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Status of Quirimbas, Bazaruto and Ponta do  
Ouro marine protected areas of  
Mozambique

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Septiembre 2017

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| <p><b>MASTER EN GESTIÓN PESQUERA SOSTENIBLE</b><br/>(6ª edición: 2015-2017)</p>                                                            |                                                                                                                                                                                                                                                                                   |                                                                                                                                                         |

## **STATUS OF QUIRIMBAS, BAZARUTO AND PONTA DO OURO MARINE PROTECTED AREAS OF MOZAMBIQUE**

SARA ABRÃO, TEMBE

**TESIS PRESENTADA Y PUBLICAMENTE  
DEFENDIDA PARA LA OBTENCION  
DEL TITULO DE  
MASTER OF SCIENCE EN  
GESTIÓN PESQUERA SOSTENIBLE**

Alicante, 04<sup>th</sup> September of 2017



# STATUS OF MARINE PROTECTED AREAS OF MOZAMBIQUE

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Trabajo realizado en el departamento de ciencias del mar y biología aplicada, España, bajo la dirección del **Profesor Dr. José Luis Sánchez Lizaso**.

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## **Abstract**

With about 2 470 km of coastline, Mozambique is composed of a vast diversity of terrestrial, marine, coastal and aquatic ecosystems that contain habitats that support an enormous diversity of species. The main threats to the biodiversity are linked to human activities. In view of threats to the biodiversity one of the significant steps taken was the signature of the Convention on Biological Diversity (CBD) and establishment of the Protected Areas in order to maintain biodiversity, conserve natural heritage also to promote tourism. The main objective of the present work was critical review of MPAs of Mozambique to identify priority areas for the improvement of the protection network; this study will contribute with MPAs information that will be useful to authorities and other stakeholders in their effort to reach a sustainable fishery management and future implementation of MPAs. For this study information was mainly derived from bibliographical revision, also on existing databases, visits and interview to the communities and managers. The assessment of the actual status of Protected Areas network of Mozambique showed important points in some strengths as: existence of management plans, proper selection, from PAs tourism has contributed to the country's economy, ect.; and also founded some weaknesses as: small proportion of marine areas of Mozambique, low staff and budget allocated for the management, illegal fishing and poor oversight, ect. From those challenges the present study proposes to increase the marine portion of marine protected area; more number of staff and capacities in MPAs needed; also to improve the oversight system using boats with alarm systems in case of violation of the law of the protected area and regular monitoring, ect., to improve the current situation of the PAs of Mozambique.

**Key-words:** Marine reserves, Management, Community, Tourism, Mozambique



## Resumen

Con cerca de 2 470 km de costa, Mozambique está compuesto por una gran diversidad de ecosistemas terrestres, marinos, costeros y acuáticos que contienen hábitats que soportan una enorme diversidad de especies. Las principales amenazas a la biodiversidad están vinculadas a las actividades humanas. En vista de las amenazas a la biodiversidad, una de las medidas significativas adoptadas fue la firma del Convenio sobre la Diversidad Biológica (CBD) y el establecimiento de las Áreas Protegidas para mantener la biodiversidad y conservar el patrimonio natural para promover el turismo. El principal objetivo del presente trabajo fue la revisión crítica de las AMPs de Mozambique para identificar líneas prioritarias para el mejoramiento de la red de protección; Este estudio contribuirá con la información de las AMPs que se espera puede ser de utilidad para las autoridades y otras partes interesadas en su esfuerzo por lograr una gestión sostenible de la pesca y la futura implementación de AMPs. Para este estudio la información se derivó principalmente de la revisión bibliográfica, también en bases de datos existentes, visitas y entrevistas a las comunidades y gestores. La evaluación de la situación real de la red de Áreas Protegidas de Mozambique mostró puntos importantes en algunas fortalezas como: la existencia de planes de gestión, la selección adecuada de las AP, el turismo ha contribuido a la economía del país, etc.; Y también fundó algunas debilidades como: pequeña proporción de áreas marinas de Mozambique, escaso personal y presupuesto asignado para la gestión, pesca ilegal y mala supervisión, etc. A partir de estos desafíos, el presente estudio propone aumentar la porción marina del área marina protegida; mayor cantidad de personal y capacidades en las AMP necesarias; también para mejorar el sistema de vigilancia utilizando barcos con sistemas de alarma en caso de violación de la ley del área protegida y monitoreo regular, etc., para mejorar la situación actual de las AP de Mozambique.

**Palabras-llave:** Reservas marinas, Gestión, Comunidad, Turismo, Mozambique

## RÉSUMÉ

Avec environ 2 470 km de littoral, le Mozambique est composé d'une vaste diversité d'écosystèmes terrestres, marins, côtiers et aquatiques qui contiennent des habitats qui soutiennent une énorme diversité d'espèces. Les principales menaces pour la biodiversité sont liées aux activités humaines. Compte tenu des menaces pour la biodiversité, l'une des étapes importantes ont été la signature de la Convention sur la diversité biologique (CDB) et l'établissement des zones protégées afin de préserver la biodiversité, de conserver le patrimoine naturel également pour promouvoir le tourisme. L'objectif principal du présent travail était l'examen critique des AMP du Mozambique pour identifier les domaines prioritaires pour l'amélioration du réseau de protection; Cette étude contribuera aux informations des AMP qui seront utiles aux autorités et aux autres parties prenantes dans leurs efforts pour parvenir à une gestion durable des pêches et à la mise en œuvre future des AMP. Pour cette étude, l'information provient principalement de la révision bibliographique, également sur les bases de données existantes, les visites et les entretiens avec les communautés et les gestionnaires. L'évaluation du statut actuel du réseau des zones protégées du Mozambique a montré des points d'importance dans certains points forts, car: l'existence de plans de gestion, une sélection appropriée, du tourisme des AP a contribué à l'économie du pays, ect .; Et a également fondé certaines faiblesses: petite proportion de zones marines du Mozambique, faible effectif et budget alloué à la gestion, à la pêche illégale et à la surveillance insuffisante, ect. De ces défis, la présente étude propose d'augmenter la partie marine de l'aire marine protégée; Il faut un plus grand nombre de personnel et de capacités dans les AMP; Aussi pour améliorer le système de surveillance en utilisant des bateaux avec des systèmes d'alarme en cas de violation de la loi de l'aire protégée et un suivi régulier, etc. pour améliorer la situation actuelle des AP du Mozambique.

**Mots-clés:** Réserves maritimes, gestion, communauté, tourisme, Mozambique



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## List of acronyms

| Abbreviation | Meaning                                                     |
|--------------|-------------------------------------------------------------|
| AMA          | Environmental Association                                   |
| ANAC         | Administration of Conservation Areas                        |
| CBD          | Convention on Biological Diversity                          |
| CAs          | Conservation Areas                                          |
| CCP          | Communitarian Fisheries Conservation                        |
| COMEDQ       | Development Committee of Quirimbas                          |
| CG-PNQ       | PNQ Management Council                                      |
| CIHEM        | International Centre of High Agronomic Studies of Mediteran |
| DNAC         | National Direction of Conservation Areas                    |
| ESCMC        | Marine and Coastal Science School                           |
| EU           | European Union                                              |
| FFEM         | French Fund for the Global Environment                      |
| GIS          | Geografic Information System                                |
| GOM          | Government of Mozambique                                    |
| ha           | Hectare                                                     |
| IAMZ         | Agronomic Institute Mediterranean of Zaragoza               |
| i.e.         | Example                                                     |
| IUCN         | International Union of Conservation of the Nature           |
| MITADER      | Ministry of Land Environment and Rural Development          |
| MITUT        | Tourism Ministry                                            |
| MCEA         | Ministry for the Coordination of Environmental Affairs      |
| MPA          | Marine Protected Area                                       |
| Mde          | Improvement of Understanding                                |
| N.F          | Not found                                                   |
| N.Y          | None year                                                   |
| PA           | Protected Area                                              |
| PNQ          | Quirimbas National Park                                     |
| PNAB         | Bazaruto Archipelago National Park                          |
| RNP          | Pomene Nacional Reserve                                     |
| REPMAR       | General Regulation of the Marine Fisheries                  |
| SCUBA        | Self Contained Underwater Breathing Apparatus               |
| spp          | Species                                                     |
| TFCAS        | Trans-Frontier Conservation Areas                           |
| UA           | University of Alicante                                      |
| UEM          | Eduardo Mondlane University                                 |
| WIO          | West Indian Ocean                                           |
| WWF          | World Wildlife Fund for Nature                              |
| ZT (BZ)      | Buffer Zone                                                 |

|     |                        |
|-----|------------------------|
| ZPT | Total Protection Zones |
| ZUL | Local Use Zones        |
| ZUM | Multiple Use Zones     |

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## 1. INTRODUCTION

Located on the southeast coast of the African continent, Mozambique is between the parallels 10° 27'e 26° 52' South Latitude and the meridian of Longitude 30° 12'e 40°51 E. It borders the Indian Ocean to the East; North Tanzania, Malawi and Zambia; the West, Zimbabwe and South Africa; and the South, South Africa and Swaziland (figure 1).

The country has about 799 380 km<sup>2</sup> of surface area that extends from north to south direction facing the Indian Ocean. Narrowing from north to south, reaches its maximum width in the North Centre, between the coast and the confluence of the Zambezi and Aruângua rivers and the smaller the South, only 47.5 Km, in the Namaacha zone (MCEA, 2014).



Figure 1: Geographic localization of Mozambique (Source: [www.googlemaps.com.br](http://www.googlemaps.com.br))

In this country there are more than 24 million people with a growth rate of 2.5% per annum, the majority of which lives below the poverty line and has no access to improved water and sanitation. About two-thirds of the total population resides within the coastal region (Pereira et al., 2014). Agriculture, fisheries, mineration and commerce are the aim socioeconomics activities.

Mozambique has about 2 470 km coastline and a diverse and productive continental shelf area of about 104,300 km<sup>2</sup> is of paramount importance for the country (Pereira et al., 2014). In the country are locate three of the Global 200 Ecoregions defined by the World Wildlife Fund for Nature (WWF), which developed by WWF scientists and regional experts on terrestrial, freshwater and most biologically exceptional marine species in the world; The world's most biologically exceptional freshwater and marine ecoregion; Ecoregion 233, East African Marine Ecoregion between the Tanzania border to the south of Inhambane Bay; Ecoregion 211, Needle Current in the coastal zone of the provinces of Gaza and Maputo; And Ecoregion 136, Eastern African Mangroves, appears in the coastal zone of Mozambique in the form of scattered spots, more conspicuous on the shores of Zambezia and Sofala provinces, is classified as a critical ecoregion (CPD, n.y.).

