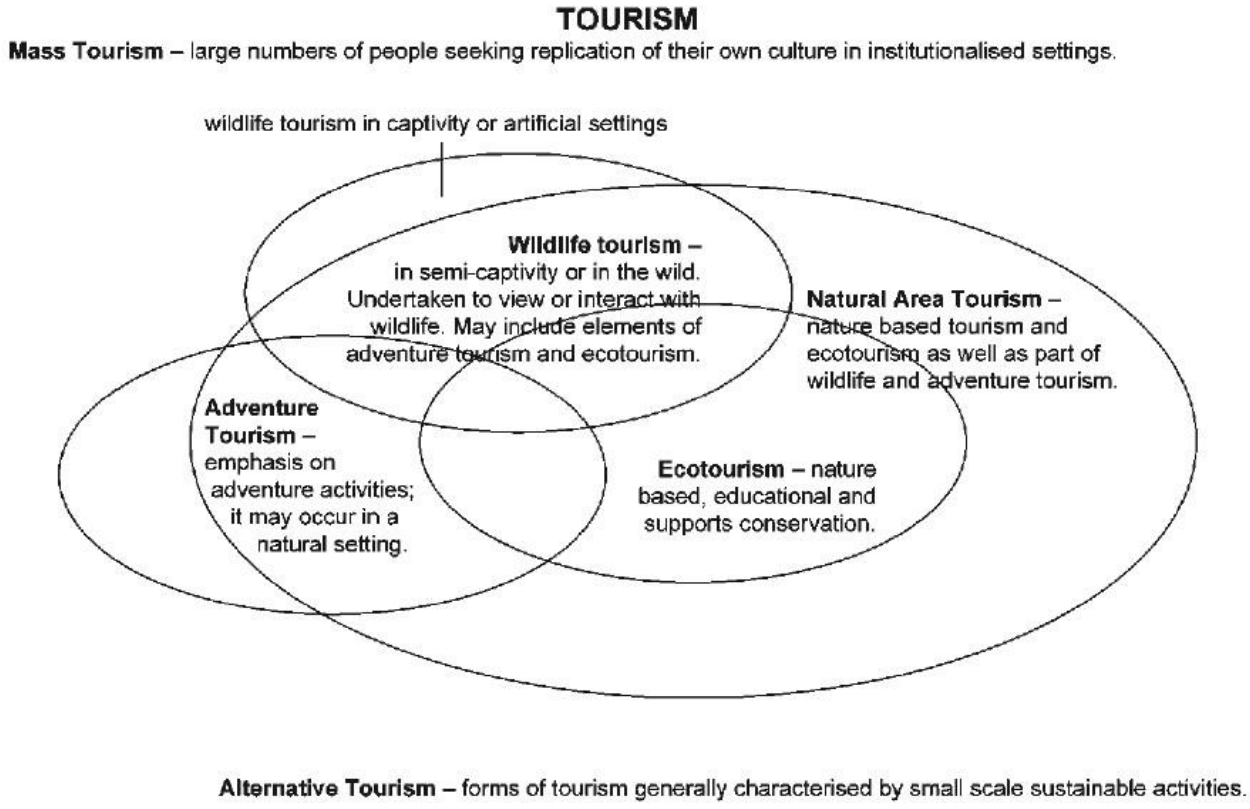


Figure 3: Relationship of ecotourism to other forms of tourism. Source: Gale, 2009, p.5.

As referred by Gale (2009), ecotourists are characterised by having participated in nature-based tourism, being better educated, more affluent (consequently, prepared to pay more for their holidays) and tend to be slightly older, around 35 and 54. The differentiating features are the environmental awareness, regard for local customs and culture, as is gender (for activities for instance bird watching, that attracts more males than females). The most frequent motives presented by ecotourists for a trip are a desire to enjoy nature and scenery and experience new places.

We can find notable examples of ecotourism in all regions around the world. Starting in Europe, tourists seek southeast regions because of their eco-friendly, rare and authentic villages where visitors are curious about how people live in their village. The areas consist of the Greek Islands, Macedonian, Serbian villages and Romania, the latter with 3000 eco-friendly hotels (Angelici & Rossi, 2020). Furthermore, environmental activities include recycling programs, sourcing food sustainably, and reducing energy and water usage.

According to Altunel & Buğday (2019), Costa Rica is a leading country in ecotourism, and implemented sustainably corresponding to the definition of ecotourism, in early 1970, they established four national parks comprising 1 million ha, (21% of the national territory). Malaysia has 54 protected areas with 1,483 million ha of beaches, diving spots and landscapes that draw tourists all around the world. In Asia, countries like Thailand, Indonesia, Singapore and Malasia have the highest number of tourism arrivals leading to Malaysia having declared in 2017 to create 110 eco-parks around the country (Angelici, & Rossi, 2020).

2.4 Protected Areas

The IUCN defines a protected area as "a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values" (IUCN, 2008). Protected areas contain many of the most important tourist attractions in the world. These attractions can either be rare, endemic or gaudy flora or fauna species, abundant wildlife, high diversity, singular or spectacular geomorphologic formations, historical or contemporary cultural expressions, unique in a natural context.

Therefore, the link between tourism and the well-protected areas is unavoidable, since several tourists seek natural or unspoilt environment compared to urban areas they usually come from (Jimenez & Lanh, 2004, p.14). According to Barić et al. (2016), visitors in protected areas are more frequently young to middle-aged, well-educated, foreigners that have a higher than average income. Furthermore, the same study concluded that visitors are more likely to visit a natural park with a group of friends and their family (Barić et al., 2016).

According to IUCN management objectives, there are six different categories of protected areas (Table 1). These categories are known by international bodies such as several national governments and by the United Nations. The Desertas Islands Nature Reserve is listed as an IUCN Protected Area Category Ia.

Table 1: Definition and primary objectives of IUCN Protected Areas Categories.

IUCN Category	Definition	Primary Objective
Ia Strict nature reserve	Strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphological features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values. Such protected areas can serve as indispensable reference areas for scientific research and monitoring.	To conserve regionally, nationally or globally outstanding ecosystems, species and/ or geodiversity features: these attributes will have been formed mostly or entirely by non-human forces and will be degraded or destroyed when subjected to all but very light human impact.
Ib Wilderness area	Protected areas are usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.	To protect the long-term ecological integrity of natural areas that are undisturbed by significant human activity, free of modern infrastructure and where natural forces and processes predominate, so that current and future generations have the opportunity to experience such areas.
II National Park	Protected areas are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.	To protect natural biodiversity along with its underlying ecological structure and supporting environmental processes, and to promote education and recreation.
III Natural monument or feature	Protected areas are set aside to protect a specific natural monument, which can be a landform, sea mount, submarine caverns, geological feature such as a caves or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.	To protect specific outstanding natural features and their associated biodiversity and habitats.

IV Habitat/species management area	Protected areas aim to protect particular species or habitats and management reflects this priority. Many protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.	To maintain, conserve and restore species and habitats.
V Protected landscape or seascape	Protected areas are where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.	To protect and sustain important landscapes/seascapes and the associated nature conservation and other values created by interactions with humans through traditional management
VI Protected areas with sustainable use of natural resources	Protected areas conserve ecosystems and habitats together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in natural condition, where a proportion is under sustainable natural resource management and where low-level non industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area.	To protect natural ecosystems and use natural resources sustainably, when conservation and sustainable use can be mutually beneficial.

Source: Day et al. 2012, p.9-10.

The World Database on Protected Areas (WDPA) released in January 2021, the total number of protected areas was "258,725, covering 245 countries and territories" (Protected Planet, 2021a). According to UNEP-WCMC & IUCN (2020), Portugal has 456 Protected Areas in total, 45 with management effectiveness evaluations. The terrestrial protected area coverage is 22.91%, representing 21.112km2 of land area covered from 92.141km2 of total land area (UNEP-WCMC & IUCN, 2020).

There are in Portugal, 13 protected areas in category Ia (2.28%), 25 areas in category Ib (5.48%) but only one in category II (Figure 4). Category III has 24 protected areas (5.26%), category IV has 69 areas (15.13%), category V 48 (10.53%) and category VI a total of 54

areas (11.84%). There are 214 not reported areas (46.93%) and 8 not applicable (1.75%) UNEP-WCMC & IUCN. (2020).

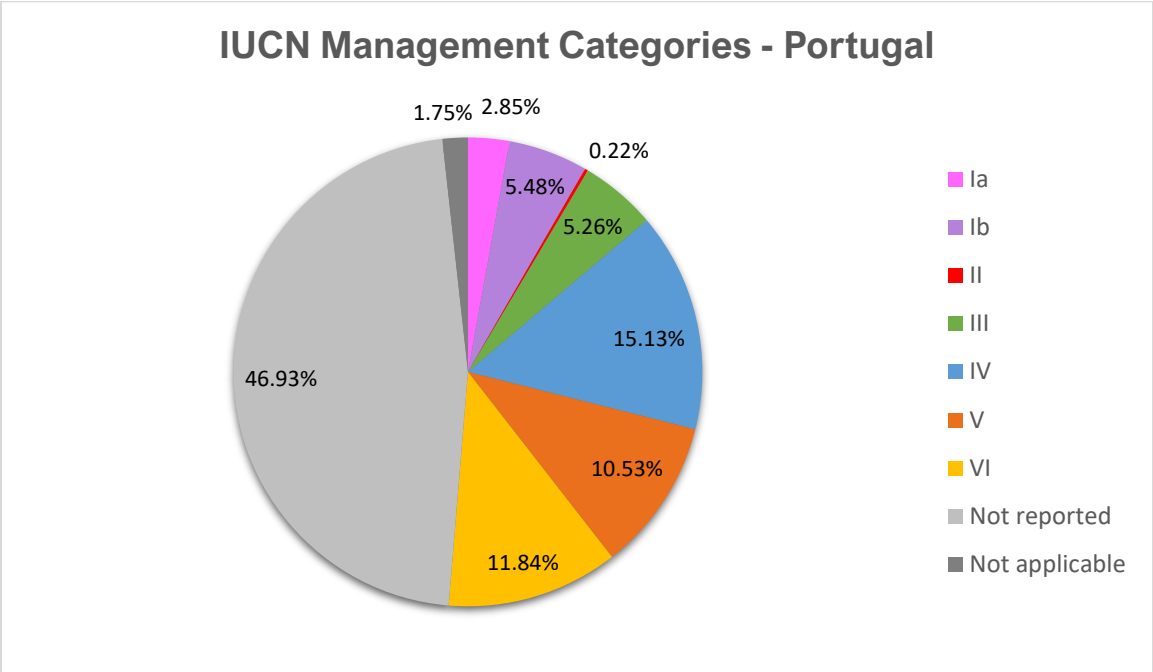


Figure 4: IUCN Management Categories from Portugal. Source: UNEP-WCMC & IUCN (2020).

Portugal has 234 areas designated as National, 183 Regional and 39 International, as illustrated in Figure 5. In the National designation, there are 36 Nature Reserves, 1 National Park, 2 Marine Parks, 20 Natural Monuments, 14 Nature Parks, 29 Protected Landscapes, 9 Partial Reserves, 1 Botanical Reserve, 54 Habitats or Species Management Protected Area, 2 Local Nature Reserve, 1 Private Protected Area and 1 Other. Also, there are 9 Leisure and Mountain Reserve, 1 Geological and High-Altitude Vegetation Reserve, 4 Silence and Tranquility Area, 34 Resource Management Protected, 6 Integral Natural Reserve, 3 Regional Protected Landscape, 5 Local Protected Landscape, 1 Regional Natural Park and 1 Partial Nature Reserve (UNEP-WCMC & IUCN, 2020).

Furthermore, in the Regional designation, there are 108 Sites of Community Importance (Habitats Directive), 13 Marine Protected Areas (OSPAR) and 62 Special Protection Area (Birds Directive). Lastly, there are 7 UNESCO-MAB Biosphere Reserves, 1 World Heritage Site and 31 Wetlands of International Importance (Ramsar Site) in International designations.

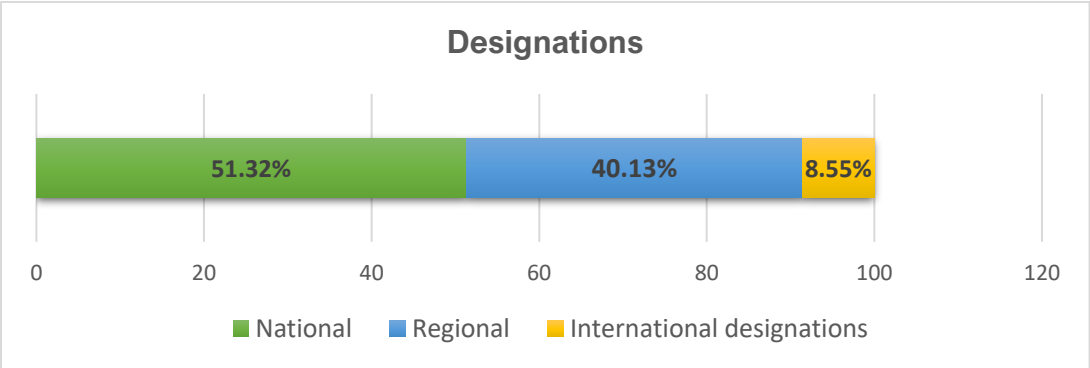


Figure 5: IUCN designations in Portugal. Source: UNEP-WCMC & IUCN (2020).

2.5 Marine Protected Areas

Marine Protected Areas (MPAs) are "fully enclosed marine spaces in ocean waters, with the purpose of enhancing the conservation of marine nature and biodiversity" (DGRM, 2018). These areas have specific legislation and resources to fulfil their goal of safeguarding ecosystems and species, enabling sustainable use of the natural heritage associated with the sea. The classification of MPAs is carried out according to different protection criteria, which result from different legislation and regulation, mainly the principles incorporated in the National Sea Strategy and international commitments made by Portugal, both within the EU and within of the OSPAR Convention (DGRM, 2018).

> MPAs involve the protective management of natural areas according to pre-defined management objectives. MPAs can be conserved for a number of reasons including economic resources, biodiversity conservation, and species protection. They are created by delineating zones with permitted and non-permitted uses within that zone. (IUCN, 2015)

For establishing MPAs, fisheries management and protection of biodiversity are the two main reasons, moreover the use of MPAs for conservation has grown along with the increasing global recognition of the need to preserve the marine environment (FAO, 2020). Illustrated in Figure 6, MPAs have increased rapidly in number and spatial extent over the last several years (Protected Planet, 2021b). According to goal 14 of the United Nations,

some of the objectives are to "reduce marine pollution, increase ocean health and enhance the contribution of marine biodiversity".

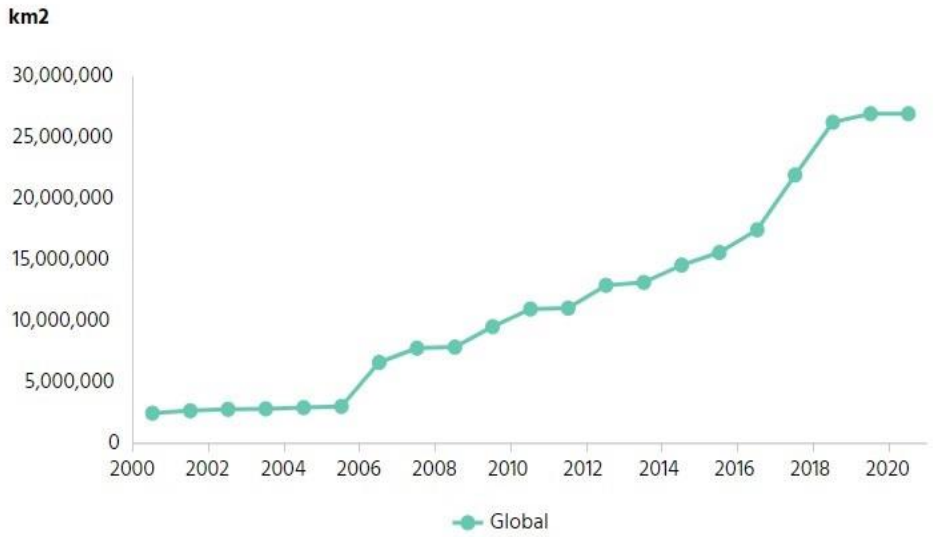


Figure 6: Growth in Marine Protected Area coverage. Source: Protected Planet, 2021b.

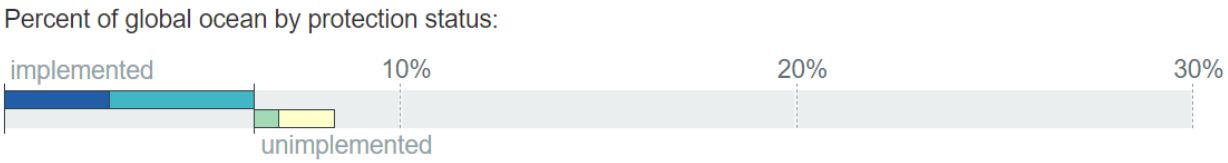
DGRM (2018) describes its objectives as to "propose the creation of marine protected areas, in conjunction with the national authority for nature conservation and biodiversity. (…) collaborate in the management of those of regional or local scope, through the elaboration, evaluation and revision of specific management plans".

The ecological benefits within MPAs can allow an "increased diversity, abundance, size, and biomass of species (e.g., fish and crustaceans), which can be 2–5 times higher in MPAs compared to fished areas" (Davis et al. 2019, p.2). As referred by Davis et al. (2019, p.2), MPAs can also "improve ecosystem health and help marine ecosystems adapt to climate change impacts, including ocean acidification, sea-level rise, storm intensification, and shifts in species distributions leading to climate invaders".

Davis et al. (2019, p.2) claim that "marine protected areas can also provide market benefits through increased tourism, or the provision of ecosystem services". The economic values for goods or services are non-marked benefits that cannot be seen through market deals, and "include the benefit to people from knowing that a threatened species is protected, or that an ecosystem is in good condition" (Davis et al., 2019, p.2).

Currently, "the global coverage of marine protected areas (MPAs) is 7.68%" (Protected Planet, 2021b). "Approximately half of that, or 2.5% of the ocean, is highly protected in no-take marine reserves" (Atlas of Marine Protection, 2021). The total MPAs coverage in Portugal is 16.82%, representing 289.974 km2 of marine and coastal area covered from a total of 1.724.156 km2 of marine and coastal area (UNEP-WCMC & IUCN, 2020).

According to Atlas of Marine Protection (2021), "experts decided that 30% of each marine biogeographic region must be preserved in effectively and equitably managed, ecologically representative, well-connected systems of marine protected areas by 2030 to safeguard biodiversity and the benefits humans derive from nature" (Figure 7).



	MPA zones	area (km2)	% of global ocean
Implemented:	**14 092**	**22 846 219**	**6.4%**
Fully / Highly Protected	1014	9 634 054	2.7%
Less Protected / Unknown	13 078	13 212 165	3.7%
Unimplemented:	**2403**	**2 187 650**	**< 1%**
Designated & Unimplemented	2403	2 187 650	< 1%
Total Designated:	**16 495**	**25 033 869**	**7%**
Proposed / Committed:	**232**	**5 022 168**	**1.4%**
Proposed / Committed	232	5 022 168	1.4%

Figure 7: Current progress toward global marine protection. Source: Atlas of Marine Protection, 2021.

In Portugal, the MPAs are composed mainly by estuarine and island ecosystems and lagoons and include "vulnerable habitats such as reefs, underwater caves and marine seagrass beds" (MPAs Europe, n.d.a). These areas are highly associated with local fishing communities, recreational tourism, and activities related to marine resources' commercial use. A few examples of the mainland MPAs are Ria Formosa Natural Park, which is

composed of canals and islands that span about 60 km of coastline. With the ongoing movement of currents, winds, sandbanks and tides, it is an ever-changing system and considered one of the most important areas for aquatic birds in Portugal, including migratory birds.

A different example is the Southwest Alentejo and Vicentine Coast Natural Park, where bird species build their nests in the steep coastal cliffs such as eagles. There are over one hundred endemic plant species in the park, and in the waters, the rocky reefs, sandy bottoms, and seagrass beds provide homes to vulnerable species, such as the long-snouted and short-snouted seahorse and eels (MPAs Europe, n.d.b).

Lastly, the Natural Reserve of the Santo André and the Sancha Lagoons, presents willow plantations, small marsh areas, reed and rush beds, heathland and wetland pastures. It contains two partially protected zones where fishing is regulated. It is home to 54 fish species, 12 amphibians, 15 reptiles, 29 mammals, 241 bird species, 344 aquatic invertebrates and 205 butterflies have been registered in this area. (MPAs Europe, n.d.c).

Proven scientifically, MPAs can have ecological, and social benefits under proper managing and design settings. In order to measure the "effectiveness, in ecological terms, is commonly measured by comparing values of ecological or biological measures in MPAs and adjacent unprotected areas and/or before and after an MPA is established" (Giakoumi et al., 2018, p.2).

According to Haines et al. (2018, p.46) case studies, an MPA proved "to have supported stock improvements for many species", in which fishermen benefitted economically, resulting in catches increasing by over 100% for some species and specimens becoming bigger compared to those before the MPA.

CHAPTER 3 – AUTONOMOUS REGION OF MADEIRA

Madeira is part of a vast biogeographic region that comprises other three archipelagos: Azores (Portugal), Canaries (Spain) and Cape Verde (Republic of Cape Verde) (Figure 8). As mentioned by Delgado (2006, pp.10-11), "Macaronesia is characterised by the remnants of a forest from the Tertiary Period, which occupied vast areas of Europe. However, the last glaciation resulted in the destruction of various European forest species, which managed to survive on these Atlantic islands".

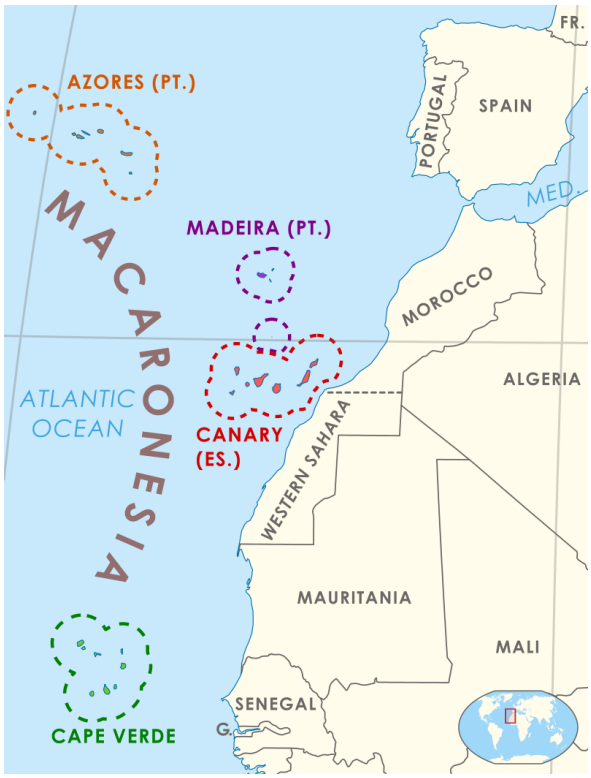


Figure 8: Madeira localisation. Source: Platon, 2014.

The Autonomous Region of Madeira (ARM) is situated in the Atlantic Ocean, southwest of continental Portugal, approximately 630 kilometres west off the Moroccan coast and 900 kilometres from Lisbon (MPAs Portugal, 2020). Madeira's archipelago contains two main inhabited islands, Madeira (742 km2, 1,861 m altitude), the smaller Island of Porto Santo (43 km2, 517 m) and several nearby islets.

Borges et al. (2008, p.16) refer that the Madeira archipelago continues to the Southeast "along the Desertas sub-archipelago, composed of three islands: Ilhéu Chão (ca. 0.5 km2, 100 m

altitude), Deserta Grande (ca. 10 km2, 479 m) and Bugio (ca. 3 km2, 388 m)". The Selvagens archipelago is located at approximately 300 km South of Madeira Island and 180 km North of the Canary Islands. This archipelago consists of three islands (Selvagem Grande, Selvagem Pequena, and Ilhéu de Fora) and several islets, totalising about 2.73 km2. On the Selvagem Grande Island, the highest altitude is reached at Pico da Atalaia with 153 m (Borges et al., 2008).

The ARM results from submarine volcanic activity and has been predominantly shaped by marine sedimentation and erosion. Madeira island is "the top of a massive shield volcano, that rises 1862 meters above the Atlantic, but that is only the tip of the volcano; from the seafloor, the volcano measures a massive 6000 meters" (MPAs Portugal, 2020).

> The emerged part of the Madeira island dates back to the Post -Miocene, <5,6 Ma, and the more recent volcanic activity took place 6,000 -7,000 years BP. Porto Santo is much older, with an estimated age of 14 million years. The volcanic activity in Porto Santo stopped 8 Ma. The Selvagens Islands have an estimated age of 27 m.y. and were originated by the same hotspot of the Canary Islands. (Borges et al., 2008, pp.16-17)

According to Borges et al. (2008, p.17) although on "Madeira Island one can find both arid and super-moist climates, on Porto Santo the climate is more homogenous, predominantly of the arid type". The ARM territory has protected areas included in the Natura Network 2000, both within the Habitats Directive (Special Conservation Areas – SCA) and the Birds Directive (Special Protection Areas – SPA).

With 28 species of whales and dolphins recorded, the ARM waters are known as a heaven for cetaceans (Museu da Baleia da Madeira, 2020). The region is also famous for the marine birds who make the islands their home, either year-round or only seasonally (MPAs Portugal, 2020). The typical species surrounding Madeira island include "the dusky grouper (*Epinephelus marginatus*), the Mediterranean parrotfish (*Sparisoma cretense*), the striped barracuda (*Sphyraena viridensis*), the European cuttlefish (*Sepia officinalis*), the common octopus (*Octopus vulgaris*), the round stingray (*Taeniura grabata*) and different species of moray eels" (MPAs Portugal, 2020).

3.1. Tourism in the Autonomous Region of Madeira

The Mediterranean is known as the number-one destination worldwide for immigrants and a leading holiday destination. The Madeira island has "exuberant nature (heritage of humanity), superior quality of service, tourist tradition (genuine hospitality), history and culture, variety of sea and mountain activities, proximity and accessibility to markets, and safety" (Valls et al., 2019, p.7)

The ARM has a varied range of tourism offers, with different demand and offer regarding the international, national and regional context, being, to a greater extent practised in the land element, followed by the sea element. Madeira welcomes tourists throughout the year; in contrast, Porto Santo struggles with seasonal tourism, as its offer is focused mainly on golf and beach activities.

From 2013 to 2019, Madeira island was presented the World Travel Awards for the Leading Island Destination category, following with other European and international institutions awards (Prudente et al., 2020). The island is an international tourist destination, being "visited by thousands of tourists every year and many come for cultural tourism and for hiking" (Prudente et al., 2020, p.155). Currently, Madeira offers several different tourism products that go past the sun and beach option and "are adapted to a profile of tourists with higher education and greater environmental consciousness" (Prudente et al., 2020, p.157).

According to Prudente et al. (2020, p.157), the tourist that visits this island "is more highly educated, has digital skills, and who can easily access updated information about places to visit and about recommended trails". They originate mainly "from the European markets, largely the United Kingdom, Germany, Portugal, France, and Spain" (Valls et al., 2019, p.7).

Figure 9 illustrates the island's tourism assets, recognised as a place of mostly "nature (6.66), of mountains and countryside (6.49), of tranquillity (6.27), of adventure (5.54), and of exoticism (5.03). On the other hand, Madeira is endowed with natural attractions (6.51), year-round mild climate (6.44), native hospitality (6.31), and connectivity (6.15)" (Valls et al., 2019, p.9).

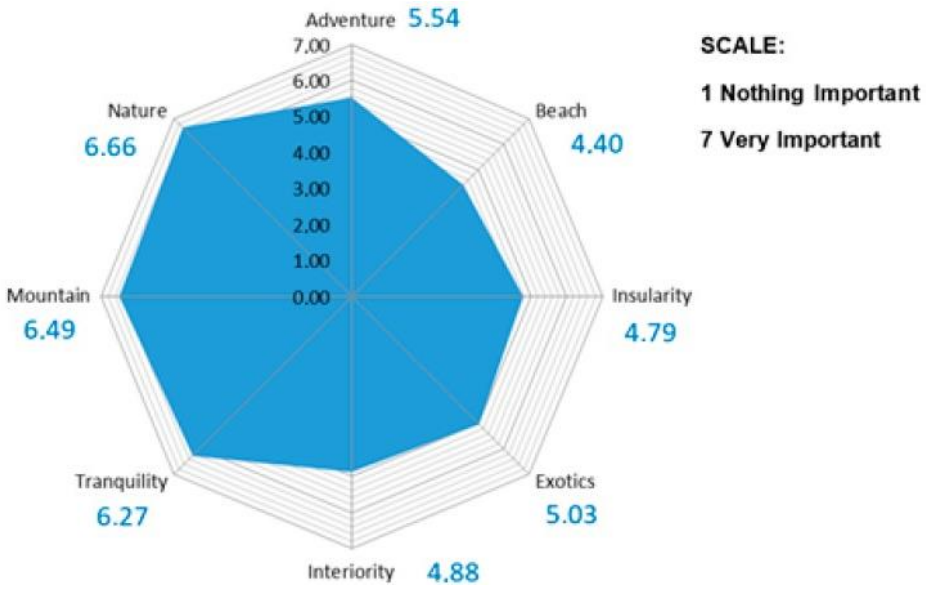


Figure 9: Mean values for the importance of Madeira as a tourist destination. Source: Valls et al., 2019, p.9.

3.2. Importance of Marine Protected Areas in the Autonomous Region of Madeira

Several MPAs in Europe had the tourism sector as the most benefitted from the MPA designation (Haines et al., 2018). In Madeira, being surrounded by sea has led fishing activities to be part of the local economy and the population subsistence. However, non-monitored fishing activities can have negative impacts on the ecosystem or cause the extinction of species.