The country it's composed of a vast diversity of terrestrial, marine, coastal and aquatic ecosystems. Marine and coastal ecosystems (coastal dunes and sandy beaches) occupy an area of approximately 572,000 km<sup>2</sup>, about 42% of the country. To the marine environment, it is estimated that sea grass ecosystems have coverage of 439 km<sup>2</sup> and 1,890 km<sup>2</sup> in Mozambique coral reef, whose conservation status is generally good (MCEA, 2014). The ecosystems contain habitats that support an enormous diversity of species, including more than 5500 species of plants, 220 of mammals, 690 of birds 167 reptiles and 79 amphibians, some of which are endemic. The diversity of marine species includes 5 species of turtles, 18 species of mammals, 2626 species of fish, 1363 species of mollusks and 194 species of corals (MICOA 2009).

In Mozambique, the main threats to the biodiversity are linked to human activities, which constitute the direct causes of change in land cover and, consequently, the loss of biodiversity; human activities are developed at the level of individual parcel of land, household or community.

In view of threats to the biodiversity one of the significant steps taken was the signature of the Convention on Biological Diversity (CBD), in 1992, at the World Summit on Environment and

Sustainable Development - Rio Summit. With the ratification of this Convention by the Legislature two years later, Mozambique became a State Party to the Convention, taking on the commitment to promote international cooperation on the management and sustainable use of biological resources for the implementation of the three objectives of the Convention: the conservation of biological diversity, the sustainable use of its components and the fair and equitable benefit sharing from genetic resources (MCCEA, 2014).

Actually, the Protected Areas (PA) represents an effective mode of biodiversity protection. In Mozambique, protected areas have been established in order to maintain biodiversity, conserve natural heritage also to meet its international commitment to conserve biodiversity but also to promote tourism.

The Conservation Law (Law no. 16/2014, of June 20), in its article 43, reiterates that "*conservation areas must be managed through a management plan as a technical document that establishes the order and the norms that should govern the use and management of natural resources, namely: studies are necessary to better understand the area, containing the follow-up of the environmental conditions and use required to support the management (...)*".

In many cases, the establishment of a marine protected area has approval from the government without the necessary baseline information, including consultation with local people (Reid et al. 1999); to be an effective means to support biodiversity conservation and ecologically and economically sustainable fisheries marine areas should be managed in the context of human societies that are dependent on those resources (WCPA 2003). MPAs should include the full range of IUCN categories (including highly protected marine reserves and areas managed for multiple uses). Which category is applicable in a particular situation needs to be carefully considered. In many aspects of the establishment and subsequent management of such areas, the perceptions of local people are likely to be important (Gaspar, 2008).

The background of the legal regime for biodiversity conservation consists of a series of policies and legal instruments (Sal e Caldeiro Advogados, LDA, 2014). However, although the Management Plans of Conservation Areas (CAs) have monitoring and research priorities and significant work

done, experience has shown that CAs still face major challenges in establishing, harmonizing and consolidating monitoring and evaluation programs and research (Pereira and Fernandes, 2014).

Each of these areas of conservation presents its specificities in terms of research and monitoring priorities. One of the measures adopted by the National Administration of Conservation Areas (ANAC) to respond to these priorities has been the adoption of Improving of Understanding (Mde) with several partners related to conservation, monitoring and research to improve the understanding of the status of each protected area and improve what is necessary (Louro et al., 2014).

### **1.1.OBJECTIVES**

The main objective of the present work was critical review of MPA in Mozambique to identify priority areas for the improvement of the MPA network.

The specific objectives of the work are:

- Describe general characteristics of the Marine Protected Areas;
- Characterize the socio-economic activities and benefits;
- Analyze if the MPAs have management plan, if they are applying it, resources allocated to management, and how may be improved.

The main aim of this work is to collect information about the status of marine protected areas of Mozambique, analyze the collected information, mainly the MPAs problems will be found and propose some tools to improve their management. This work will contribute with management, regulation and socio-economic data about the MPAs that will be useful to authorities and other stakeholders in their effort to reach a sustainable fishery management and future implementation of MPA.

## **2. METHODS**

### **2.1. Study area**

Mainly the present work was most focused on three Marine Protected Areas, which according to the Workshop on Improvement of Conservation Areas (2015), there is current need for Improvement of Understanding (MdE), which includes the Quirimbas National Park (PNQ), Bazaruto Archipelago National Park (PNAB) and Ponta do Ouro Marine Reserve (RMPPPO).

### **2.2. Data collection**

For this study information was mainly derived from:

- i) Bibliographical revision: reports, articles, books and other documents of each Marine Protected Area;
- ii) Also based on existing databases of MPAs: for collection of general information as general description of each area.
- iii) Interviews: to collect information that was not found in previous work was held structured interviews with stakeholders and managers of some MPAs. The interviews were carried by emails or by phone and focus on information related to uses regulation, socio-economic activities and benefits, zoning, management resources, staff, monitoring, threats and problems in the MPA. In this perspective, 25 interviews were conducted, of which 3 were CCP members, 2 were leaders, 5 were community members and 15 were fishermen from the Ibo community, one of the islands of the PNQ, where all respondents asked for anonymity in data processing. In the remaining MPAs the information obtained was not in the totality of what had been drawn.
- iv) The interview formulary can be founded in attachments.
- v) The study was also based on visit of one of the MPA, to have direct contact with the community, managers and stakeholders involved in protection.

The detection of the declared spaces was done with the help of the following search websites:



- a) <http://www.biofund.org.mz/base-de-dados/plataforma-sobre-as-ac/#>: is one of the website for the marine conservation areas of Mozambique;
- b) [www.mpaglobal.org](http://www.mpaglobal.org): initiative in which all the previous organisms intervene together with the organization WWF and Sea around us;
- c) [www.protectedplanet.net](http://www.protectedplanet.net): initiative for the use of the world database of protected areas, of which they are part.

**2.3. Method**

This is primarily a qualitative study using research interviews administered to key informant interviews, direct observation (in case of the visit of one of the MPA) and the examination of existing government and public documents. Data were analyzed using qualitative methods.

**2.3.1. Interviews and Structured interviews**

The survey for this work was based in interviews technique; was used direct observation and document review as indicators and reports respectively (table 1).

**Table 1:** Method used for the work

| Paradigm     | Methods            | Techniques | Selection/methods | M. Instrument |
|--------------|--------------------|------------|-------------------|---------------|
| Interpretive | Survey             | Interviews | Key informants    | Questionnaire |
|              | Direct Observation |            |                   | Indicators    |
|              | Document review    |            |                   | Reports       |

Interviews and Structured interviews are useful techniques for gathering information not yet available to the researcher used to fully explore a general area and usually conducted face to face between interviewer and respondent (Mack et al, 2005); for structured interviews interest using an interview guide (Appendix 1) with a list of topics to be discussed (Mitchell et al, 2005). In this study structured interviews were held purposively with respondents familiar with the area and knowledgeable about the history of the PQN.

Interviews were held at PNQ with some members of Communitarian Fisheries Councils (CCP) (figure 2) that make part of the PNQ management and monitoring, who served as key informants in the research. The objective was to get a first impression regarding the: general impact of the PNQ and challenges to improve the management.



**Figure 2:** Interview held with member of CCP, Quirimbas National Park MPA (Photo: Tembe, 2017)

### 2.3.2. Additional data collection methods used

Direct observation and document review were also used to collect data for the study. Direct observation is important because it gives the researcher the information to be studied first-hand compared to interviews, where the information is second-hand (Welman et al, 2005). Direct

observations enable the researcher to explore more features to understand the event or manifested behaviors (Babbie & Mouton, 2006). The direct observation was conducted during the interviews; different events were recorded using a digital camera. Review of documents was relevant information such as progress reports associated with the research topic, annual plans, reports on past projects and reports concerning relevant participating stakeholders were used to augment information collection from sources other than interviews, direct observations.

#### **2.4. Scientific basis of the technique used for data collection**

According Gil (1999) research is carried out through the use of available knowledge and the careful use of methods, techniques and other scientific procedures throughout a process that involves numerous phases, from the adequate formulation of the problem to the satisfactory presentation of the results.

The starting point of a scientific investigation should be based on a survey of data; For this survey it is necessary, at first, to make a bibliographical research; In the second moment, an observation of the facts or phenomena must be made so that it obtains more information and in a third moment, the objective of the researcher is to obtain information or to collect data that would not be possible only through bibliographical research and observation.

The interview is one of the techniques most used by researchers for the collection of data in this third moment of data collection. According to Ribeiro (2008), the technique is the most pertinent to obtain information about its object and that can go beyond the descriptions, incorporates new sources for the interpretation of the results by the interviewers themselves.

In the present work, a structured or formalized interview was developed that develops from a fixed list of questions, whose order and writing remain unchanged for all interviewees, who are usually in large numbers. This type of interview becomes the most appropriate for the development of social surveys.

Some of the main advantages of using the structured interview are their speed and the fact that they do not require exhaustive preparation of the researchers, which implies relatively low costs. Another

advantage is to enable the statistical analysis of the data, since the answers obtained are standardized, but this in turn leads to the possibility of analyzing the data with a greater depth.

However, the interview does present some disadvantages or limitations, which makes its use in some circumstances less viable than other data collection techniques.

For Gil (1999), the main limitations of the interview are:

- The lack of motivation of the interviewee to answer the questions that are asked to him;
- The inadequate understanding of the meaning of the questions;
- Providing false answers, determined for conscious or unconscious reasons;
- Inability, or even incapacity, of the interviewee to respond adequately, due to the lack of vocabulary or psychological problems;
- The influence exerted by the personal aspect of the interviewer on the interview;
- The influence of the interviewer's personal opinions on the interviewee's responses.

Junior et al (2008) identifies as technical weaknesses: high cost, time consuming application, subjection to the interviewer's polarization, lack of anonymity, and sensitivity to the effects on the interviewee, interviewer and interviewee characteristics, the specialized training it requires, the questions that guide the response.