In order to guarantee a sustainable capture of species, and prevent extinctions, the creation of Marine Protected Areas (MPAs) gives animals a place of refuge and a safe area for life early stages and reproduction. Furthermore, the MPA of DI has helped the fishing sector by protecting the natural fish resources and being an additional asset to fisheries in the subarchipelago. "This applies especially in terms of tuna fishing and the traditional harvesting of limpets, which are especially important in the gastronomy of the archipelago" (Oliveira, 2013, p.4). One important aspect of MPAs in the ARM can be shown by:

> The effects of protection from MPAs on limpet populations resulted in a differential increase on size at first maturity, shell size, and capture per unit effort according to the degree of protection. Old and enforced MPAs showed the best-preserved limpet

populations in the study area, and both variables (age and enforcement) best explained the observed variability among the MPAs studied. (Sousa et al., 2020, p.21)

The total fish biomass is different among distinct areas from ARM, as illustrated in Figure 10. According to the research by Friedlander et al. (2017, p.11), "biomass in the Garajau MPA was 2.4 times higher than areas open to fishing around Madeira and 2.2 times higher than the partially protected Rocha do Navio MPA". The difference in the latter example was not significant but indicated a difference between these two areas. Friedlander et al. (2017, p.11), also affirm that:

> Total biomass at Garajau was only 1/3rd lower than Selvagens, while biomass at partially protected Rocha do Navio was 2.8 times lower than Selvagens. Top predators comprised 15% of the total biomass at Garajau but only <4% at both Rocha do Navio and areas open to fishing around Madeira. Top predator biomass at Garajau was 90% lower than Selvagens, compared to Rocha do Navio, where top predator biomass was more than 15 times lower than Selvagens.

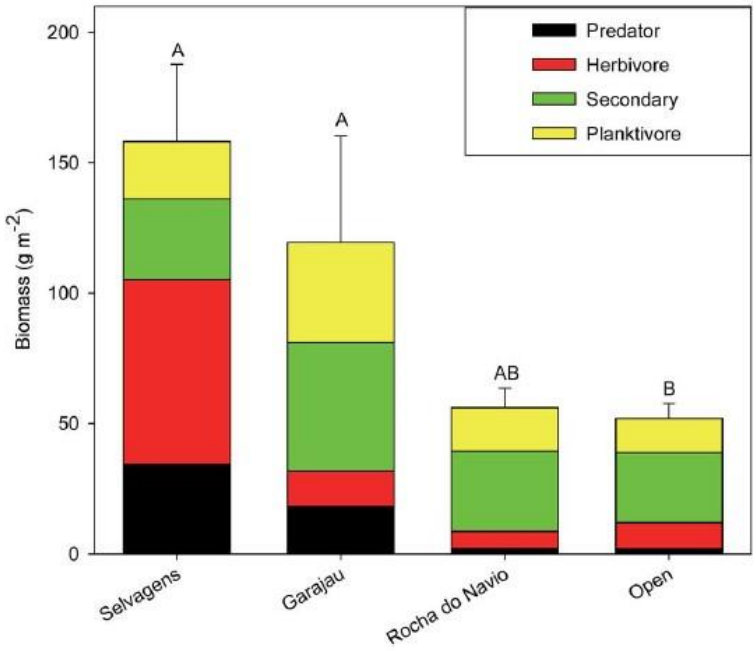


Figure 10: Comparisons of fish trophic biomass (g m-2) by management regime. Source: Friedlander et al., 2017, p.18.

CHAPTER 4 – STUDY

4.1 Methodology

This chapter presents the methods applied for completing the objectives proposed in Chapter 1 to design and perform the questionnaire and then analyse the data to gather conclusions.

Throughout the internship, the literature review included books, academic journals, and governmental policy documents to set a state of the art, learn about the current policies, research previous studies, and analyse tourism history in the islands. With this internship, interpersonal and business skills were developed to communicate effectively in a face-to-face relationship during fieldwork and written communication from emails. Due to Covid-19, problem-solving skills were learned, and adaptability was improved to handle different tasks and rapid changes of plans.

This research contributed to using a quantitative methodology analysis through a questionnaire, translated into four languages designed for DINR visitors. The questionnaire is available in Annexe II. The questions were chosen to obtain answers relative to visitors' profile, their interests, assess their knowledge of the visited areas, and the reasoning for choosing the reserve as a visiting destination. Besides, it allowed the answers to be compared to the previous questionnaire made by IFCN, IP-RAM in 2010-2011.

The questionnaire consists of 20 questions, 7 identical to the previous one from 2010-11, to characterise visitors' profile in terms of gender, age, nationality and education level, and 13 different questions to collect quantitative data to address the research's objective.

Visitors were questioned about the DINR, the classifications and the importance of those in their decision to visit. Furthermore, if they had access to information about the area before arriving, if yes in what way, what transportation did they used and with whom they are doing the visit. They were also asked if it was their first visit to the area if they would recommend it, how long their stay was, if willing to pay to enter the area, and how much would pay. There were also questions about what activities they did and what could be improved in their recreational experience.

The questions were based on three answering mechanics: 1) single and multiple-choice (seventeen questions) to assess demography, interests, information about the visit and general feedback for improvements on the experience; 2) open answer (one question) to gather information about nationality and also to provide the option "other" to multiple-choice questions; and 3) a four and five-point Likert scale (two questions to rate 14 items) to assess the importance of key characteristics and satisfaction of the reserve were rated by visitors from very little to very important, to provide support for the statistical analysis.

Before deploying the questionnaires, a pilot test was made to 20 respondents to assess its: receptibility; accessibility; the time needed to answer and general feedback on the questions and options presented. Participants took around two minutes to complete the questionnaire. After this test, the respondents provided some feedback and adjustments were made to multiple questions that were susceptible to multiple interpretations.

The anonymous questionnaire was administered from July to September of 2020. There were collected 310 questionnaires, on Funchal and Machico's port where people returned from visiting DI and onboard of different maritime tourism companies. Moreover, 75 through Google Forms and people could only participate once. Collecting unbiased samples was done on random sampling days, on visitors who were proposed to participate anonymous, except for people aged less than 14 or that worked in IFCN, IP-RAM. With only a few refusals, the public was very cooperative. A total of 385 questionnaires were collected.

The information obtained was organised in a database on IBM SPSS Statistics 25, and then used for a statistic study and descriptive statistics to explore DINR's visitors' traits.

4.1.1 Reliability of using Cronbach's Alpha on Likert Scales

Rensis Likert developed a technique for measuring attitudes, which is applied in questionnaires for registering an individual's observation. The Likert scale can be used for "measuring personal perception, attitude or performance, arranged from the less favourable to the more favourable answer within a certain rank, and unfavourable answers always tend to occupy the lower rank" (Mota, 2013, p.203).

Cronbach's Alpha assesses reliability by considering the average value of the given reliability for all possible combinations using a split-half method. "Cronbach developed

internal consistency by measuring or testing the scale in use by expressing a number between 0 and 1 whereby items testing the construct can provide the level of inter-relationship among them" (Mota, 2013, p.205).

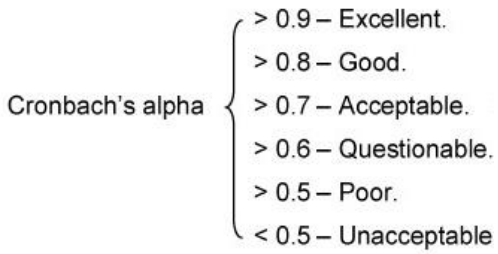


Figure 11: Cronbach's Alpha value interpretation. Source: Mota, 2013, p.205.

According to Mota (2013, p.205), when assembling the scale with respective statements to measure, low values are frequently associated with a small number of questions, and the goal should be an alpha range from 0.7 to 0.95. This verifies the importance of multi-item measurements or the poor inter-relation between items. "Cronbach's alpha is a numeric value describing reliability and provides an index associated to the variation between the hypothetical true score and the construct being measured" (Mota, 2013, p.205).

4.2 Study area – The Desertas Islands Nature Reserve

According to Ramos (2019, p.5), "the Madeira Archipelago is located in the eastern North Atlantic, comprises the oceanic islands of volcanic origin: Porto Santo, Madeira and Desertas Islands. Along with the Selvagens, Azores, Canary and Cape Verde Archipelagos, constitute the Macaronesian Biogeographic Region". The Desertas Islands consist of a small group of three islands: Ilhéu Chão, Deserta Grande and Bugio (Figure 12). They are approximately 3.5 million years old and formerly was a single island resulting from just one volcano. Climate and erosion led to the formation of their present appearance, after the ceasing of volcanic activity (Freitas et al., 2011). These islands are about 40 kilometres away from Funchal, and they can be seen when there is no mist, set in a line.

Figure 12: Location of the DINR. Source: Menezes et al., 2005, p.29.

The Desertas Islands Nature Reserve (Figure 13) has a total area of 114,57km2 and is "delimited by a 100-metre bathymetric value and the furthest points of this group of islands, in order words Farilhão to the north and Ponta da Agulha to the south, are approximately 24 kilometres apart" (Freitas et al., 2011, p.80).

Reserva Natural
das Ilhas Desertas

Figure 13: DINR Logo.

Ilhéu Chão, with a surface area of 0.4 km2, is the smallest of the three Islands. Its maximum width is 500 metres and is approximately 1600 metres in length. This island is in the shape of a plateau, and its highest point is 98 metres is in the north, where there is a Lighthouse. "Right in front of this is a tall, thin, 50-metre rock that emerges abruptly from the ocean and is called by fishermen Farilhão or Ilhéu de Nossa Senhora" (Menezes et al., 2005, p.34). There is a small stone building in the plateau as support to the research works

and conservation within the project LIFE Recover Natura framework, which is occupied regularly throughout the year (Ramos, 2019).

Deserta Grande has a surface area of 10 km2, being the largest and highest of the three islands, with the highest point of 479 metres in its central location. "It is 11700 metres long from Ponta da Castanheira in the north to Ponta do Tabaqueiro in the south, with a maximum width of 1900 metres at Ponta do Pedregal" (Freitas et al., 2011, p.82). On the top of the island, the relief is diversified, with steep sides, valleys, and plateaus. There are numerous small beaches with pebbles on the coast, caves carved into the rock and some *fajãs* (flat land at the base of a sea cliff). Menezes et al. (2005, p.37) refers that "the largest *fajãs* are Fajã Grande and Doca, which resulted from simultaneous landslides on the west and the east in 1894".

Bugio is narrow and long, in the form of an arch curving from north to southwest. This island has a surface area of 3 km2, and its maximum altitude is 388 metres to (Menezes et al., 2005). "It is 7500 metres in length from Ponta do Cágado in the north to Ponta da Agulha in the south and has a maximum width of 700 metres" (Freitas et al., 2011, p.83). There are at both sides (east and west) cliffs, a few small pebble beaches and several caves along the coast. According to Ramos (2019), there is a small wooden building in the plateau as support to the research works and conservation with the Desertas Petrel (*Pterodroma deserta*) which is frequented during specific periods throughout the year.

4.2.1 Legislation

Desertas Islands became legally protected in 1990 as Special Protection Area and designated Nature Reserve since 1995. In 1992, the Council of Europe classified them as a Biogenetic Reserve for their Natural Heritage. They were included in the Natura 2000 network as Special Conservation Area (SAC) in 2009, with the same boundaries as the Nature Reserve, and Special Protection Area (SPA) and in 2014 they were awarded the European Diploma of Protected Areas by the European Council (Ramos, 2019).

These islands comprise various types of habitats which are included in four categories, all covered by the Natura Network 2000:

- Large shallow inlets and bays;

- Vegetated sea cliffs with endemic flora of the Macaronesian coasts;
- Thermo-Mediterranean and pre-desert scrub;
- Submerged or partially submerged sea caves. (Menezes et al., 2005, p.47)

The marine area divides into the Partial Reserve – to the north of the Doca and the Fajã Grande (flat land at the base of the sea cliffs) on the Deserta Grande – and Restricted Reserve – to the south (Figure 14).

Figure 14: DI Partial Reserve and Strict Nature Reserve. Source: IFCN, IP-RAM, 2020.

On the Restricted Reserve, there are areas of refuge for Mediterranean monk seals, so the surrounding marine area is subject to significant restrictions on use. No boats are allowed to navigate through the southern part of the reserve, and there is a total ban on spearfishing in this reserve. All human activities are prohibited in this zone, excluding the following situations: activities that add value to the natural resources, scientific research, dissemination, surveillance and monitoring (Ramos, 2019). Advanced permission from IFCN, IP-RAM is needed before any vessel can visit DINR.

The preservation and sustainable development policies for the Autonomous Region of Madeira's natural resources highlight the sustained use of natural resources ensuring that their biological diversity, environmental quality and social development protects both the current

and future generations. Besides the Regional Secretary of the Environment, Natural Resources and Climate Change, IFCN, IP-RAM, "the supervision is also exercised by the entities with jurisdiction on the matter (Maritime Police, Republican Guard and the Portuguese Navy)" (Ramos, 2019, p.12).

The Management Plan foresees for Doca area in Deserta Grande a maximum of 250 people allowed simultaneously on land, with a maximum per month of 2.500 (Table 2). The visitors mostly arrive from Funchal from maritime tourism companies. The maximum number of people authorised to stay overnight is 12, but only at Baía da Doca in Deserta Grande. Exceptionally, IFCN, IP-RAM may authorise an increase in the number of people simultaneously on land and allowed to stay overnight. The overnight stay requires prior authorisation from the management entity. Maritime tourism companies and private vessels must obtain prior permission to get to Desertas.

Table 2: Access and overnight stay legislation on the Desertas Islands Nature Reserve.

DINR Limits	
Monthly nº of people	2500
People simultaneously on land*	250
Overnight stay nº of nights	2
Nº of people for overnight stay*	12
The place for overnight stay	Baía da Doca, Deserta Grande
*Exceptionally, the management entity may authorise an increase in the number of people.	

Source: Portaria n.º 370/2018.

Concerning the activities allowed in DI, hiking is conditioned to the path marked on Deserta Grande and accompaniment by an element of the managing entity or a guide. The maximum number of people accompanied by a guide is fifteen.

Without an element of the management entity, the diving activity's authorisation is conditioned to the partial protection area. The maximum number of scuba divers fixed per dive point is ten people. Only one vessel supporting the activity is authorised, unless, upon a previous request, more than one vessel proves to be necessary and safety conditions are met. This activity is prohibited in the presence of Mediterranean Monk seals.

The activities of sailing, surfing, stand up paddle, windsurfing, bodyboarding, canoeing, rowing and swimming are conditioned to the partial protection area of the Desertas islands and Doca. All these activities are prohibited in the presence of Mediterranean Monk seals. Practitioners must inform in advance the management entity about the place where they intend to carry out the activity and confirm the possibility of carrying it out. Upon a request, the maximum number of people per activity is determined on a case-by-case basis by the management.

4.2.2 History and infrastructures

The Portuguese officially discovered the Desertas Islands in 1420 despite being known since the 14th century (Menezes et al., 2005). Towards the end of the 15th century, the islands were under the jurisdiction of *Donatários* (lords) *do Funchal* and their descendants. According to Menezes et al. (2005), Desertas was owned by Henry Carvely Hinton, represented by his heirs, who used them as a hunting ground in 1956. Several people owned these islands and used them as hunting ground until 30th December 1971, when the Portuguese State officially acquired them.

These islands' economic interest was associated with cattle-raising, harvesting Orchil and Iceplant (Freitas et al., 2011). Orchil, a lichen that grows on rocky escarpments, was used in dyeing cloths and paper into a deep purple colour. "Three vascular plants were also commercially exploited, two from the *Mesembryanthemum* genus (*M. crystallinum* and *M. nodiflorum*) - Common and Slender- leaf Iceplant - were used in the production of soap" (Menezes et al., 2005, p.42).