## **2.5. Limitation on data collection**

For the present study, the collection of information was not complete or exhaustive due to the poor communication and information sharing by the administration of some Marine Protected Areas. At the beginning of the survey, an interview form was drawn up and sent by e-mail. However, most of the administrative entities of the MPAs remained silent, and insisting on a telephone call, they no longer answered calls after introducing the subject of interviews. Thus, it was necessary to visit at least one of the MPAs that was the case of Quirimbas National Park, however even with the direct contact with Quirimbas National Park managers the difficult of sharing the requested information persisted. To obtain information and achieve the goals to understand the status of that MPA the most viable option was to interview the fisherman and community, which are members of MPA monitoring and managing; the group consisted of members of the Community Fisheries Council (CCP), fishermen and community leaders residing in the protection area. There was not possible to visit Bazaruto and Ponta do Ouro Marine Protected Areas because of scholarship limitations.

### 3. RESULTS and DISCUSSION

The REPMAR (General Regulation for Maritime Fishing), Decree No. 43/2003 is the regulation that governs all fishing activity in Mozambique. According to Section III, Article 112, it is stated that in order to preserve and protect marine resources, Protection Areas may be established; Parks and Marine Reserves and Marine Protected Areas.

In addition to the protection zones mentioned above, there are closed fishing areas, which are usually temporal or spatial; Article 29 of REPMAR No 43/2003, cites the existence of areas closed to fishing; “Veda”, where species are allowed to grow, establish themselves in growing areas of marine species; Where marine species are allowed to reproduce and settle in breeding sites. In these areas closed to fishing, in the “Veda” is allowed the fishing of larvae, juveniles and spores for Marine Aquaculture purpose; It is also allowed to catch shrimp farms to artisanal fishermen using the three-mesh net; To fish for larvae or shrimp breeding fishermen or an aquaculture entity must request authorization from the Ministry of Fisheries.

In addition to the “Veda” and “Defeso” periods, according to Law No 16/2014, Article 22 there are conservation areas with the purpose of restoring marine resources, such as Shrines and Areas of Community Conservation; Where areas can be closed for a period and then opened for fishing purposes. During the period in which the areas are closed, it is allowed to repopulate species in the area.

Those periodic areas closed for fisheries exist in Mozambique, although they are rarely documented or listed in the Map. In some sites as WWF is possible to find cases of success of places where for some months closed fishing activity to restore the stock, as: Quirimbas communities have programs of temporal “Veda” for octopus; also have the example of Primeiras e Segundas Islands, Moma and Angoche has “sanctuary” for fish.

According to Law n. ° 16/2014 the main “categories” of Protected Areas (PA’s) in Mozambique (table 2) which have different degrees of protection in relation to the conservation of biodiversity are:

- (i) National Parks: are an area of total conservation, in the public domain of the State, bounded for the propagation, protection, conservation, preservation and management of wild flora and fauna as well as protection of sites, landscapes or formations of particular scientific, cultural or aesthetic value, in the interest and for public recreation, representative of the national patrimony.
- (ii) National Reserves: the reserve is a total area of conservation, in the public domain of the State, delimited for the preservation of nature, the maintenance of ecological processes, the functioning of ecosystems and endangered or rare species.
- (iii) Environmental Protection Areas: are protected areas of conservation, of public use of the State, delimited, managed in an integrated way, where the interaction between the human activity and the nature model the landscape with aesthetic, ecological or cultural qualities specific and exceptional, Producing important ecological services for its residents and neighbors.
- (iv) Special Reserves: are protected areas of limited public use in the state, intended for the protection of a species of rare, endemic or endangered fauna or flora or that with recognized cultural and economic value.

Besides the aim categories mentioned above there are other types of protected areas in Mozambique as: Total conservation areas, Cultural and natural monument, Areas of conservation of sustainable use, Official “Coutadas”, Communitarian conservation area, Sanctuary, Farm of the wild and Municipal Ecological Park.

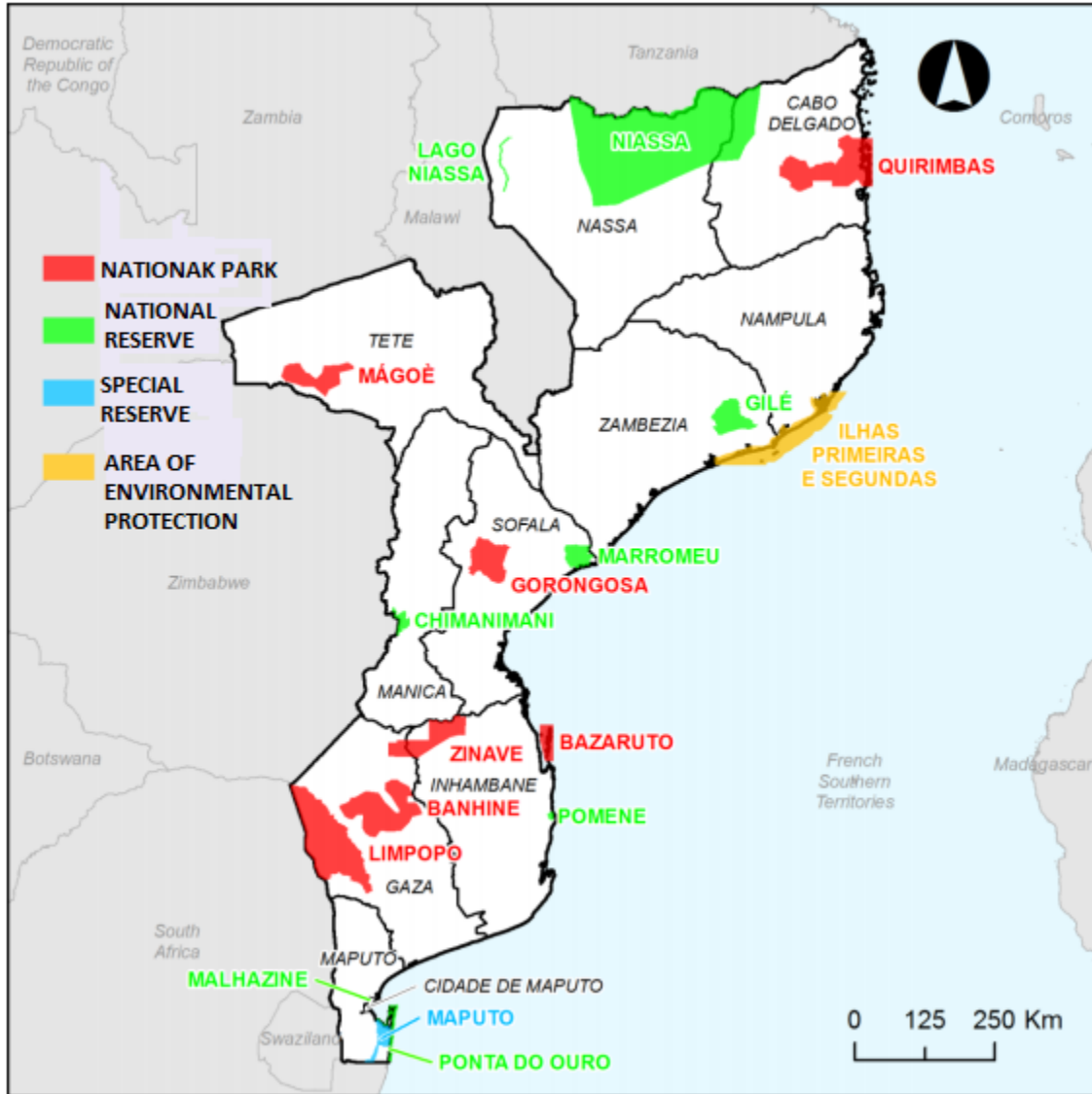
In data base “Biofound”, founded that Mozambique has currently protected Areas (PA) cover a total area of about 20,462 km<sup>2</sup> of which 8,633 km<sup>2</sup> encompass marine ecosystems.

There are, in total, references to the existence of seventeen (17) protected areas and a proposed declaration, all with part or their entire surface in the middle (table 2) (figure 3). The distribution among official protection figures of the country was: seven (7) declared national parks, eight (8) national reserves and one (1) special reserve and (1) environmental conservation area. There is

Trans-Frontier Conservation Areas (TFCAs) areas shared with trans-boundary countries with Mozambique that are not included in table (2).

**Table 2:** List of marine and coastal protected areas of Mozambique (Source: Adapted from: Biofound (data base))

| Name                                          | Province           | Creation Year | Area (km <sup>2</sup> ) |
|-----------------------------------------------|--------------------|---------------|-------------------------|
| <b>National Parks (NP)</b>                    |                    |               |                         |
| Gorongosa                                     | Sofala             | 1960          | 4 086                   |
| Bazaruto Archipelago                          | Inhambane          | 1971          | 1 430                   |
| Banhine                                       | Gaza               | 1973          | 9 113                   |
| Zinave                                        | Inhambane          | 1973          | 4 000                   |
| Limpopo                                       | Gaza               | 2001          | 11 233                  |
| Quirimbas                                     | Cabo Delgado       | 2002          | 7 250                   |
| Mâgoé                                         | Tete               | 2013          | 3 745                   |
| <b>National Reserves (NR)</b>                 |                    |               |                         |
| Marrromeu                                     | Sofala             | 1960          | 1 500                   |
| Gilé                                          | Zambézia           | 1960          | 2 861                   |
| Niassa                                        | Niassa             | 1964          | 42 000                  |
| Pomene                                        | Inhambane          | 1964          | 200                     |
| Chimanimani                                   | Manica             | 2000          | 655                     |
| Reserva Marinha Parcial de Ponta do Ouro      | Maputo             | 2009          | 678                     |
| Reserva Parcial do Lago Niassa                | Niassa             | 2011          | 478                     |
| Malhazine                                     | Cidade de Maputo   | 2012          | 5, 68                   |
| <b>Special Reserve (SR)</b>                   |                    |               |                         |
| Reserva Especial de Maputo                    | Maputo             | 1960          | 1 040                   |
| <b>Area of Environmental protection (AEP)</b> |                    |               |                         |
| Ilhas Primeiras e Segundas                    | Zambézia e Nampula | 2012          | 10 409                  |



**Figure 3:** Distribution of protected areas in Mozambique (Source: FUNAB, 2015).

In view of the table 2, the first PAs of Mozambique and perhaps the WIO region was designated in 1960 as, Gorongosa National Park, Gilé and Marromeu National Reserve. In 2013 were designated the most recent Protected Area, Magoé NP, Malhazine NR and Ilhas Primeiras e Segundas AEP. The largest protection area is Niassa NP with about 42,000 km<sup>2</sup> and Malhazine NR the smallest with 5.68 km<sup>2</sup>.

According Pereira et al. (2014), throughout the years, there have been several proposals for the designation of MPAs in Mozambique. These include: Benguelene Island, Incomati estuary, Bilene,



Inhambane (Tofo and Paindane), Nacala (Nacala bay and Relanzapo), Mossuril, Mozambique Island and Lumbo, that until the moment there was not approved the proposal.

### **i) The Evolution of Protected Areas in Mozambique**

According to the table 2, is possible to note that most protected areas were established in the 1960 and 1970, under the Decree n° 400 40, of 20<sup>th</sup> January 1955. During the civil war (1977 – 1992) no protected areas were established and the existing ones were mostly abandoned due to lack of security. USAID (2013) mentioned that these areas were invaded by local people for housing or cultivation and were heavily affected by illegal and excessive use of natural resources, particularly bush meat to feed soldiers and to supply the market.

A process of protected area restoration started in 1995 with the re-establishment of management bodies and preparation of management plans; creation of new parks, reserves and hunting areas; shifting of protected area boundaries; formulation of policies and laws such as the Environmental Law, Forest and Wildlife Law, and Land Law. Three Trans-Frontier Conservation Areas (TFCAs), have been established: Limpopo TFCA between Mozambique, South Africa and Zimbabwe; Lebombo TFCA between Mozambique, South Africa, and Swaziland; and Chimanimani TFCA between Mozambique and Zimbabwe. In developing the Lebombo TFCA, the Futi Corridor (about 240km<sup>2</sup>) was proclaimed as a formal conservation area in 2011, to strengthen the connectivity between the Maputo NR in Mozambique and the Tembe Elephant Park in South Africa (USAID, 2013).

This resulted in an increase in the percentage of the total land covered by protected areas from 11.4% in 1995 (MICOA 1998) to about 25% in 2012. Known biodiversity hotspots such as the Maputaland centre of endemism, the afro-montane habitats around the Chimanimani Mountain and the Gorongosa Mountain - Rift Valley - Marrromeu complex are all included within the protected area network. However, some biodiversity-rich areas remain outside protected areas, for example, the inselberg archipelago of northern Mozambique, which hosts unique fauna and flora. The gaps in representation within the protected area system are more pronounced in coastal and marine ecosystems, which have historically been neglected in conservation priorities. To overcome this

imbalance, there are currently several proposals in advanced stages for the proclamation of coastal and marine protected areas.

The Ilhas Primeiras e Segundas Marine Partial Reserve has just been declared (November 6, 2012), and is Mozambique's newest protected area, with an area of 10 400 km<sup>2</sup>, the largest marine environmental reserve in Africa.

The Marromeu NR and the Lake Niassa PR have been proclaimed as Ramsar sites due to their richness in wetlands supporting a large diversity of aquatic avifauna, including intra-African intra-African migratory species. There are proposals for new TFCAs, namely Rovuma between Mozambique and Tanzania, and Zimoza TFCA between Mozambique, Zimbabwe and Zambia. In addition to these categories proclaimed by the Council of Ministers, there are several sacred forests proclaimed at provincial and district level due to their historic and cultural value for local communities (USAID, 2013).

## **ii) Management evolution**

The Tourism Ministry (MITUR) was created by Presidential Decree N<sup>o</sup>. 1/2000 of January 17. The reason for its creation has to be with the need to have a Ministry dedicated exclusively to the coordination and development of tourism in the country. The attributions and competences of MITUR are detailed in articles 2 and 3 of Presidential Decree 9/2000 of May 23. These include "promoting the conservation of wildlife as one of the components necessary for the development of tourism" and "promoting the sustainable development of tourism with a view to contributing to the economic and social development of the country".

At the central level, MITUR created the National Directorate of Conservation Areas (DNAC), whose functions established by article 4 of Ministerial Diploma no. 126/2000 of September 13 are: "(...) supervise conservation areas under the management of MITUR, as well as the activities of operators in the exploitation of hunting tourism; coordinate the operations of conservation areas; present proposals for the creation of new conservation areas; approve management plans and itineraries in conservation areas and ensure compliance; keep updated the inventory and register of the fauna and

forest resources of conservation areas; collaborate with the competent bodies in promoting the policy of conservation of natural resources.

In these terms the DNAC is therefore responsible for the coordination most of the National Network of Conservation Areas in Mozambique, managed by National Administration in Conservations Areas (ANAC). Other categories of conservation areas are also included in the ANAC management framework, such as official “coutadas” and wilderness farms destined to the development of hunting tourism, as well as the 3 Community Conservation Areas of Mitchéu. Tchuma Tchato and Chipanje Chetu, and the Forest Reserves. This management is carried out in the field through the park and reserve managers who have a team mostly made up of inspectors, who are directly responsible for the activities of inspection and daily control of conservation areas.

This biological diversity that Mozambique has through its network of conservation areas, gives it a very rich biological diversity, bringing together different ecosystems, both terrestrial and marine. This diversity of ecosystems has an important role in providing environmental services.

### **3.1. General description of Protected Areas of Mozambique**

#### **3.1.1. Management of the Protected Areas**

According to table 3, almost all PAs are managed under the National Administration of Conservation Areas (ANAC) entity; the Partial Marine Reserve of Ponta do Ouro is managed by the Ministry of Fisheries and the Malhazine Reserve by the Municipal Council of the city of Maputo; with the exception of the Mâgoe National Park, which was not founded the management entity: the PAs have the management plan, however in table 3 some of the areas that are blank are those that did not answer interviews. Direct states is the Most of the PAs have as a type of governance almost all Protected areas in Mozambique, with exception of the Reserves of Gilé, Niassa, Ponta de Ouro and the Special Reserve of Maputo that have a Partnership management. Regarding Management Effectiveness Tracking Tool (METT) there is still a lot to work on to improve the conservation of areas, there are areas still far from achieving effectiveness in the conservation process such as the

Lake Niassa Partial Reserve and the Malhazine Reserve, this can be justified of possibly because they are relatively few years old.

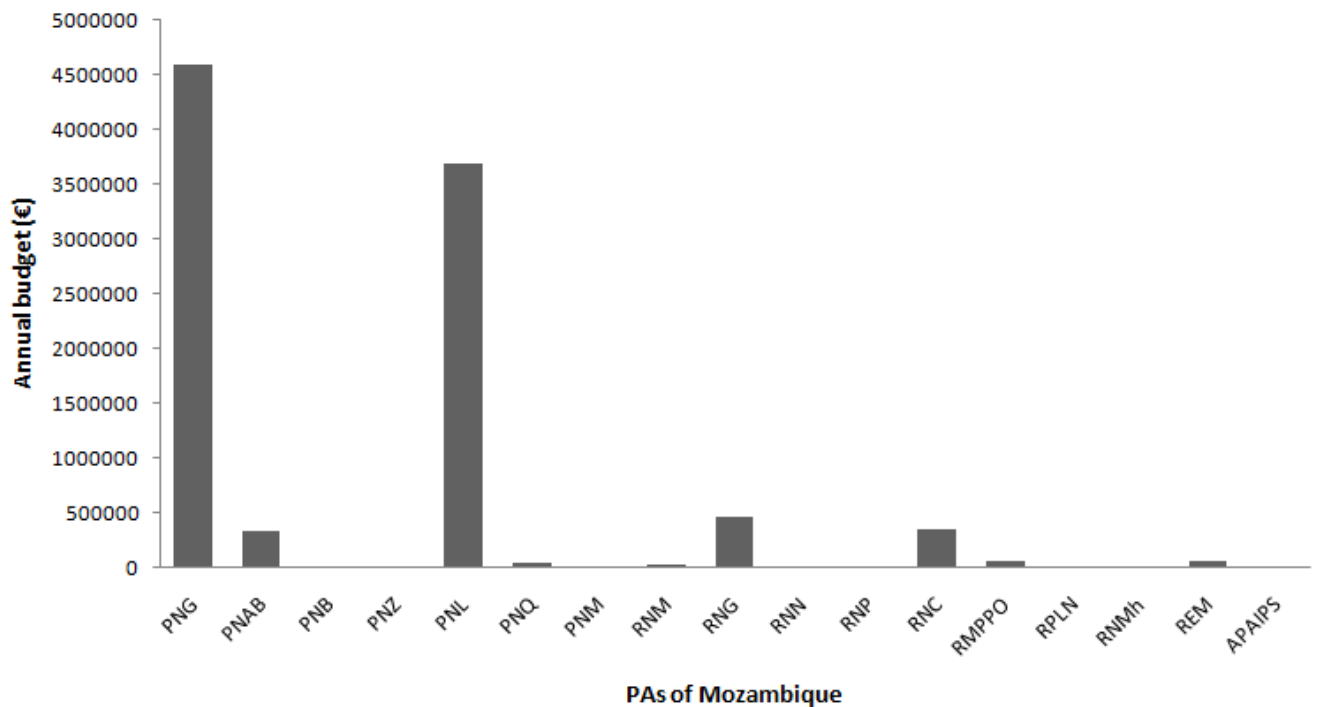
**Table 3:** Description of management type of Protected Areas of Mozambique: N.F- Not found, ANAC- Conservation Areas National Administration, METT- Management Effectiveness Tracking Tool (**Source:** Self elaboration: from interviews data and Biofound database)