As stated by Menezes et al. (2005, p.42) "the introduction of herbivores and cereal crops altered the natural vegetation and the flora, reducing the vegetation cover, leading to a reduction in both the abundance and the diversity of the flora and accelerating the process of soil erosion". There have been several attempts to settle in the Desertas Islands. However, due to their lack of water and aridity, they were never inhabited. Nonetheless, there are signs of human presence, such as a conserved floor on Deserta Grande, numerous stone walls, a water tank, shelters and watchtowers (Menezes et al., 2005; Ramos, 2019).

A watchtower was created in the 17th century so that Madeira could be warned of enemy ships' existence using bonfires. As a result of the Second World War, four watchtowers and a few shelters were built to control the craft in the area. Whalers later used these watchtowers to look out for whales; however, when whale hunting became banned, they were abandoned (Menezes et al., 2005).

Fishing in the Desertas Islands was a sustained activity that attracted many fishers. Nonetheless, the fishing resources rapidly became over-exploited in the 1970s, due to motor crafts and the gill nets (Freitas et al., 2011). At the same time, people started capturing shearwaters and other sea birds for consumption and bait. However, in 1990 due to the creation of the Desertas Islands Special Protection Area, the exploration of the fish stocks has been carried out in a more sustained fashion, and sea birds have no longer been caught (Menezes et al., 2005).

Deserta Grande's house is home to the nature wardens, who work for this protected area and have been taking care of this reserve since 1988. There is an interpretation centre to provide visitors with information about the reverse. In 1997 a Monk Seal Rehabilitation Unit was created to treat debilitated animals (starving, wounded or sick), and reintroduced into the wild once they recovered (Menezes et al., 2005; Ramos, 2019). In order to remove herbivores from Deserta Grande, the Madeira Nature Park services rebuilt in 1996 the Vale da Castanheira shelter.

4.2.3 Climate

Due to the combination of various factors, the species and habitats on DI are essential to the conservation of their biodiversity, particularly in endemics and vulnerable species on the global level (Freitas et al., 2011). These factors include geographic location, isolation, and climate.

According to Menezes et al. (2005), the Desertas Islands have a temperate oceanic climate, due to its influence. The sea temperature may reach to 24ºC in the summer, falling to 17ºC in the winter. Rainfall is light. The dominant winds are from the north and the northeast. In oceanographic terms, the Desertas Islands are under the Cold Canary Current, a southward flowing branch of the Gulf Stream. The ocean currents are felt more in Deserta

Grande than Ilhéu Chão and Bugio. In Doca, the Regional Laboratory of Civil Engineering has set up an electronic system designed to record the temperature, relative air humidity, global solar radiation, and rainfall.

4.2.4 Flora

Desertas Islands, along with other Atlantic archipelagos, contain the late Tertiary vegetation remnants, disappeared in the most northern hemisphere during the Quaternary period's adverse climatic events (Ramos, 2019). These archipelagos host the Macaronesian vegetation and constitute the Macaronesian bio-geographic region.

The botanist Richard Thomas Lowe (1868) was the first who studied the flora of DI and identified 141 different plants (Freitas et al., 2011). At present, it has been inventoried more than 200 vascular native and naturalised plant species. About "30% of them (37) endemic to Madeira and 10% (20) to Macaronesia. Its exclusive endemic species rate is among the highest since it is estimated in more than 10 taxa per 100 km2" (Ramos, 2019, p.8).

Lowe determined two regions, first region being maritime, reaching from sea level up to 360 metres above sea level. Menezes et al. (2005) stated that one could find indigenous plants in this vegetation, namely *Matthiola maderensis, Monizia edulis*, and *Calendula maderensis* (Figure 15). The second region, labelled mountainous, from 300 up to 480 metres above sea level, on Bugio and Deserta Grande, with vegetation characterised by indigenous plants such as *Trifolium angustifolium, Lotus argyrodes and Argyranthemum haematomma* (Menezes et al., 2005).

Figure 15: *Matthiola maderensis* (on the left) and *Calendula maderensis* (on the right) found in Deserta Grande. Source: The author.

The two forest communities present in the DI are "the Zambujal (*Oleo maderensis-Maytenetum umbellatae*), and the Laurissilva do Barbusano (*Semele androgynae-Apollonietum barbujanae*)" (Menezes et al., 2005, p.54). Zambujal is named after a subspecies endemic to the Madeira Island, Wild Olive (*Olea europaea* ssp. *Maderensis*). In this community, one can find shrubs, the endemic species "*Maytenus umbellata* and *Chamaemeles coriacea*, as well as *Globularia salicina*, White Everlasting (*Helichrysum melaleucum*), Yellow Jasmine (*Jasminum odoratissimum*) and *Ephedra fragilis*" (Menezes et al., 2005, p.54). Furthermore, it can also be found on rocky escarpments on Deserta Grande and Ilhéu Chão. The majority of this community lives in isolation, not establishing well-defined communities.

Traces of the Laurissilva do Barbusano can be found on Deserta Grande, recognised by the "presence of some *Apollonias barbujana*, Climbing Butcher's Broom (*Semele androgyna*) and a bindweed (*Convolvulus massonii*)" (Menezes et al., 2005, p.54). Other plants that can be found in Doca, Deserta Grande include the *Echium plantagineum* and *Euphorbia piscatoria* (Annexe III). The marine flora of the DINR is varied and represents three seaweed groups, *Chlorophytas, Phaeophyta* and *Rhodophyta*. Menezes et al. (2005, p.65) indicate:

> The first group is that of the green algae characteristic of the supralittoral and intertidal zones; here are seaweed of the genera *Codium, Enteromorpha* and

Cladophora and other seaweed such as *Ulva rigida, Valonia utricularis, Calothrix crustacea, Cladophora rupestris* and *Blidingia minima*. In the second group, of brown algae, the most frequent are those from the genus *Cystoseira, Padina pavonica, Halopteris filicina* and *H. scoparia,* and also *Fucus spiralis, Taonia atomaria, Colpomenia peregrina,* and *Dictyota dichotoma*. Of the red algae, *Asparagopsis armata* and *Liagora sp.* Are the most abundant, and there are also others from the genera *Gigartina,Gelidium* and *Laurencia*.

4.2.5 Fauna

The Desertas Islands is home of unique species worldwide, making these islands' conservation crucial (Ramos, 2019). The Mediterranean Monk Seal (*Monachus monachus*) is the symbol of the Desertas Islands Nature Reserve. In 1988, this species was classified as critically endangered, and the estimated population in Desertas was of 6 to 8 individuals (Menezes et al., 2005, p.72).

"In addition to the declaration of Desertas as Nature Reserve harmful fishing gears were prohibited and the authorities helped the fishermen to replace them by alternative methods" (Ramos, 2019, p.7). In the same year, a Monk Seal Conservation and Monitoring Program started by the MNPS. As a result of these efforts, according to LIFE Madeira Monk Seal (2019, p.14), by 2019 the population was "comprised of 10 adult females, 3 adult males, 4 subadults and 3 juveniles" and the species is currently classified as endangered by IUCN Red List.

In the ocean surrounding the archipelago of Madeira, have been confirmed to date 28 species (either frequently or occasionally) from which 7 belong to the sub-order *Mysticeti* (cetaceans with beards) and 21 to the sub-order *Odontoceti* (toothed cetaceans) (Museu da Baleia da Madeira, 2019). Ramos (2019, p.7) claims that a few of the species often seen include "striped dolphins (*Stenella coeruloalba*), sperm whales (*Physeter macrocephalus*), fin whales (*Balaenoptera physalus*) or spotted dolphins (*Stenella frontalis*)".

The most dominant crustacean is the Sally Lightfoot Crab (*Grapsus grapsus*), although Sea Cucumbers and the Sea Urchins are also frequent, the abundant species being the Long-Spined Urchin (*Diadema antillarum*) (Menezes et al., 2005, p.72).

Concerning the ichthyofauna there are "Wrasses (*Sparisoma cretense*), Salema (*Sarpa salpa*), the White sea bream (*Diplodus sp*), the Golden grey mullet (*Mugil auratus*), Damsel fish (*Chromis chromis* and *Abudefduf luridus*), the Saddled seabream (*Oblada melanura*), the Bogue (*Boops boops*) and the Ornate wrasse (*Thalassoma pavo*)" (Menezes et al., 2005, p.72).

These islands are important nesting areas for sea birds from Macaronesia and the North Atlantic and have long engaged ornithologists' interest (Menezes et al., 2005, p.66). The slopes and the plateaus existing on the three islands are excellent grounds for several seabirds, some of them protected under the Bern Convention and Birds Directive, of great ecological and conservation value. According to Ramos (2019, p.8):

- Desertas' petrel (*Pterodroma deserta*): exclusive endemic species breeding in Bugio, with approximately 160 to 180 breeding pairs,
- Bulwer's petrel (*Bulweria bulwerii*): the largest colony of the Atlantic and probably of the world, with about 45.000 breeding pairs,
- Cory's shearwater (*Calonectris borealis*): more than 1.500 pairs,
- Madeiran Storm Petrel (*Hydrobates castro*): 5.000 pairs,
- Little shearwater (*Puffinus lherminieri baroli*): 300 pairs.

Ramos (2019, p.8) mentions that the Desertas Islands are the habitat of "two endemic passerines: the Madeiran subspecies of Berthelot's pipit *Anthus berthelotii madeirensis* and the canary *Serinus canaria canaria*". They are also home of "a Macaronesian bird subspecies: the kestrel (*Falco tinnunculus canariensis)* as well as two Madeiran subspecies of raptors: the common buzzard (*Buteo buteo harterti*) and the Barn Owl (*Tyto alba schmitzi*)" (Ramos, 2019, p.8). As stated by Menezes et al. (2005, p.69) there is also "shore birds including Yellow-Legged Gulls (*Larus michahellis atlantis*) and the Common Tern (*Sterna hirundo*)".

Figure 16: Berthelot's pipit *Anthus berthelotii madeirensis* spotted in Deserta Grande. Source: The author.

As referred by Ramos (2019, p.8), Desertas Islands has "an endemic subspecies of lizard: *Teira dugesii mauli*". This lizard occupies various habitat types, from high elevations to coastal areas, while favouring rocky places with low or medium plant coverage.

Concerning invertebrates, at least 44 Madeiran endemic terrestrial molluscs have been described. "About 305 Madeiran endemic terrestrial arthropods have been described, 104 of them are exclusive, like the Desertas tarantula (*Hogna ingens)* and the cerambycid beetle (*Paradeucalion desertarum*)" (Ramos, 2019, p.8). Mentioned by Menezes et al. (2005, p.70), this arachnid has a small area of distribution, with a population density of around 840 adult individuals per hectare, inhabiting at the Vale da Castanheira. This Tarantula does not build a web, unlike most spiders, due to their considerable size and weight.

The introduction of animals and plants in oceanic islands ecosystems is one of the major conservation problems. According to Menezes et al. (2005, p.75), the introduction of non-native or exotic species, into a natural habitat can result in its deterioration, disturbance or destruction.

As reported by IFCN, IP-RAM (2017a), in Desertas Islands existed three of the most damaging species for the balance of terrestrial habitats: the goat (*Capra hircus*), the rabbit (*Oryctolagus cuniculus*) and the house mouse (*Mus musculus*). These animals led to the degradation of the vegetation, especially in Deserta Grande and Bugio, causing a decrease in the abundance and diversity of flora, accelerating the process of erosion.

Currently, in Deserta Grande, the rabbit has been eradicated, and it has been a drastic reduction in the population of goats, with being kept at a low level (Ramos, 2019, p.9). The other species have been a target of control projects to allow the recovery of the natural heritage (Menezes et al., 2005; Ramos, 2019), such procedures include rodenticide illustrated in Figure 17.

Figure 17: Rodenticide in Deserta Grande. Source: The author.

4.2.6 Visitation

In order to guarantee that natural values will not be affected, the tourism activity is under authorities' control. Each maritime tourism company is scheduled a certain number of days a week to visit the DIRN. Boats and ships cannot be tied to terrestrial grounds to avoid accidental entrance of alien/invasive species, so their ropes must be tied to submerged structures and buoys. On the vessel, visitors must disinfect their hands before entering a semi-rigid boat that takes them to Doca, the only area allowed for debarkation (Figure 18).

Figure 18: Doca, in Deserta Grande. Source: The author.

The area has a path around the wardens' house, with informative bilingual panels (Portuguese/English), and borders to avoid deterioration of soils and vegetation outside the paths. Furthermore, there is an "area for rest and leisure and a small shop selling environmental merchandising material specific to these islands. It should be pointed out that the funds raised are used in the management of the Reserve" (Oliveira, 2013, p.15).

A group of 15 visitors is accompanied, at a time, by nature wardens along the informative circuit and then to the reception centre. In the case of maritime-tourist visitors, this guided tour is made by each company's staff; whose employees have received detailed training given by the IFCN, IP-RAM staff (Oliveira, 2013, p.15).

This tour encompasses an educational experience for visitors since professional guides (authorised and trained by the nature conservation authorities), or nature wardens provide instructions of acceptable practices to go through the path and respect the area's fauna and flora. A maximum daily and a monthly number of visitors have been established, and no impact has been identified so far (Ramos, 2019, p.10).

The is also a path from Doca to Deserta Grande's top that is prohibited, except in specific situations. This path is difficult, due to the degree of difficulty, danger and existence of obstacles, and is only available to experienced people, properly equipped and in good physical shape. The specific situations for granting it access are essentially investigation,

image collection and mountain groups, through the mandatory presence of an IFCN, IP-RAM employee.

The Visitor Centre has informative panels and materials for visitors to familiarise the management practices made in the reserve and the characteristics and situation of the endangered and endemic species inhabiting the site (Figure 19). As a result of the pandemic, people were not allowed to visit this centre.

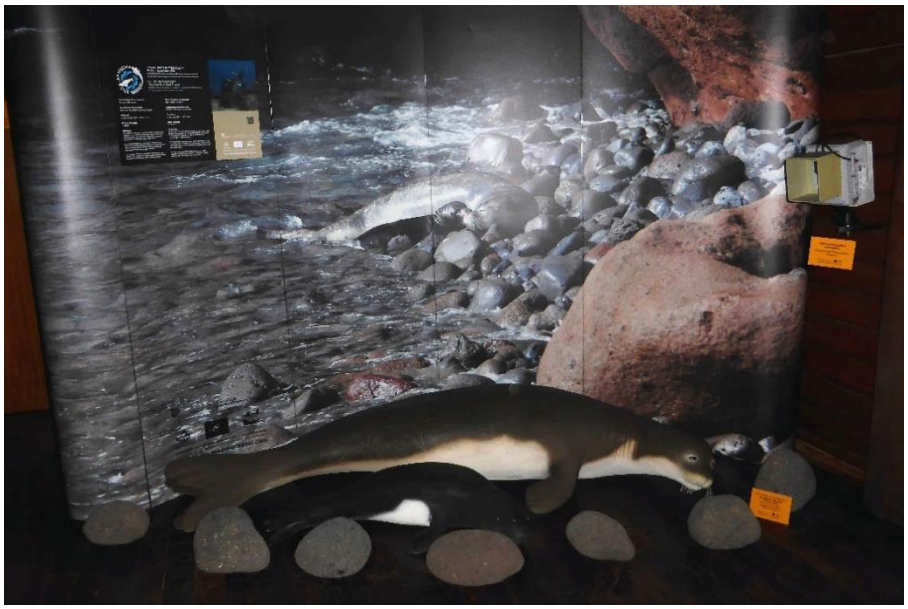


Figure 19: Exhibition in the Visitor Centre, Deserta Grande. Source: The author.