| Name                                     | Management Plan (MP)    | Responsible Entity  | Type of Governance     | Management Effectiveness Tracking Tool (METT %) |
|------------------------------------------|-------------------------|---------------------|------------------------|-------------------------------------------------|
| <b>National Parks</b>                    |                         |                     |                        |                                                 |
| Gorongosa                                | 2010-2010               | ANAC                | Partnership Management | 62                                              |
| Bazaruto Archipelag                      | 2016-2025               | ANAC                | Direct State           | N.F                                             |
| Banhine                                  | N.F                     | ANAC                | Direct State           | 39                                              |
| Zinave                                   | 01/01/2010 - 20/10/2015 | ANAC                | Direct State           | 40                                              |
| Limpopo                                  | 2003-2007               | ANAC                | Partnership Management | 52                                              |
| Quirimbas                                | 01/01/2011 - 01/01/2021 | ANAC                | Direct State           | 51                                              |
| Màgoé                                    | N.F                     | ANAC                | Direct State           | 8                                               |
| <b>National Reserves</b>                 |                         |                     |                        |                                                 |
| Marromeu                                 | N.F                     | ANAC                | Direct State           | 29                                              |
| Gilé                                     | 01/01/2012 - 31/12/2022 | ANAC                | Partnership Management | 28                                              |
| Niassa                                   | 01/01/2006 - 01/01/2011 | ANAC                | Partnership Management | 54                                              |
| Pomene                                   | N.F                     | ANAC                | Direct State           | 28                                              |
| Chimanimani                              | 01/01/2010 - 31/12/2015 | ANAC                | Direct State           | 48                                              |
| Reserva Marinha Parcial de Ponta do Ouro | 01/01/2010 - 31/12/2015 | ANAC                | Partnership Management | 48                                              |
| Reserva Parcial do Lago Niassa           | N.F                     | Fisheries Minister  | Direct State           | 9                                               |
| Malhazine                                | N.F                     | Maputo City Council | Direct State           | 6                                               |
| <b>Special Reserve</b>                   |                         |                     |                        |                                                 |

|                                         |           |      |                        |    |
|-----------------------------------------|-----------|------|------------------------|----|
| Reserva Especial de Maputo              | 2010-2014 | N.F  | Partnership Management | 54 |
| <b>Area of Environmental protection</b> |           |      |                        |    |
| Ilhas Primeiras e Segundas              | N.F       | ANAC | Direct State           | 40 |

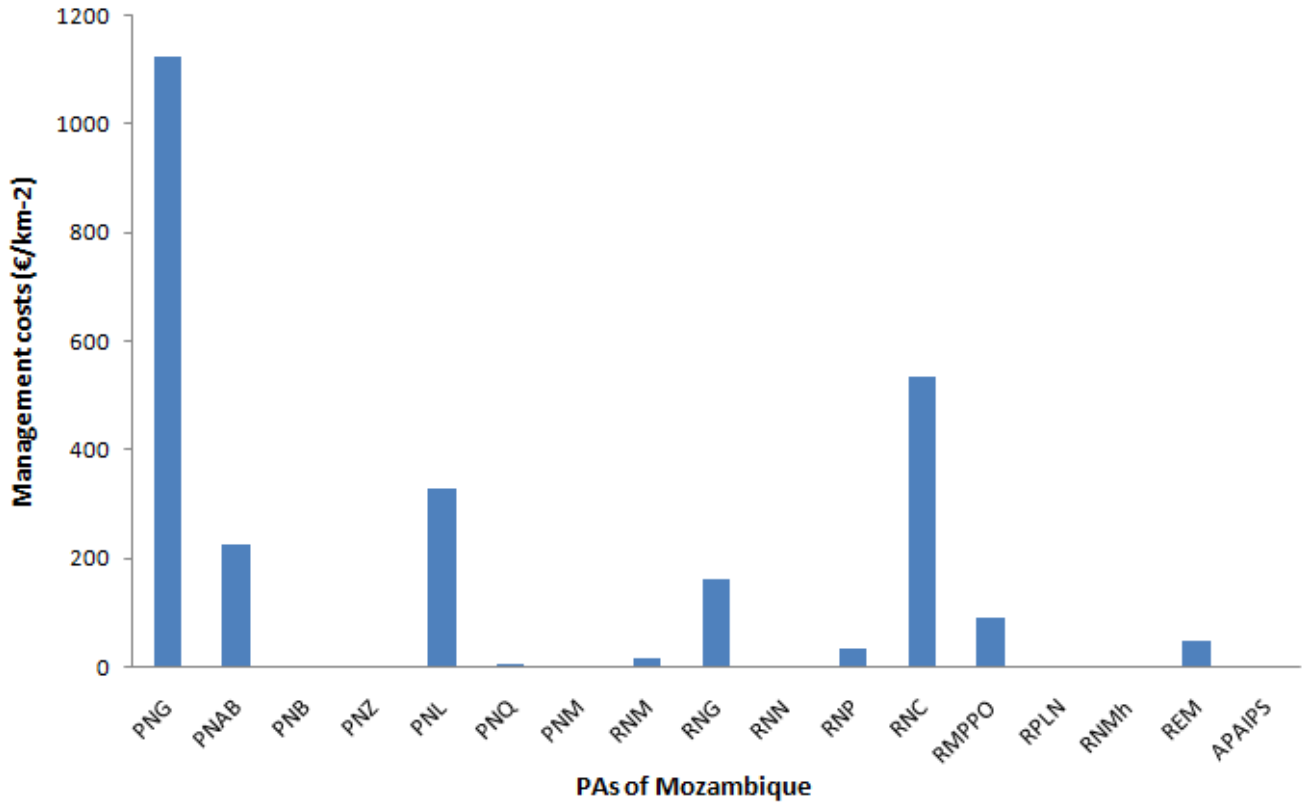
### 3.1.2. Budget and coast management of the Protected Area of Mozambique

The figure 4 is about annual budget for each Protected Area of Mozambique. The Gorongosa National Park (PNG) has high annual budget with 4 595 445 € and 3 697 521 € of Lipompo National Park (PNL). This two NP has the largest number of infrastructures and means of transportation as well. The Zinave National Park (PNZ) and Pomene National Reserve (RNP) has the lowest budgets about 6 950 € by year, as well Banhine National Park (PNB) with 13 622 €.



**Figure 4:** Annual budget of Protected Areas of Mozambique

About annual management coast budget by km<sup>2</sup>, the Gorongozo National Park (PNG) has high management coast with 1 124 €, 534 € of Chimanimani National Reserve (RNC) and 329 € of Lipompo National Park (PNL). The lowest management coast found in Banhine National Park (PNB), Zinave National Park (PNZ) and Quirimbas National Park (PNQ) with 1,88, 1,74 and 5,12 € respectively by km<sup>2</sup>.

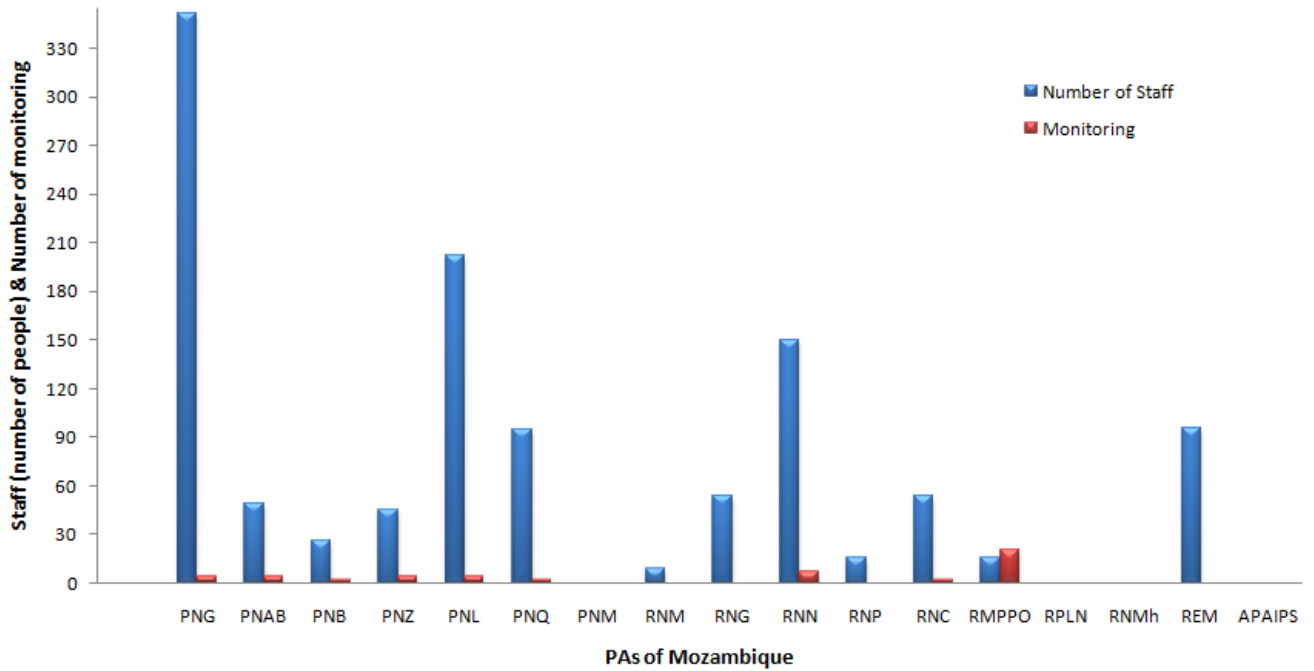


**Figure 5:** Management costs by year by km<sup>2</sup> of Protected Areas of Mozambique

### 3.1.3. Staff and Monitoring of the Protected Area of Mozambique

About the staff, Gorongozo National Park (PNG) has a larger number of staff allocated with about 351 and Lipompo National Park (PNL) with 202 (figure 6). And the low number of staff found in Marromeu National Reserve (RNM) with 9 and Ponta do Ouro Partial Marine Reserve (RMPPO) with 16. As for monitoring, it has usually been aerial counts and / or dives, the data on the counts show that from the reported counts were aerial except for the Partial Marine Reserve of Ponta de Ouro that has counted also by diving; this total number refers accounts resisted from 2013 to 2015. The high number of monitoring was in Ponta do Ouro Partial Marine Reserve (RMPPO) with 21

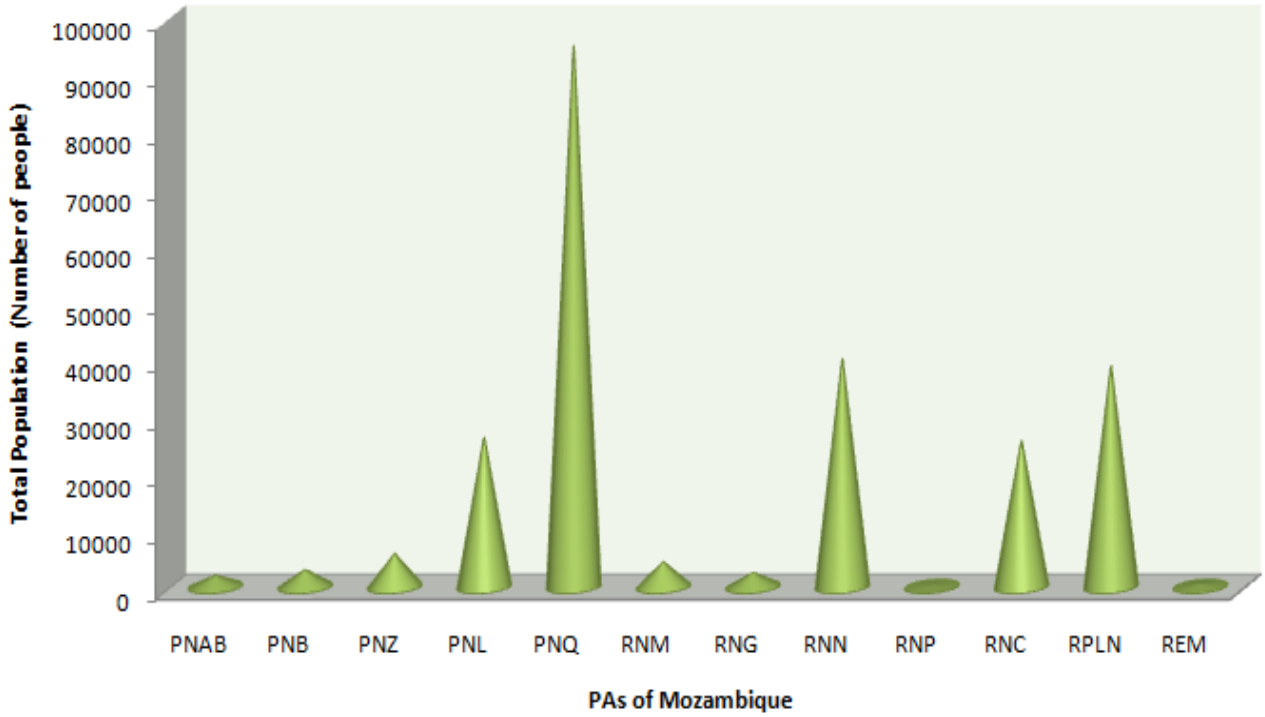
counts. And the lowest was in Quirimbas National Park (PNQ), Banhine National Park (PNB) and Chimanimani National Reserve (RNC) with 2 counts.



**Figure 6:** Staff and Monitoring (N° of Total Counts (Air or Diving/ year) of Protected Areas (PAs);

### 3.1.4. Socio-economic situation

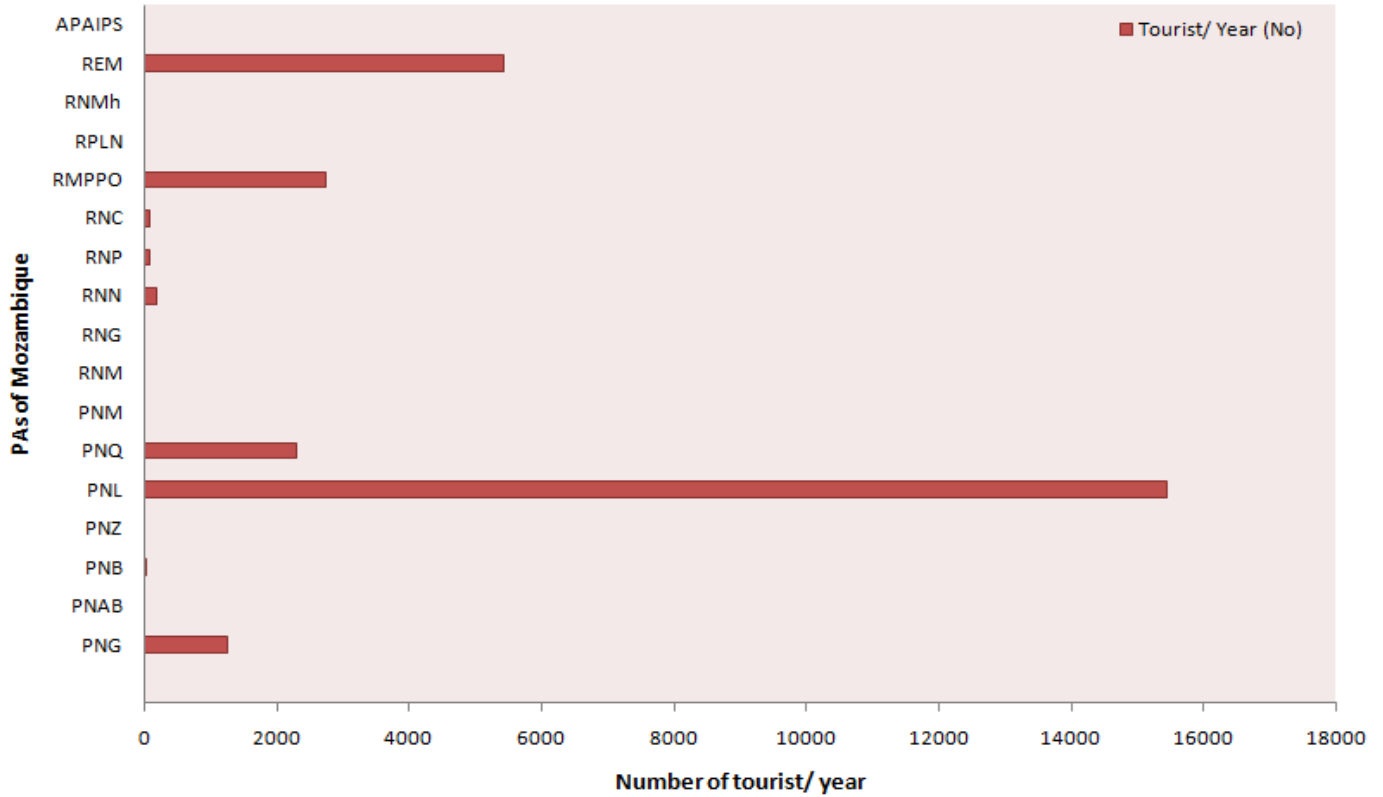
According to figure 7, the Quirimbas National Park and the Niassa National Reserve have the high number of population living in protected area with around 95 and 40 thousand inhabitants respectively; the Pomene National Reserve and the Maputo Special Reserve with low number of inhabitants. For the successful functioning of protected areas, community involvement is a priority to involve the local community; there are associations that have been created to assist the management of these protected spaces; the Limpopo National Park has about 18 associations; Gilé National Reserve and the Lake Niassa Partial Reserve, about 14 and 42 associations respectively.



**Figure 7:** Total population by Protected Area of Mozambique

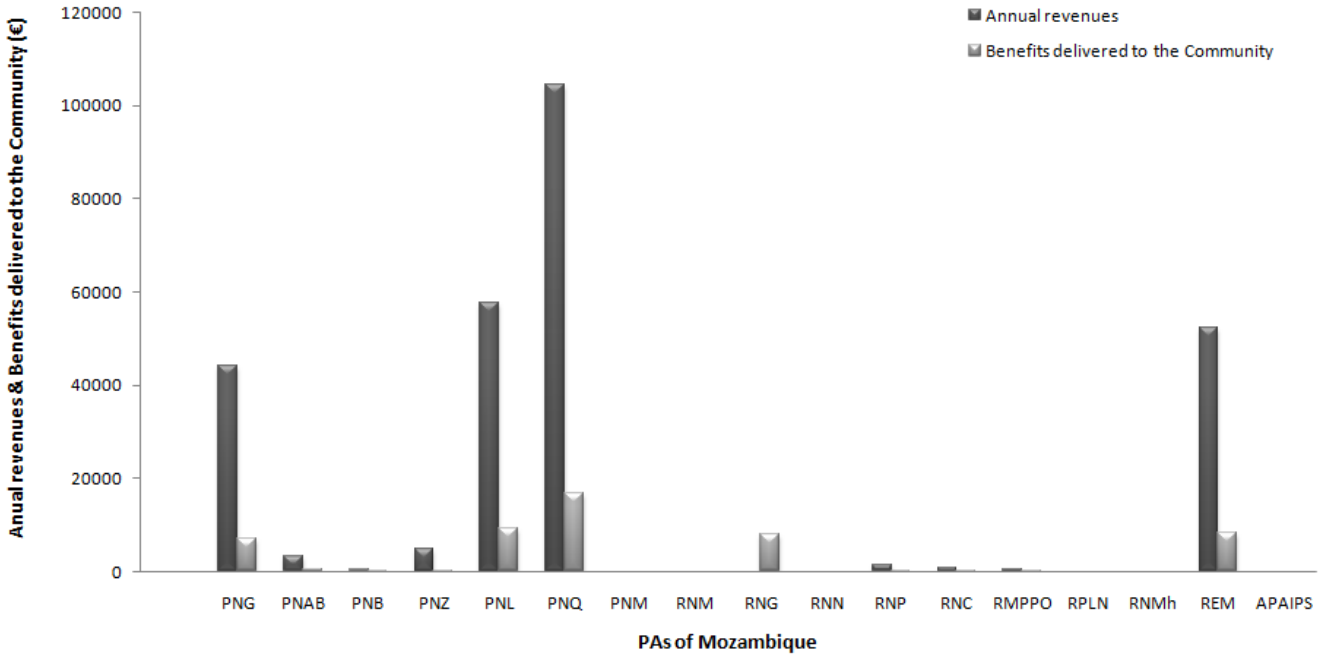
Tourism the main socio-economic activity results of the Protected Areas in Mozambique. With around 15 436 tourists, the National Park of Limpopo has the highest number of visitors, followed by the Maputo Special Reserve with 5 429 by year. Banhine National Park has the most reduced with 10 by year. Annual revenues come from including from tourism (figure 8).