The interest in knowing the reserve has grown over the years. The DINR was visited by "an average annual number of 3474 visitors, who travel there by private vessels and maritime tourism operators, with the authorisation of the managing entity" (IFCN, IP-RAM, 2017b, p.41). The Portuguese Navy also contributes to the transportation of visitors, mainly from school groups. The only access is by sea, and the crossing to DINR takes 1 to 3 hours, depending on the vessel. Tourism companies offer a one-day tour or a one-and-a-half-day trip.

The total number of visitors to the DINR (Figure 20) comprises the number of people who travelled by private vessels, by maritime tourism operators and the researchers/people who participated in environmental education activities transported by Portuguese Navy or

the IFCN, IP-RAM vessel. In 2015, visitors increased due to a new ship named Sea Nature, from the tourism company VMT Madeira, capable of transporting 216 passengers.

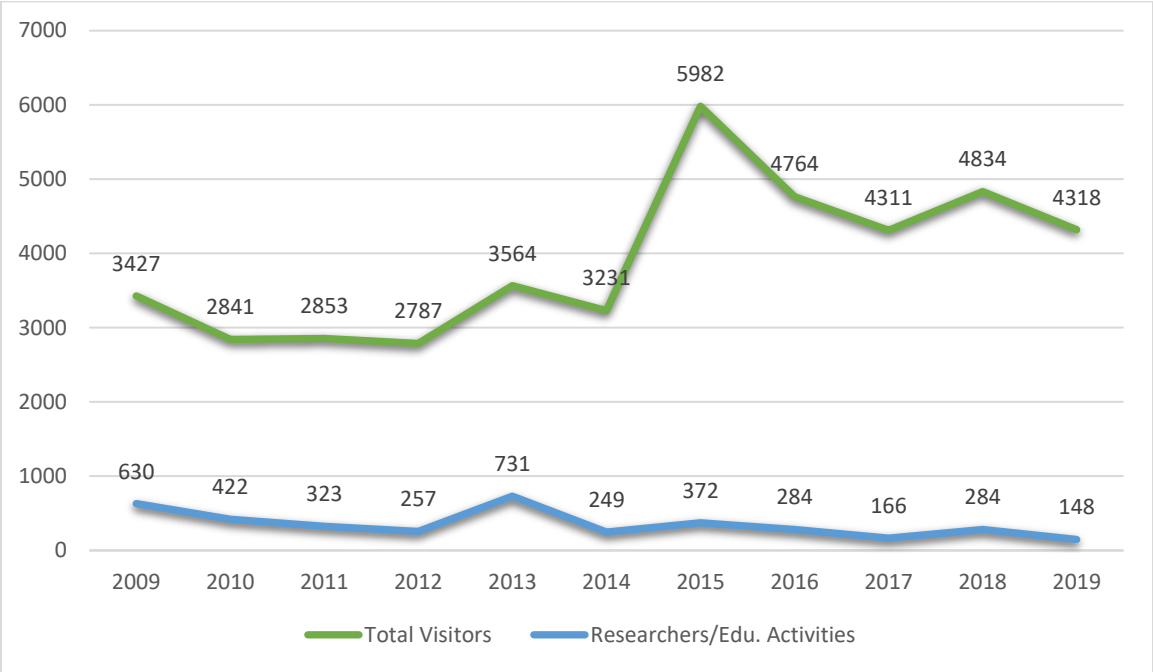


Figure 20: Total number of Desertas Islands visitors from 2009 to 2019. Source: IFCN, IP-RAM, 2020.

Figure 21 illustrates the number of individuals who visit by either a private vessel or a maritime tourism operator. One can conclude that the vast majority travels to DI by a maritime tourism operator. From the number of visitors was rising, reaching the maximum number of 5263 registered in 2005. Since then, it has been decreasing slowly, but not in a significant amount.

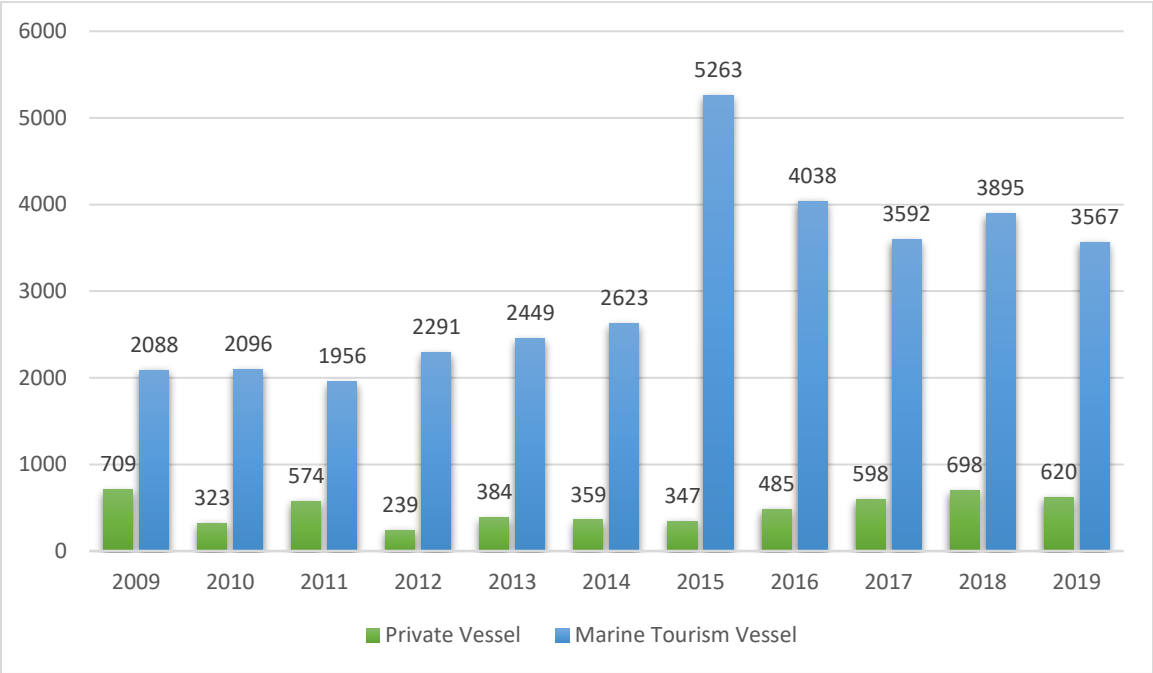


Figure 21: Number of people who visited the Desertas Islands by private vessel or maritime tourism operator from 2009 to 2019. Source: IFCN, IP-RAM, 2020.

4.2.7 Questionnaire results from 2010-2011

In 2010 and 2011, Madeira Natural Park services conducted a questionnaire to Desertas Islands visitors to access their socio-demographic aspects and visitation opinions. The total number of people inquired was 1293, being 496 individuals in 2010 and 797 in 2011.

Most people were in the age group of 19 to 40 years old or 41 to 64 years in both years. In 2011 it appeared that fewer minors (<18) and seniors (>65) were surveyed compared to 2010. By analysing Table 3, one can notice that during 2010, 80.8% of the total individuals were visiting this protected area by the first time, and 94.8% recommend a visit to this reserve. In 2011, 84.9% of total respondents visited Desertas for the first time (more 4.1% than in 2010), and 92.3% recommend a visit to these islands (2.5% less than in 2010).

Table 3: Comparison of information collected about the age, visitation and recommendation from 2010-2011 questionnaire in DINR.

	Age				1st visit?		Recommend?	
	≤18	19-40	41-64	≥65	Yes	No	Yes	No
2010	8.9%	41.1%	38.9%	5.9%	80.8%	17.1%	94.8%	2.0%
2011	6.7%	46.2%	36.4%	4.5%	84.9%	13.1%	92.3%	4.0%

Source: SPNM, 2011, p.17.

The three most frequent nationalities, in 2010 and 2011, were Portuguese, English and German (Table 4). However, there is a decrease in Portuguese respondents in the year 2011. In total, in 2010 about 30 different nationalities got to know these islands from 5 continents: Europe (22), Asia (1), Africa (1), the Americas (4) and Oceania (1) (SPNM, 2011, p.17). The results were the same in the year of 2011.

During 2010, most respondents (54.2%) used the maritime-tourism companies to travel to Desertas Islands, while 15.9% used private vessels, 14.5% arrived transported by the Portuguese Navy, and 13.7% through the IFCN, IP-RAM vessel. In 2011 the results were slightly different, there was an increase in visitors travelling by maritime-tourist companies to 68.8%. Nonetheless, compared to 2010, the number of respondents transported by the Portuguese Navy and IFCN, IP-RAM in combination decreased from 28.2% to 12.2%.

Table 4: Comparison of information collected about nationality and transportation from 2010-2011 questionnaire in DINR.

PT = Portuguese, UK = British, DE = German, ES = Spanish and FR = French.

	Nationality					Transportation			
	PT	UK	DE	ES	FR	Tourism Operator	Private	Portuguese Navy	IFCN
2010	50.6%	10.9%	6.0%	3.2%	5.2%	54.2%	15.9%	14.5%	13.7%
2011	33.5%	14.9%	12.9%	5.4%	3.6%	68.8%	15.8%	5.9%	6.3%

Source: SPNM, 2011, p.17.

In 2010, the access to information through which more people claim to have known the DINR was oral communication (someone recommended 34.5%) (Table 5). Next are

brochures and flyers (30.2%), the internet (17.7%) and newspapers and magazines (12.7%). About 17.7% affirms that they got to know this area through other ways, such as through another protected area under the management of IFCN, IP-RAM.

The results were similar in 2011, although more people claimed to have come to know the DINR through brochures and flyers (36.9%). Followed by oral communication follows (someone recommended 32.7%), the internet (20.2%) and newspapers and magazines (11%). About 16.8% stated that got to know this area through other media and by another protected area under the management of IFCN, IP-RAM.

Table 5: Comparison of data collected about the access to information from the questionnaire during 2010-2011 in DINR.

	Access to information				
	Internet	Newspapers/ Magazines	Brochure/ Flyer	Someone recommended	Other
2010	17.7%	12.7%	30.2%	34.5%	17.7%
2011	20.2%	11.0%	36.9%	32.7%	16.8%

Source: SPNM, 2011, p.18.

Regarding the evaluation of the visit by IFCN, IP-RAM, in 2010 (Table 6), visitors were very satisfied with the area's cleanliness (78.6%). The aspect that people were the most dissatisfied was the visit duration, where 4.2% of respondents indicated that they were dissatisfied with the time spent on Desertas. The trails also made 2.8% of dissatisfied people.

In 2011, the number of people very satisfied with the overall aspects decreased compared to the previous year. Still, as in 2010, respondents were particularly very pleased with the area's cleanliness (72.4%). Correspondingly, the field that generated the most dissatisfaction was the visit duration, where 7.4% of respondents indicated being displeased with the time spent on the island, plus 3% compared to 2010. As well in 2011, there was an increase in dissatisfaction as a recreational experience, from 1.6% in 2010 to 3.8% in 2011. The unsatisfied number of people about the displays and exhibits also increased from 0.8% in 2010 to 2.4% in 2011. Finally, the recreational experience caused more discontent in 2011 compared to 2010.

Table 6: Comparison of information collected about the nationality and transportation from 2010-2011 questionnaire in DINR.

	2010			2011		
	Uns	Sat	VSat	Uns	Sat	VSat
Trail	2.8%	44.0%	49.8%	1.4%	45.9%	44.5%
Picnic Area	0.4%	34.3%	54.0%	1.4%	37.5%	44.0%
Cleanliness of the area	0.0%	19.0%	78.6%	0.3%	22.6%	72.4%
Displays and exhibits	0.8%	39.9%	54.6%	2.4%	43.2%	47.6%
Visit Duration	4.2%	38.1%	52.6%	7.4%	35.9%	50.1%
Educational Experience	1.0%	30.6%	65.5%	1.0%	39.9%	53.8%
Recreational Experience	1.6%	32.7%	61.9%	3.8%	40.5%	46.3%

Source: SPNM, 2011, p.19

Concerning comments, the vast majority (71.6%) did not comment. The individuals that made any comments praised the protected area (64.5%) and praised the nature wardens (14.9%). Regarding the negative comments, 9.2% reported a lack of a toilet in the island, 8.5% would like to see more of the reservation, and 5.7% would like more information on various topics about the reserve. In 2011, results are very similar to the year 2010, and the majority commented positively on the reserve, and 18% praised the nature wardens. Regarding negative comments, about 11% of respondents reported the lack of a toilet and 12.2% would like to see more of the reserve.

CHAPTER 5 – RESULTS

5.1 Visitor Profiling

Participants were chosen randomly on different day trip visits to DI. A total of 385 visitors were registered, 50.90% were female, and 49.10% male. The most significant percentage of individuals gathered in the age of 19 to 40 years old (41.60%). Visitors aged 41 to 64 were well represented (35.10%), followed by those aged older than 65 (16.60%). The less regular group were from those aged less than 18 years old (6.80%). Illustrated in figure 22, the biggest group of visitors was females from 19 to 40 years old, while the smallest was from 18 and younger females.

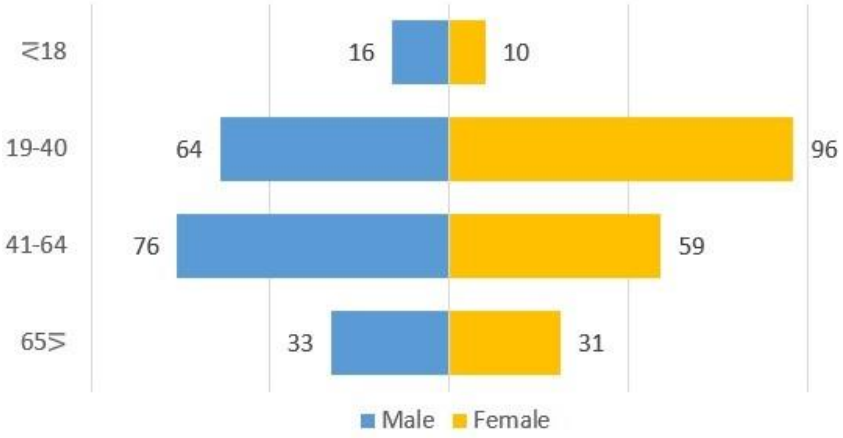


Figure 22: Age by gender of visitors. Source: The author.

Most people surveyed had a university education (54.50%), followed by those who answered secondary school (36.10%) and primary school (9.40%) (Figure 23).

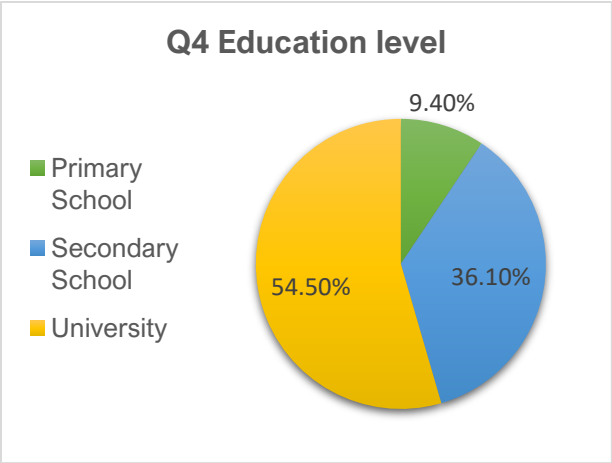


Figure 23: Education level of visitors. Source: The author.