**Figure 8:** Number of tourist by year of Protected Areas of Mozambique

According figure 9 the Quirimbas National Park has the highest annual revenues with 104 467,79 €, although it does not receive the largest number of tourists, this can be related of taxes applied on each Protected Area; the National Park of Limpopo has 57 750,18 €; the Banhine National Park has the lowest annual revenues with 442,17 €. Of the total benefit that PAs around 16% of total revenues is provided to the community for local development. About 16 714,85 Euros (€), the community of the Quirimbas NP is the one that receives the most benefits; the communities of Banhine and Zinave Parks receiving the lowest benefit with 70,75 and 19,18 € (figure 9). In table 4 there are some examples of kind of investment applied for the community of the benefits delivered, example of Bazaruto Archipelago National Park.



**Figure 9:** Annual revenues and benefits delivered to the community (€) of the Protected Areas of Mozambique

**Table 4:** Examples of application of the Benefits delivered to the Community (Bazaruto Archipelago NP)

|                                 |                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------|
| Kind of application of benefits | - Payment for scholarship for 16 students for high school education in Inhassoro district on mainland            |
|                                 | - Payment for 52 boarding students from Sitone and Pangaia to Zenguelemo (purchase of food and school equipment) |
|                                 | Construction of two rooms for boarding students (one for females and one for males)                              |
|                                 | - Construction of teacher houses                                                                                 |
|                                 | - Constructions of a commentary center for eco-tourism                                                           |
|                                 | - Construction of two boreholes for water consumption                                                            |
|                                 | - Construction of one room for pregnant women waiting to give birth                                              |
|                                 | - Purchase of student uniforms and stationery                                                                    |
|                                 | - Distribution of Construction material to the communities affected by cyclone Favio                             |
|                                 | - Payment of salary to the First Aid person                                                                      |

## **3.2. Marine Protected Areas**

### **3.2.1. Quirimbas National Park (PNQ) MPA**

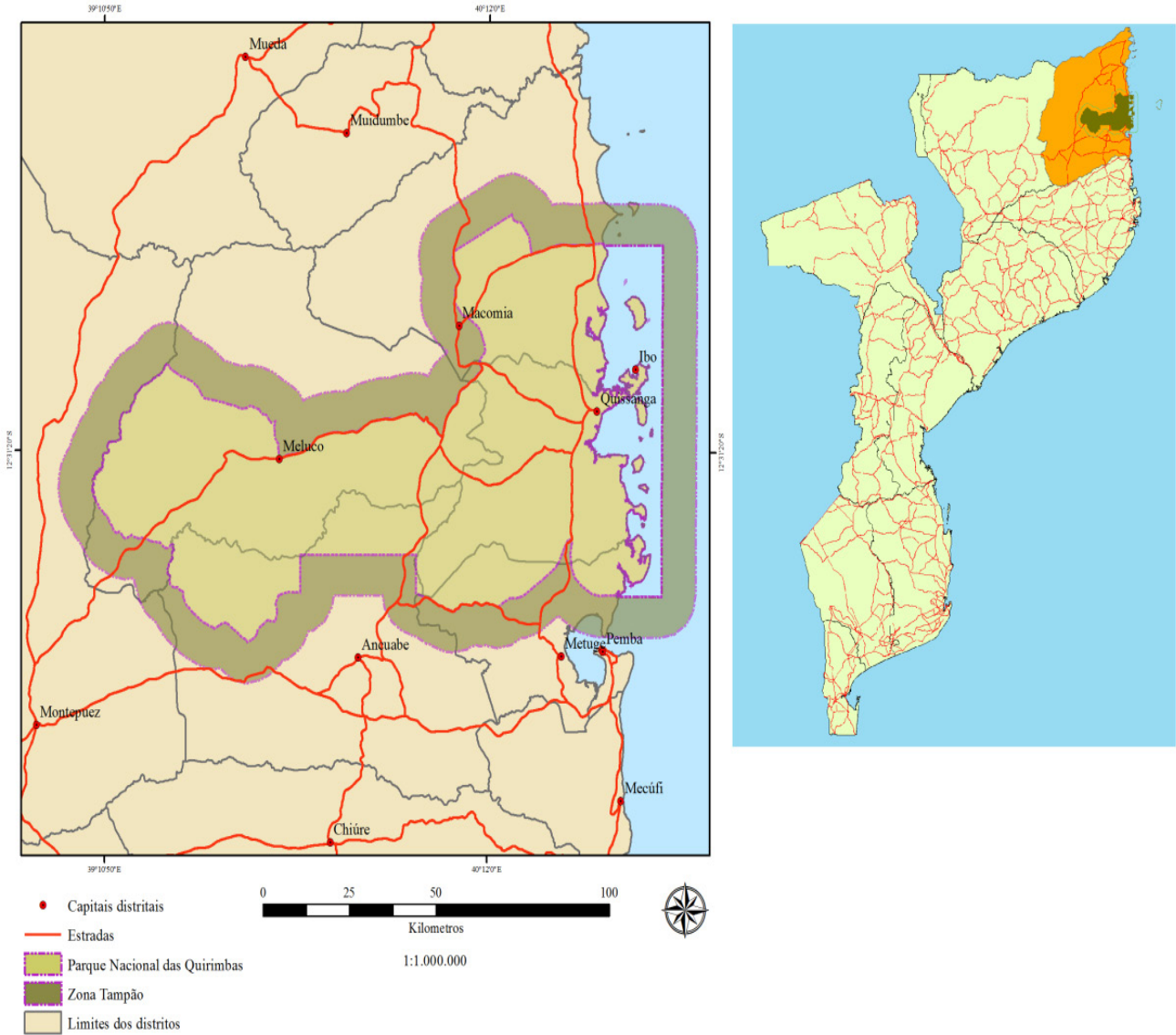
#### **3.2.1.1. Location and Background**

The Quirimbas National Park was designed through Decree N<sup>o</sup>. 4/2002, of June 6, thus representing the second, in temporal order, of the five conservation areas created by the Government of the Republic of Mozambique after independence in 1975.

This PNQ has the singularity of being established in response to requests from local communities and other stakeholders. Therefore, the Park should be understood as a "bottom-up" initiative, an attempt by the grassroots to solve the problems that affect the Cabo Delgado province in general and the area of the PNQ in particular (Plano de Maneio PNQ, 2012-2016).

The Quirimbas Archipelago in Cabo Delgado has a total area of 9 130 km<sup>2</sup> (GIS) of which 1185 km<sup>2</sup> constitute the marine part and 7 945 km<sup>2</sup> the terrestrial part (RESE, 2016); and covers 7 districts, namely Macomia, Meluco, Quissanga, Montepuéz , Ancuabe, Metuge and the island of Ibo. However, only the districts of Quissanga and Ibo are completely within the park, while the remaining districts contribute with certain administrative posts.

There is a chain of 28 islands, which stretch along almost 400 km. The 11 southernmost islands and an extensive forest and forest area on the continent are included in the PNQ. The buffer zone of the park is also defined as a 10 km strip along the park boundary with an extension of 5,704 km<sup>2</sup> (figure 10).

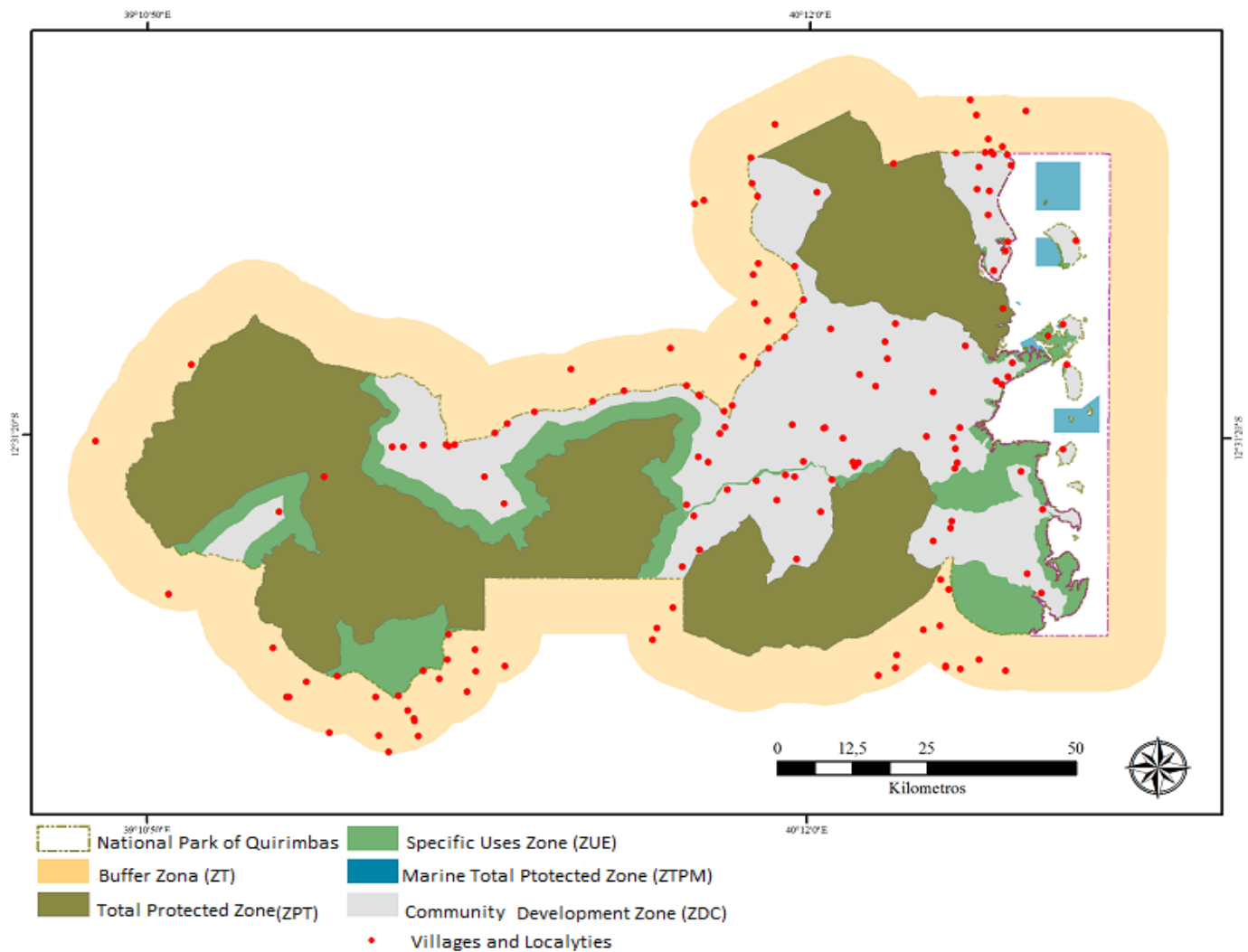


**Figure 10:** Delimitation of Quirimbas National Park (PNQ) MPA (Source: Plano de Maneio PNQ 2012-2021)

Following its declaration in 2002, the 2004-2008 NP was approved. This guideline allowed the establishment and strengthening of the park, including the creation of synergies with other local partners, mainly the contribution of local communities to the management and conservation of coastal and marine resources. The MP 2011-2021 is in force and presents, through its specific objectives, priority actions that guide the implementation of monitoring and research activities (MITUR, 2011).