5.2 Visitation

Table 7 illustrates a small sample of the nationalities recorded during the fieldwork. A total of 17 different nationalities was registered. More than half of the visitors were from Portugal (53.00%). The next biggest group was Great Britain and France with the same value (11.40%) followed by Germany (8.80%) and the Netherlands (5.20%). The remaining countries were the following: 2.10% Venezuela, 1.80% Sweden, 1.0% Italy, 1.0% Luxembourg, 1.0% Spain, 0.80% Poland, 0.50% Lithuania, 0.50% Finland, 0.50% Romania, 0.30% Norway, 0.30% Denmark and 0.30% U.S.A.

Table 7: Visitors' nationality.

Nationality from DINR visitors		
Nationality	**Frequency**	**Per cent**
Portuguese	204	53.00
British	44	11.40
French	44	11.40
German	34	8.80
Dutch	7	5.20
Venezuelan	4	2.10
Swedish	2	1.80
Other nationalities	46	6.30

Source: The author.

Visitors were asked about the Desertas Islands protection and classifications. A high percentage of respondents (98.70%) knew the area was protected, while only a few selected "no" (0.50%) and "do not know" (0.80%) (Figure 24). Concerning the classifications, 77.40% answered nature reserve and 13.80% selected Natura 2000 network which both are correct, although 11.70% selected biosphere reserve that DINR does not have that classification.

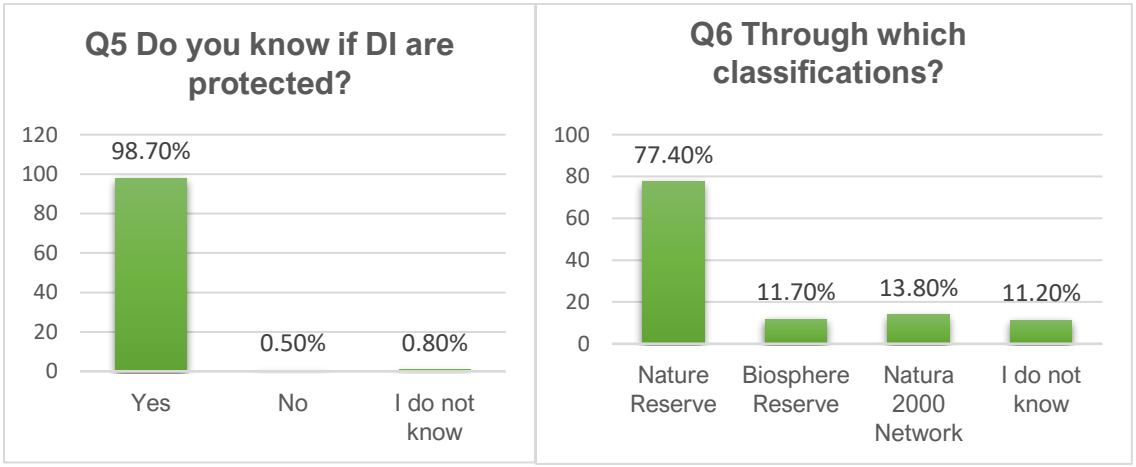


Figure 24: Visitors knowledge of DI protection and classifications. Source: The author.

The results relating to tourists' importance of the classifications in their decision to visit showed that 23.10% answered it was very important, 50.90% important, 22.90% not important and 3.10% do not know (Figure 25). The majority of tourists (60.80%) had access to information about DINR before arriving, while 33.20% did not, and 6.00% answered that they do not know.

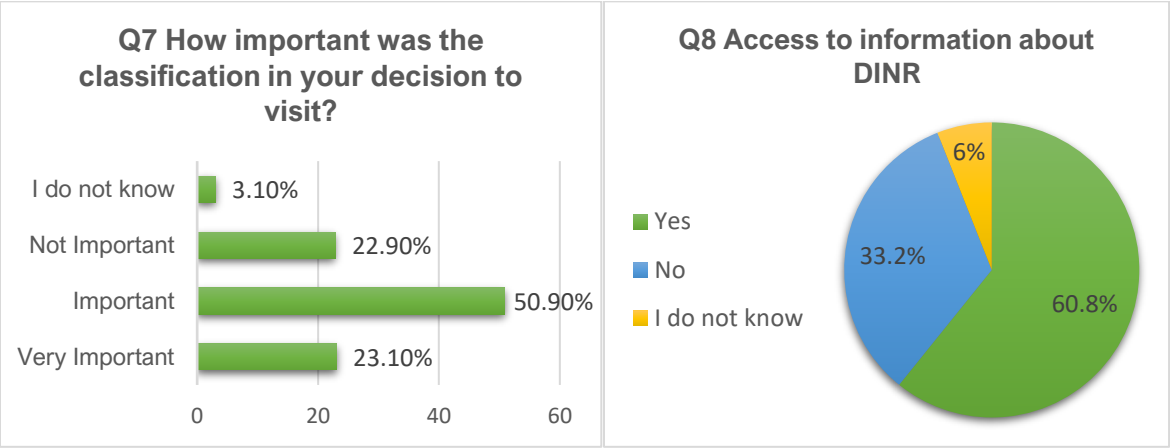


Figure 25: Importance of the classification and access to information about DINR. Source: The author.

Figure 26 illustrates the data from question 9, how visitors accessed information about DINR. More than half answered internet (51.20%), 15.60% newspapers or magazines, 9.90% brochure or flyer, 3.40% commercial agents and 27.30% someone recommended.

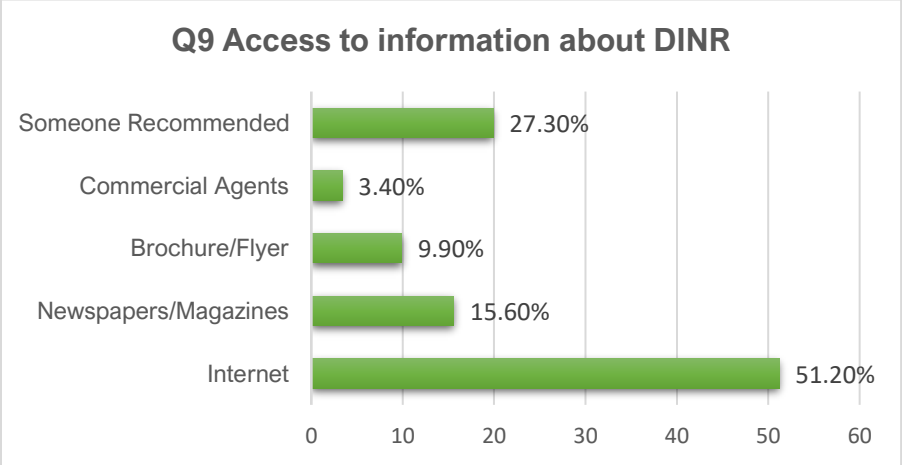


Figure 26: Visitors access to information about DINR. Source: The author.

In question 10, visitors were asked what transportation they use to get to DI. The vast majority (91.90%) travelled by a maritime tourism operator, 3.90% Portuguese navy and 3.10% by the IFCN, IP-RAM vessel (Figure 27). When asked "With whom did you do this visit?" half (49.40%) answered family, 24.40% friends, 16.60% group tour, 8.10% alone and 1.60% answered partner.

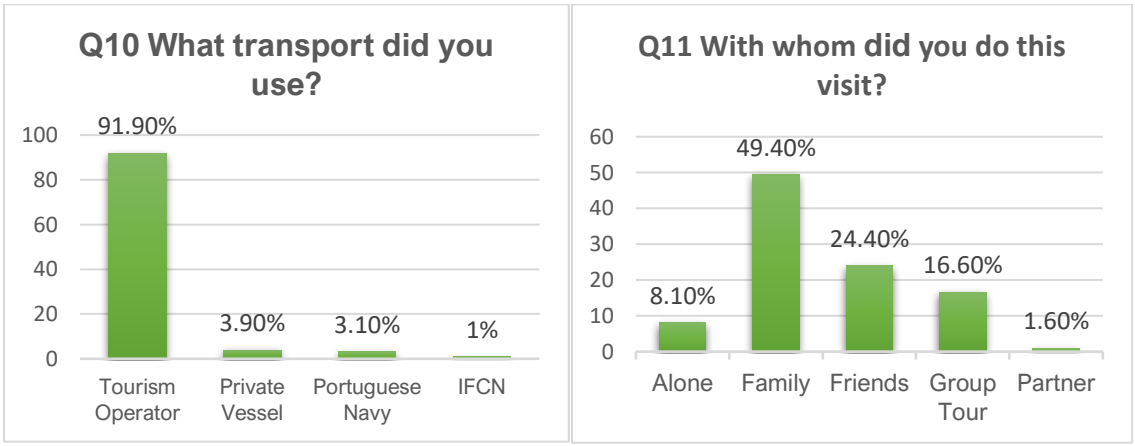


Figure 27: Visitors' type of transportation and with whom they visit. Source: The author.

The DINR is a very welcoming place hosting many visitors, most visiting for the first time (83.40%), while a small percentage were "repeaters" (15.80%) and answered that they do not know (0.80%) (Figure 28). Concerning their willingness to recommend a visit to

this area, the overwhelming majority of respondents said yes (91.90%), while a small percentage answered no (3.40%) and did not know (4.70%).

Figure 28: Descriptive analysis of questions 12 and 13. Source: The author.

To the question "How long was the visit on Deserta Grande?" the majority spend less than 3 hours (92.50%), 0.80% 24 hours, 0.30% two days, 6.50% do not know (Figure 29). When asked "What activities did you do during your visit?" most respondents did the observation of wildlife (70.40%), almost half of them walked (44.70%), 23.90% answered diving and 38.20% did sea activities that include swimming, surf, stand up paddle, windsurf and bodyboard.

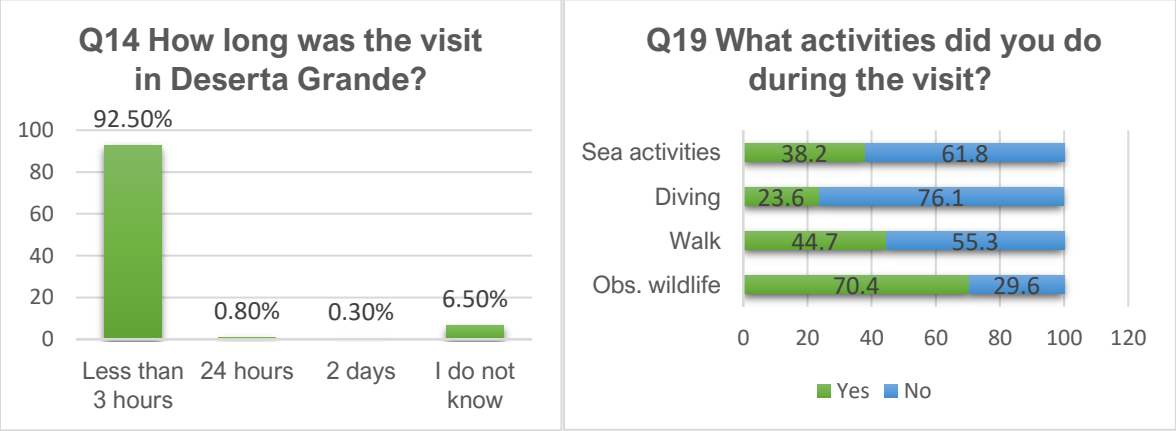


Figure 29: Visit duration and participation in activities. Source: The author.

Concerning the question about paying to enter this area, almost half of tourists (48.6%) said yes, 39.50% answered no and 11.90% do not know (Figure 30). When asked about how much they are willing to pay, more than half of the visitors (60.00%) selected from 3 euros to 6 euros, 14.60% answered less than 3 euros and 25.40% more than 6 euros.

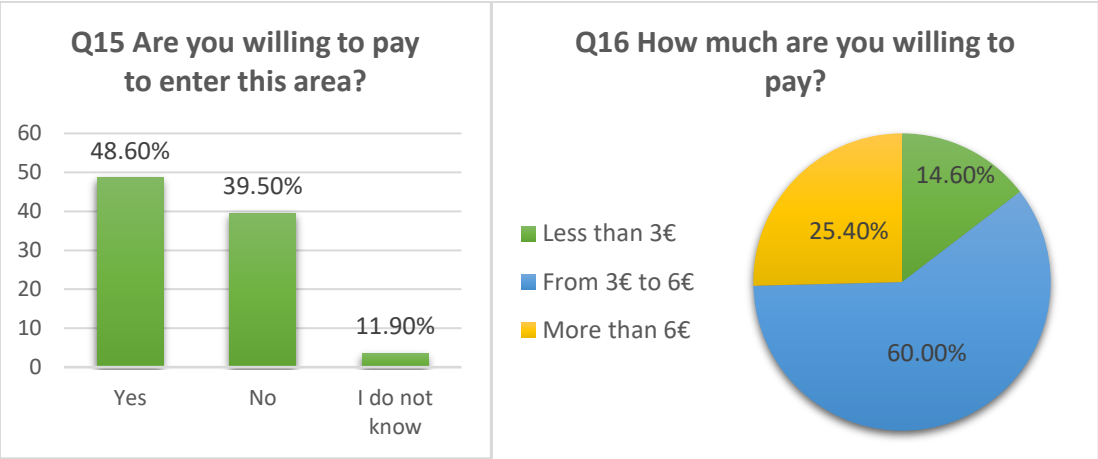


Figure 30: Visitors willingness to pay to enter DI and how much. Source: The author.

Visitors were asked to rate various aspects of the DINR according to their satisfaction level (Table 8). Most people were satisfied with the cleanliness of the area in Deserta Grande (59.70%). The visit duration was the aspect that most visitors answered they were unsatisfied, and they appeared to not know about the overnight conditions.

Table 8: Ratings of aspects according to the visitors' satisfaction.

	1-Unsatisfied	2-Satisfied	3-Very Satisfied	4-I do not know	Average (w/o option 4)	Std. Dev
Trail	10,9%	43,9%	23,4%	21,8%	2,2	1,0
Picnic area	2,9%	46,2%	30,4%	20,5%	2,3	0,8
Cleanliness of the area	1,0%	29,4%	59,7%	9,9%	2,7	0,6
Displays and exhibits	5,7%	41,3%	38,4%	14,5%	2,4	0,8
Visit duration	15,3%	48,3%	25,2%	11,2%	2,1	0,9
Number of people	12,5%	46,8%	30,6%	10,1%	2,2	0,8
Overnight conditions	7,5%	16,6%	9,4%	66,5%	2,1	1,0
Educational Experience	4,9%	41,3%	37,9%	15,8%	2,4	0,8
Recreational Experience	5,2%	46,5%	33,8%	14,5%	2,3	0,8

Source: The author.

5.3 Management components

In question 17, visitors were asked to rate five aspects of the DINR according to the level of importance for their visit (Table 9). Wildlife viewing (57.1%) and the quality of the

seawater (55.1%) are the most important aspects for visiting the DI. Followed by the landscape (48.8%), increase knowledge about the wildlife (46.8%) and the tranquillity of the area (43.1%).

Table 9: Ratings of aspects according to the visitors' level of importance.

	1-Very little	2-Little	3-Neutral	4-Important	5-Very Important	Average 1-5	Std. Dev
Landscape	1,3%	3,4%	11,2%	35,3%	48,8%	4,3	0,9
Tranquility	1,0%	3,6%	21,3%	30,9%	43,1%	4,1	0,9
Quality of Seawater	0,5%	2,9%	14,8%	26,8%	55,1%	4,3	0,9
Wildlife viewing	2,3%	2,3%	8,3%	29,9%	57,1%	4,4	0,9
Knowledge about wildlife	0,8%	3,4%	17,1%	31,9%	46,8%	4,2	0,9

Source: The author.

When asked what could be done to improve the visit to DINR (Figure 31), 19.70% suggested decreasing the number of people present in the area. Another suggestion was to build more infrastructures (28.80%), e.g. a pier to make the island accessible to more people.

Some also answered a toilet, despite DINR having one, it was not open to visitors due to the pandemic. The suggestion most commented on was about wanting more information about the area (36.90%). The visitors could not visit the monk seal rehabilitation centre and the exhibition in the nature reserve wardens house due to the pandemic. Furthermore, 7.30% of visitors suggested accessing the top of Deserta Grande.

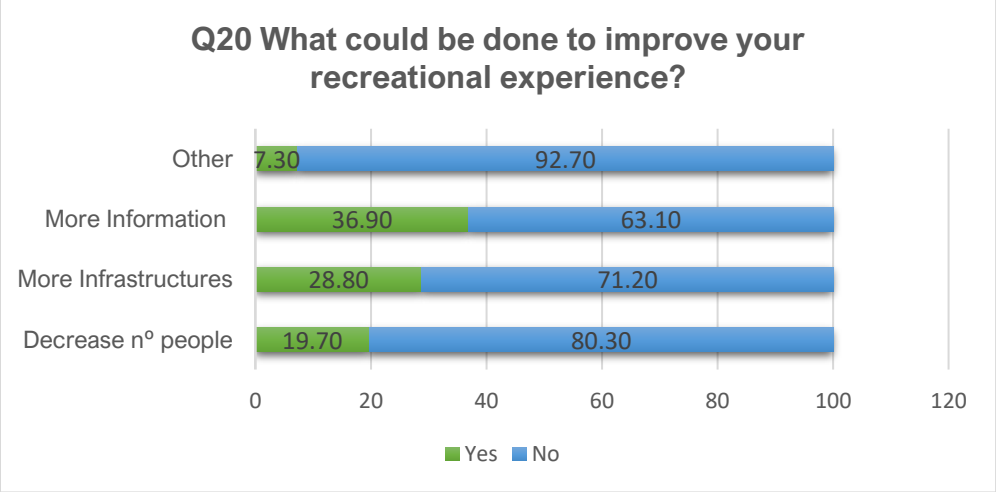


Figure 31: Respondents opinions on what can improve the recreational experience. Source: The author.

5.4 Predictor importance for visitation – SPSS two-step cluster analysis

A procedure was followed for testing the instrument reliability, obtaining Cronbach's Alpha value of 0.851, which is good, since the goal should be an alpha range from 0.7 to 0.95. The bets fit since the Cronbach's alpha was assessed if items were removed from the study, as shown in figure 32.

Reliability Statistics

Cronbach's Alpha	N of Items
,851	5

Figure 32: Reliability statistics of Cronbach's Alpha to question 17. Source: The author.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q17_Landscape	17,02	8,484	,656	,822
Q17_Tranquility	17,18	8,193	,669	,819
Q17_QualitySeawater	16,96	8,251	,730	,803
Q17_Wildlife	16,92	8,303	,673	,818
Q17_Knowledge	17,09	8,735	,586	,840

Figure 33: Question 17, Item-total statistics. Source: The author.

The two-step cluster analysis (Figure 34) was performed using the variables from question 17 (Rate the following aspects according to the level of importance for your visit). The set of variables representing Quality of Seawater, Tranquility, Landscape, Increase of knowledge about Wildlife and Wildlife viewing, represented by the answers (Very Little, Little, Neutral, Important and Very Important) were entered into SPSS 25. The cluster quality was of 0.4, being considered acceptable for the exploratory study.

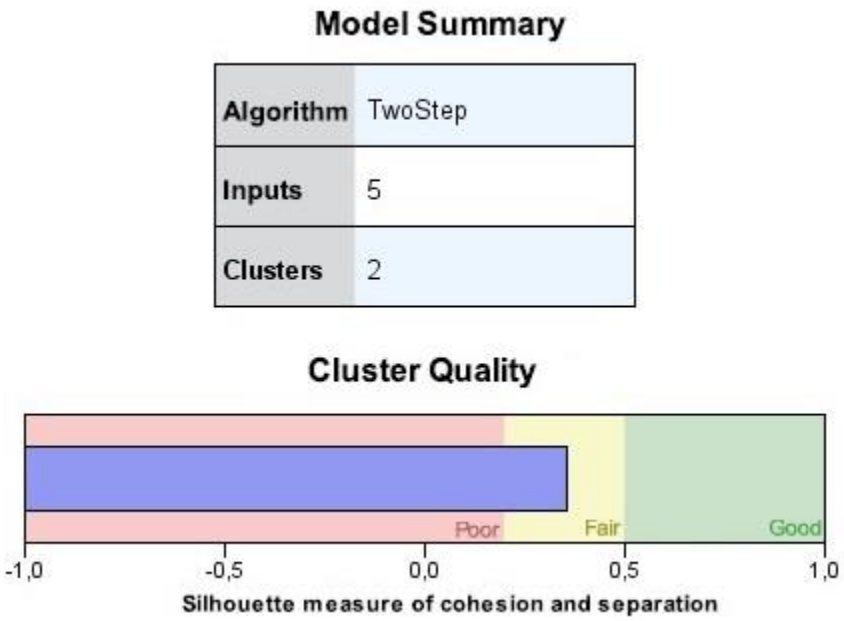
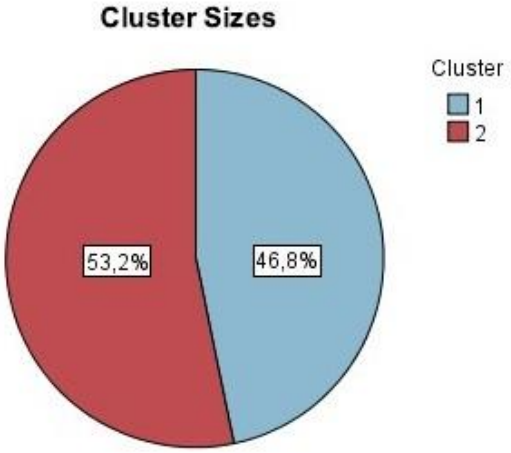


Figure 34: Clustering model summary for the variables from question 17. Source: The author.

Figure 35 illustrates the cluster sizes for the 2 clusters formed using the combination of 5 different variables, reaching a fair level of 0.4. The largest cluster has 205 visitors (53.2%), while the smallest has 180 (46.8%), with 1.14 as ratio size while comparing the two.



Size of Smallest Cluster	180 (46,8%)
Size of Largest Cluster	205 (53,2%)
Ratio of Sizes: Largest Cluster to Smallest Cluster	1,14

Figure 35: Distribution of the clusters formed using entry variables: Quality of Seawater, Tranquility, Landscape, Increase of knowledge about Wildlife and Wildlife viewing. Source: The author.

In order to find dissimilarities between variables forming clusters, it is recommended to use correlations below 0.90 to predict the importance of the cluster. Furthermore, "the rule of thumb set the cluster size to at least 30 members, with a ratio between clusters smaller than 3.0. Clusters formed with the variable set should not be 3 times bigger between clusters" (Mota, 2013, p.287-288).

In figure 36, we can see the importance of the input variables in the formation of the two clusters. One can visualize that the Quality of the seawater is the main contributor to the cluster creation, followed by Tranquility and Landscape.

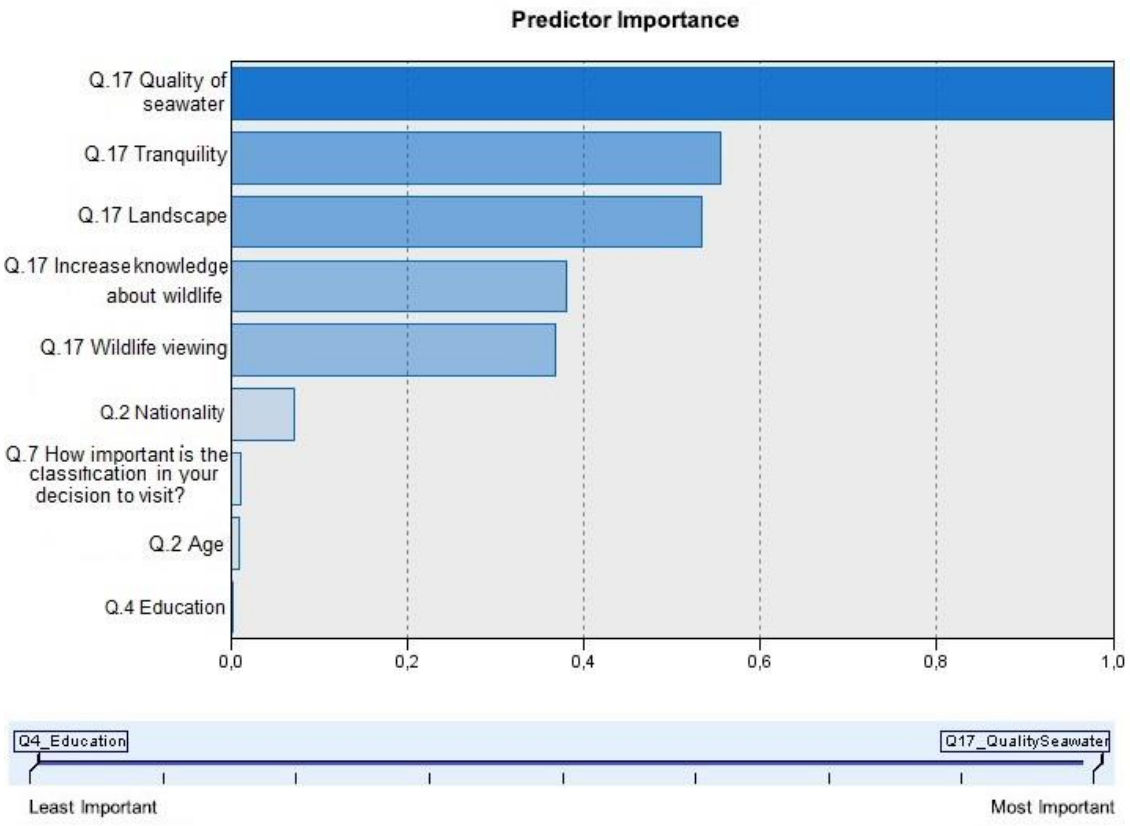


Figure 36: Cluster comparison through the respective predictor importance level of the variables from question 17. Source: The author.

Illustrated in Figure 37, cluster 1 is formed mainly by the answers related to *Very important*, and the inputs are ordered by their importance with the *quality of seawater* to be

the most decisive input in determining this cluster, On the other hand, cluster 2 is mainly formed by answers that rated the inputs as *important* or *neutral*.

These two clusters share similar distributions of the evaluation variables of *the importance of the classification in the decision to visit (question 7), Education level (question 4),* or *age (question 2).* These two clusters represent the distinct groups of respondents that give high importance to these factors against the ones that do not value as much or have a neutral feeling about those aspects in their visit.

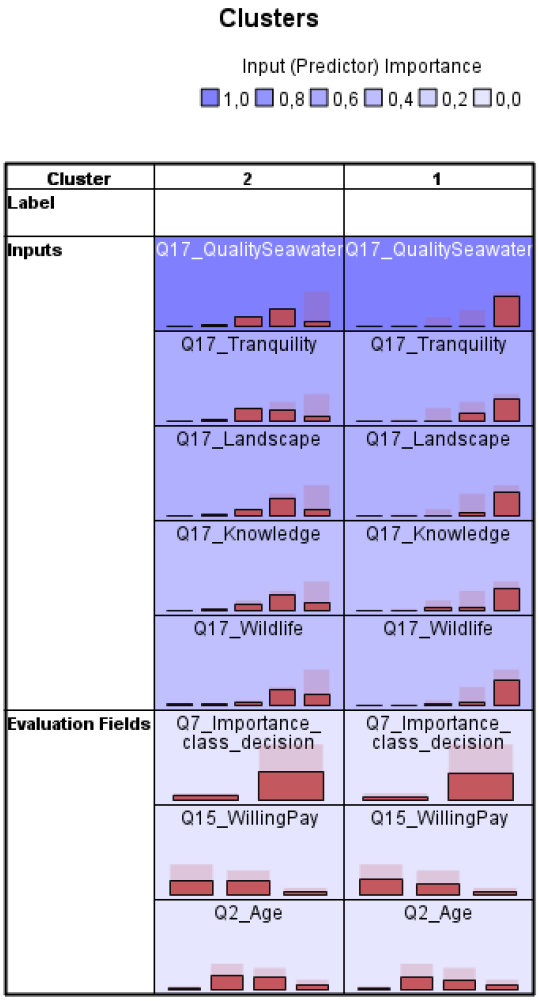


Figure 37: Cluster input importance for answers (Very Little, Little, Neutral, Important, Very Important). Red represents the importance of the input (which is the complement of the opposite cluster), and transparent red represents the overall importance. Source: The author.

In order to validate the two-step clustering, an ANOVA test was done to the clusters, and the various parameters of the results are shown in figure 38. The degree of significance for all clusters is less than 0.05, hence the clusters differ and are valid.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Q17_Landscape	Between Groups	76,052	1	76,052	130,121	,000
	Within Groups	223,854	383	,584		
	Total	299,906	384			
Q17_Tranquility	Between Groups	120,413	1	120,413	214,945	,000
	Within Groups	214,558	383	,560		
	Total	334,971	384			
Q17_QualitySeawater	Between Groups	151,809	1	151,809	423,480	,000
	Within Groups	137,298	383	,358		
	Total	289,106	384			
Q17_Wildlife	Between Groups	62,091	1	62,091	93,700	,000
	Within Groups	253,795	383	,663		
	Total	315,886	384			
Q17_Knowledge	Between Groups	54,185	1	54,185	81,511	,000
	Within Groups	254,604	383	,665		
	Total	308,790	384			

Figure 38: ANOVA for question 17 variables. Source: The author.

CHAPTER 6 – DISCUSSION

The questionnaire was specifically designed to accomplish the main objective of profiling the visitors of DINR. The results obtained were analysed to improve visitors' recreational experience while guaranteeing the conservation of natural values in these islands.

Studies about protected areas identify young or middle-aged people with a high education level as nature tourism practitioners (Barić et al., 2016; Gale, 2009; Prudente et al., 2020). The previous statement corresponds to DINR, in which the visitors are mostly young (Table 10), between 19 and 40 years old, with a university education. The small number of seniors visiting could be explained by the difficult access, having to enter a smaller boat in the sea to disembark on a pebble beach requires physical strength.

Table 10: Comparison of information collected about the age.

2. Age				
	2010	**2011**	**2020**	**Evolution**
≤18	8.9%	6.7%	6.8%	+0.1%
19-40	41.1%	46.2%	41.5%	-4.7%
41-64	38.9%	36.4%	35.1%	-1.3%
≥65	5.9%	4.5%	16.6%	+12.1%

The majority of visitors were Portuguese (Table 11), which differs from those observed in other protected areas where they were mostly foreigners (Barić et al., 2016). The pandemic may explain the situation, as it forced people to go on holidays in their own countries. Furthermore, a few maritime tourist operators created a promotion to Madeira residents, in which the trip to Desertas had a small discount. In the second and third are the British and French nationalities, followed by German and Spanish. While in 2010 and 2011 in third place was German (SPNM, 2011). These nationalities are the primary markets of Madeira, and as a consequence, they also decide to visit Desertas (Valls et al., 2019).

Table 11: Comparison of information collected about the nationality.

3. Nationality				
	2010	**2011**	**2020**	**Evolution**
PT	50.6%	33.5%	53.0%	+19.5%
UK	10.9%	14.9%	11.4%	-3.5%
DE	6%	12.9%	8.8%	-4.1%
ES	3.2%	5.4%	1.0%	-4.4%
FR	5.2%	3.6%	11.4%	+7.8%

The high level of education, mentioned above, seems to be related to the search for enriching experiences provided through protected areas' natural resources. The ageing of the population, combined with the fact that people live longer and can enjoy retirement time, also leads this group to look for places that promote well-being. Results in 2020 show more female visitors than male, probably associated with the change in women's role in society is, as there is a tendency for them to prefer activities related to the appreciation of nature (Eagles et al., 2002).

While trying to identify the visitor's awareness of the reserve's classification, most individuals were aware that the area was protected. Concerning the classifications, the majority answered nature reserve, while only a small percentage selected Natura 2000 network and biosphere reserve, while the latter is not correct. Half of the tourists answered that the DINR classification was an important factor in their decision to visit. More than half of the tourists had access to information about the DINR before arriving.

Concerning the way that they accessed that information (Table 12), more than half answered the internet, followed by someone's recommendation. This result was different in 2010 and 2011, being oral communication, someone recommending, the principal way of information (SPNM, 2011). This could be because in 2020 more participants travelled by a maritime tourism operator or due to society becoming more globalised, with connections and interactions occurring faster and online (Bosak & Mccool, 2015).

In terms of visitation, the transportation that visitors choose the most is a maritime tourist operator. This result was similar to the previous questionnaire in 2010 and 2011, but

more prevalent in 2020. Half of the individuals travelled with their family, followed by those who were with their friends. The result is consistent with other studies that point to a trend in visiting protected areas with family and groups of friends (Barić et al., 2016).

Table 12: Comparison of information collected about the way visitors accessed information and what transportation they used.

9. In what way you had access to information?				
	2010	**2011**	**2020**	**Evolution**
Internet	17.7%	20.2%	51.2%	+31.0%
Newspapers/Magazines	12.7%	11.0%	15.6%	+4.6%
Flyer/Brochure	30.2%	36.9%	9.9%	-27%
Recommendation	34.5%	34.5%	19.9%	-14.6%
Other	17.7%	16.8%	3.4%	-13.4%

10. What transport did you use?				
	2010	**2011**	**2020**	**Evolution**
Tourism Operator	54.2%	68.8%	91.4%	+22.6%
Private Vessel	15.9%	15.8%	3.9%	-11.9%
Portuguese Navy	14.5%	5.9%	3.1%	-2.8%
IFCN Vessel	13.7%	6.3%	1.0%	-5.3%

For the vast majority of tourists, it was their first visit to DINR, and this result is similar in 2010 and 2011 (Table 13). With a percentage higher than 90% in 2010, 2011 and 2020, visitors recommend visiting this reserve, showing that the vast majority enjoyed the trip. On Deserta Grande, most visitors spend less than 3 hours.

Table 13: Information collected about questions 12 and 13.

12. Was it your first visit to this area?			
2010	**2011**	**2020**	**Evolution**
Yes: 80.8% No: 17.1%	Yes: 84.9% No: 13.1%	Yes: 83.4% No: 15.8%	Yes: -1.5% No: +2.7%

13. Would you recommend a visit to this area?			
2010	**2011**	**2020**	**Evolution**
Yes: 94.8% No: 2.0%	Yes: 92.3% No: 4.0%	Yes: 91.9% No: 3.4%	Yes: -0.4% No: -0.6%

The wildlife viewing and the seawater's quality were the most important aspects that visitors classified for their trip, followed by the landscape and opportunity to increase knowledge about wildlife. These aspects' importance can be explained by the Madeira visitors classifying the island as ideal for the pursuit of leisure and enjoyment, who found the scenery aesthetically pleasing and enjoyable (Prudente et al., 2020). This may result in visitors finding the DI with similar aspects. These aspects are similar to what tourists described Madeira, being a place of nature and tranquillity (Valls et al., 2019).

About visitors' level of satisfaction (Table 14), more than half were satisfied with the cleanliness of the area in Deserta Grande. In the other hand, the visit duration left visitors unsatisfied, and they appeared to not know about the overnight conditions. This could be because most visitors had a day trip by a maritime tourism operator, spending only a few hours on land. Also, the possibility of staying overnight was not communicated during most daily visits when travelling by a maritime tourism operator. On the other hand, visitors travelling by a private vessel normally stay overnight.

Table 14: Comparison of information collected about the satisfaction of some aspects.

18. Rate the following aspects according to your satisfaction.					
		2010	2010	2020	Evolution
Trail	Uns.	2.8%	1.4%	10.9%	+9.5%
	Sat.	44.0%	45.9%	43.9%	-2.0%
	Very Sat.	49.8%	44.5%	23.4%	-21.1%
Picnic Area	Uns.	0.4%	1.4%	2.9%	+1.5%
	Sat.	34.3%	37.5%	46.2%	+8.7%
	Very Sat.	54.0%	44.0%	30.4%	-13.6%
Cleanliness of the area	Uns.	0.0%	0.3%	1.0%	+0.7%
	Sat.	19.0%	22.6%	29.4%	+6.8%
	Very Sat.	78.6%	72.4%	59.7%	-12.7%
Displays and Exhibits	Uns.	0.8%	2.4%	5.7%	+3.3%
	Sat.	39.9%	43.2%	41.3%	-1.9%
	Very Sat.	54.6%	47.6%	38.4%	-9.2%
Duration of the visit	Uns.	4.2%	7.4%	15.3%	+7.9%
	Sat.	38.1%	35.9%	48.3%	+12.4%
	Very Sat.	52.6%	50.1%	25.2%	-24.9%
Number of people	Uns.	X	X	12.5%	X
	Sat.			46.8%	
	Very Sat.			30.6%	
Overnight Conditions	Uns.	X	X	7.5%	X
	Sat.			16.6%	
	Very Sat.			9.4%	
Educational Experience	Uns.	1.0%	1.0%	4.9%	+3.9%
	Sat.	30.6%	39.9%	41.3%	+1.4%
	Very Sat.	65.5%	53.8%	37.9%	-15.9%
Recreational Experience	Uns.	1.6%	3.8%	5.2%	+1.4%
	Sat.	32.7%	40.5%	46.5%	+6.0%
	Very Sat.	61.9%	46.3%	33.8%	-12.5%

The popular activity is the observation of wildlife, followed by walking along the trail and swimming, which follows the revision of literature that tourists choose protected areas due to its nature component (Gale, 2009; Jimenez & Lanh, 2004).

Finally, the feedback provided in the last question of the questionnaire reveals suggestions about the reserve's management (Table 20). Most users reported wanting more

information about the area, and more infrastructures to make Deserta Grande's disembark easy. Some visitors suggested accessing the top of Deserta Grande.

Table 15: Comparison of information collected about what could be improved in the recreational experience.

20. What could be done to improve your recreational experience?				
	2010	**2011**	**2020**	**Evolution**
More information	5.7%	12.2%	36.9%	+24.7%
More infrastructures	9.2%	11%	28.8%	+17.8%
Decrease nº of people	0.1%	0.1%	19.7%	+19.8%
Other	0.2%	0.5%	7.3%	+6.8%

CHAPTER 7 – CONCLUSION

The DINR due to its particular characteristics, namely, being islands of small dimensions, with great cliffs and caves along the coastline, without many possible visitation places, is a very particular protected area hardly comparable with others. Therefore, management and continuous monitoring of this nature reserve are crucial.

The diversity of natural resources in the marine environment provides economic, cultural, recreational and scientific values essential to human life. The use of rationalisation and the preservation of these values constitute an obligation of society.

During this internship, several challenges helped to grow competences in different fields, by becoming more proficient in researching for literature, not only in online resources but also in books and archives. Planning and strategizing the questionnaire to obtain the answers to the research questions while ensuring comparability to the previous studies. Moreover, developing interpersonal relationships skills by approaching locals and tourists in foreign languages and improving face-to-face communication. All of this was done with the added challenge of social distancing and masks imposed by the pandemic restrictions, which due to their dynamic nature, tested the adaptability to handle different tasks and rapid changes of plans.

The study successfully gathered information about 385 DINR visitors, and their demographics and the question results were able to provide answers to the proposed objectives in terms of identifying their awareness of the reserves classification, their means of transportation to the reserve, the willingness to pay for such visit and gather opinions about the management and captivating activities of the reserve. This information can also be useful for marketing purposes.

Based on the results, one can conclude that visitors are mostly females from 19 to 40 years old, Portuguese and with a high education level. The typical individual is visiting for the first time with their family, by a maritime tourism operator. On Deserta Grande, they spend less than 3 hours, and the popular activity is the observation of wildlife.

Visitors see the Nature Reserve classification as an important factor in their decision to visit, and they are not aware of the Natura 2000 classification. They mostly access information about the DS before arriving and usually through the internet, followed by someone's recommendation. After ending the trip, almost all visitors recommend visiting this reserve.

Regarding the willingness to pay to enter the reserve, they showed receptibility from 3 to 6 euros. Wildlife viewing and the seawater's quality were the most important aspects that they classified for their trip. Regarding the visitors' level of satisfaction, they were most satisfied with the cleanliness of the area. In the other hand, the visit duration left visitors unsatisfied. The individuals' commentaries were about wanting more information about the area and more infrastructures to make Deserta Grande's disembark easy.

In comparison to the previous report, there has been an increase in visitors 65 and older and Portuguese and French nationalities. Despite still being the most prominent group, there was a decrease in people from 19 to 40 years old. There was a decrease in individuals from the United Kingdom, Germany and Spain.

Most visitors accessed information about Desertas through the internet, leading to fewer people accessing Flyers or Brochures. Similar to previous years, they mostly used a maritime tourism operator to travel to Desertas, and fewer people arrived in a private vessel. Concerning what could be done to improve the visit, there was a growth in the number of visitors who mentioned wanting more information about the area and more infrastructures than the previous report.

Despite the intention to also analyse visitation in the Selvagens Islands Nature Reserve and the Network of the Marine Area of Porto Santo, it became impossible due to the pandemic, which also posed challenges when approaching and communicating with the visitors for close contact with the questionnaire facing the pandemic regulations and social distancing. Future work lies on the conduction of a questionnaire when the pandemic ends, and conduct campaigns for different nationalities at different times of the year to assess not only the nationality prevalence throughout the year but also the motivations, interests and ways of how they found out about Madeira, also comparing the results against the advertisement programs that promote the islands overseas.

7.1 Self-assessment of acquired skills

The main and specific objectives have been met and specific skills were gained that can be an asset in the future as:

- The ability to organize field trips, getting in contact with maritime tourism companies and learning the necessary procedures before a boat trip. Not having previous experience, this new experience allowed me to understand how to deal with changes in temperature and taking enough supplies.
- The deeper knowledge in terms of the existing fauna, flora and geography of the islands that was possible *in loco*.
- Time management capabilities, when having to reconcile the internship, field trips and search information.
- Work ethics, being my responsibility a project that depended entirely on my involvement with him at all stages, with me being responsible for it to materialize.
- Technical experience when visiting the path in Deserta Grande, gaining insight about how the visit is made, the time it takes to complete and what information is told to the visitors.

All these specific skills will be important in the future as a future professional in the tourism area, managing to reconcile this knowledge with the needs required by an employer in the future.

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ANNEXE

Annexe I – Internship Chronogram.

	Oct.	Nov. Dec.	Jan. Feb. Mar.	Apr. May	Jun.	Jul. Aug. Sep.	Oct. Nov. Dec.	Jan.
Topic research and finalizing topic	X							
Literature review		X	X					
Methodology				X				
Design questionnaire					X			
Data collection						X		
Data interpretation and analysis							X	
Conclusions and findings								X
Write report			X	X	X	X	X	X

Annexe II – Questionaire about the Desertas Islands Nature Reserve carried out to visitors.

IFCN Instituto das Florestas e Conservação da Natureza IP-RAM

UNIVERSIDADE da MADEIRA

Questionnaire about Desertas Islands

This questionnaire was prepared for the internship at IFCN (Institute of Forests and Nature Conservation, IP-RAM), in order to obtain data on the motivation and satisfaction of visitors. The average duration of the questionnaire is about 2 minutes and the data collected is kept anonymous.

1. Gender ◯ Male ◯ Female

2. Age ◯ 18 or under ◯ 19-40 ◯ 41-64 ◯ 65 or older

3. Nationality:_____

4. Education
   - ◯ Primary School
   - ◯ Secondary School
   - ◯ University

5. Do you know if Desertas Islands are protected?

   ◯ Yes ◯ No ◯ I don't know

6. Through which classifications?

   ☐ Nature Reserve ☐ Biosphere Reserve ☐ Natura 2000 ☐ I don't know

7. How important is the classification in your decision to visit?

   ◯ Not important ◯ Very important ◯ Important ◯ I don't know

8. Did you had access to information about Desertas Islands BEFORE arriving?

   ◯ Yes ◯ No ◯ I don't know

9. If you answered YES, in what way?
   - ☐ Internet
   - ☐ Newspapers/Magazines
   - ☐ Brochure/Flyer
   - ☐ Commercial agents
   - ☐ Someone recommended
   - ☐ Other:_____

10. What transport did you use?
    - ◯ Tourism operator
    - ◯ Private
    - ◯ Portuguese Navy
    - ◯ IFCN
    - ◯ Other:_____

11. With whom did you do this visit?
    - ◯ Alone
    - ◯ Family
    - ◯ Friends
    - ◯ Other:_____

12. Was it your first visit to this area?

    ◯ Yes ◯ No ◯ I don't know

13. Would you recommend a visit to this area?

    ◯ Yes ◯ No ◯ I don't know

14. How long was the visit in Deserta Grande?

    ◯ <3h ◯ I don't know ◯ Other:_____

15. Are you willing to pay to enter this area?

    ◯ Yes ◯ No ◯ I don't know

16. If you answered YES, how much are you willing to pay?

    ◯ Less than 3€ ◯ More than 6€ ◯ Between 3€ and 6€

17. Rate the following aspects according to the level of importance for your visit.

	Very little	Little	Neutral	Important	Very important
Landscape					
Tranquillity					
Quality of seawater					
Wildlife viewing					
Increase knowledge about wildlife					

18. Rate the following aspects according to your satisfaction.

	Unsatisfied	Satisfied	Very Satisfied	I don't know
Trail				
Picnic area				
Cleanliness of the area				
Displays and exhibits				
Visit duration				
Number of people present				
Overnight conditions				
Educational experience				
Recreational experience				

19. What activities did you do during your visit?

- ☐ Wildlife and geodiversity observation
- ☐ Walk or hike
- ☐ Diving
- ☐ Sea activities (Sailing, Surfing, SUP, Windsurfing, Bodyboarding, Canoeing, Rowing or Swimming)
- ☐ Other:_____

20. What could be done to improve your recreational experience?

- ☐ Decrease in the number of people in the area.
- ☐ More support infrastructures (toilets).
- ☐ More information about the area.
- ☐ Other:_____

Thank you for your kind cooperation!

Annexe III – Plants present in Deserta Grande, *Echium plantagineum* (at the top) and *Euphorbia piscatoria* (at the bottom).