According to the Management Plan the NP presents different levels of protection (figure 11):

**Total Protection Zones (ZPT):** all exploitation is prohibited but regulated tourism and scientific research are permitted. These zones are being established in collaboration with local communities and tourist operators, who may be responsible for their management. Four have been defined to surface: the Quilalea and Sencar islands with their surrounding waters, managed by the tourism company operating on the islands, in collaboration with the communities; 20km<sup>2</sup> stand of mangroves adjacent to Ibo Island; sea grass beds adjacent to Matemo Island; rôlas Island and Zala Bank - an exposed, and little used, reef and associated small island. This area corresponds to 46% of the PNQ, the Marine part, as well as the terrestrial part.



**Figure 11:** Different levels of protection of Quirimbas NP MPA (Source: Adapted from: Plano de Maneio 2012-2021)

In the ZPT Biological and non-biological resources and ecological processes are protected from human disturbance and all extractive activities are prohibited. This area:

- Are relatively intact and which are also representative of the main types of natural habitats, both terrestrial and marine, found in the NQP;
- That contain relevant levels of biodiversity locally, regionally and globally representative;
- Where there are rare, endangered or endangered species;
- For marine areas, areas with mangroves, seagrass and coral reefs, preferably close to one another, since many species need all three to complete their life cycle;
- Considered important for the presence and migration of fauna and for vegetation cover;
- Considered essential for the survival of endemic, locally rare and endangered species;
- Identified as requiring high protection for wildlife re-introduction / re-settlement programs;
- Without permanent human settlements (in the terrestrial part) and with potential for restoration of natural habitats;
- With potential for the development of ecotourism.

**Specified Use Zones (ZUE):** correspondent of 13% of PNQ, this area is warrant full protection, what unfortunately it is impossible. The only marine example is the São Lázaro Bank, a seamount which is to be managed for sport fishing and SCUBA diving. Lying 80km from shore the bank is not used by artisanal fishers.

**Community Development Zone (ZDC):** the remaining areas of the Park are designated to allow for sustainable use exclusively by local residents. Regulations are developed with the communities. Correspond 41 % of the PNQ. This zone has lower level of protection of natural resources.

**Buffer Zone (ZT)** - a 10km wide strip the Park within which all developments must receive Park approval and be subject to the same environmental considerations as those within the Park.

Activities in the buffer zone are limited to activities related to conservation, animal husbandry, and tourism development, sustainable exploitation of forest and timber resources and sustainable use of wildlife resources (hunting tourism). In the buffer zone, the PNQ should ensure, in collaboration with district and provincial authorities that human activities are not to the detriment of the park's ecological and functional integrity, while at the same time trying to facilitate sustainable development in the first benefits of local communities.

In addition to the main protection levels, there are currently two rotating oyster catch zones (Mossemuco bank) and two fishing zones with alternating opening and closing periods, namely the Paquirinde channel (Isla Quirimba) and Mossemoco (Personal Communication, Member of CCP).

### **3.2.1.2. Management and monitoring**

According to the Personal Communication (Members of CCP) and the Management Plan in vigor, during the first two years after its creation, the park was supported almost exclusively by volunteers, especially from the local NGOs "KARIBO" (local language meaning "Welcome") and "GECORENA" and with small financial contributions from the World Wildlife Fund (WWF) Mozambique and the Italian NGO CESVI. In 2004 a convention was signed between the Government of Mozambique (GOM), through the Ministry of Tourism (MITUR), the French Development Agency (AFD) and the French Fund for the Global Environment (FFEM). In the same year, one agreement between MITUR and WWF for the implementation of a first five-year phase (2005-2010) of the PNQ development project, followed by a second and last phase that began in 2011 and which will end in 2015. The PNQ currently has funding from Donors, state funds and (limited) own funds.

A first management plan, with an expected duration of five years, was prepared by Park and WWF technicians and approved by the Minister of Tourism in 2003 (it is important to stress that this plan is in force until the new plan is approved).

The management plan 2003-2008 was a key instrument to guide the effective establishment and management of the NQP in the early years of existence, effectively enabling this institution to establish itself effectively on the ground, other government institutions at provincial and district

level and with local communities, creating conditions for the protection of natural resources, especially in the marine sector.

The recent management plan 2011-2021 has been prepared with a review of the previous plan (considering the legal and practical need to have a functional plan in place) from which a series of activities for the conservation of biodiversity can be implemented logically and synergistically.

The vision (table 5), which underpins the development of the PNQ, was revised, as were eight (8) specific objectives that partially reflect some of the previous objectives, which are dynamic and require constant action, since other objectives were greatly refurbished to respond to the new challenges and the current situation of management and conservation of the park.

**Table 5:** Objectives and targets to be reached in the PNQ's Management Plan (2011-2021) (Source: Plano de manejo de PNQ 2012-2021)

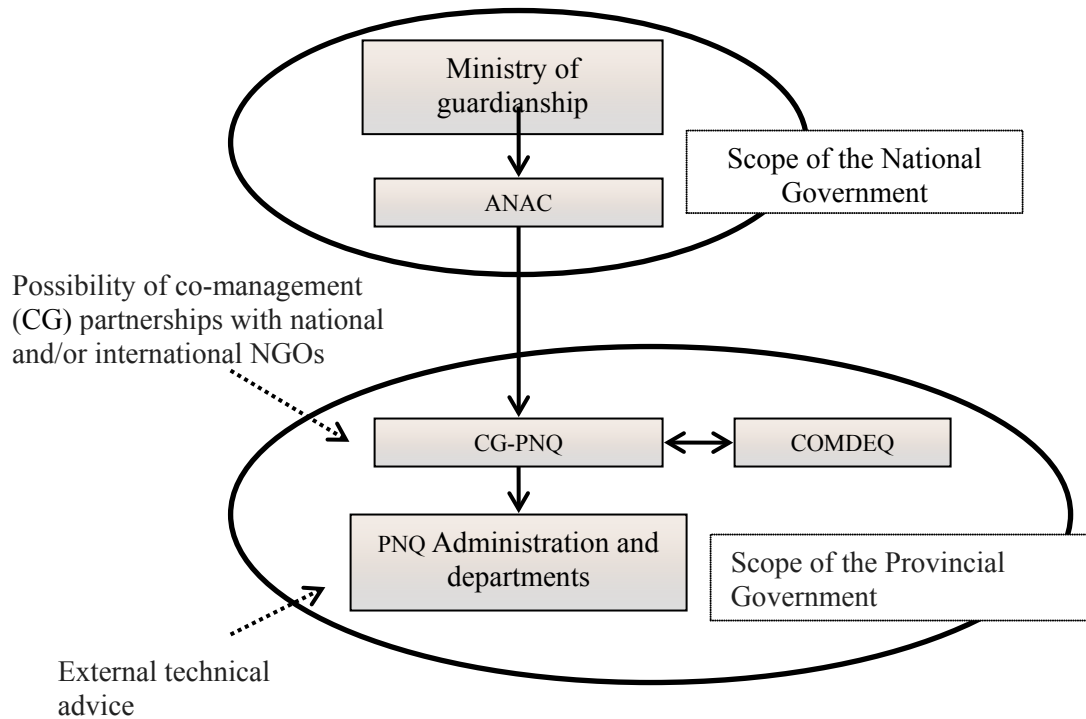
| Specific objectives and targets to be achieved                       |                                                                                                                                                                                  |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Specific objective                                                   | Targets                                                                                                                                                                          |
| 1. Protect and conserve the biodiversity of the PNQ                  | 1.1 Endangered and / or critically endangered species and habitats are known, and documented                                                                                     |
|                                                                      | 1.2 The planning of activities is oriented towards the ecological integrity of the PNQ                                                                                           |
|                                                                      | 1.3 The new zoning plan is approved and adopted                                                                                                                                  |
|                                                                      | 1.4 The PNQ's strategic oversight plan is finalized, adopted and implemented                                                                                                     |
| 2. To promote the sustainable development of the resident population | 2.1 The legal provisions on the use of natural resources are known and fulfilled                                                                                                 |
|                                                                      | 2.2 Local communities assume increasing levels of responsibility for sustainable management of resources, enforcement of regulations, and protection of habitats and key species |
|                                                                      | 2.3 Ensuring the sustainable use of biological resources in predisposed areas                                                                                                    |
|                                                                      | 2.4 The conflict between man and wildlife is substantially reduced                                                                                                               |



|                                                                                           |                                                                                                                                         |
|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                           | 2.5 The livelihood and income base of the local population is broader and more solid.                                                   |
|                                                                                           | 2.6 The benefits derived from the development of tourism are guaranteed to local communities                                            |
| 3. Ensure and improve collaboration between all stakeholders in the management of the PNQ | 3.1 The management structure of the PNQ is representative of all stakeholders                                                           |
|                                                                                           | 3.2 The management of the PNQ is widely shared with existing institutions                                                               |
|                                                                                           | 3.3 The management of the PNQ is monitored and evaluated in a participatory manner                                                      |
|                                                                                           | 3.4 Gender issues have primary treatment in planning, resource allocation and community participation                                   |
| 4. Harmonize management plans and actions of district governments and the PNQ             | 4.1 The development of the districts is done in accordance with the objectives of the PNQ                                               |
|                                                                                           | 4.2 The cultural resources of the PNQ are identified, classified and preserved according to their global, national and local importance |
| 5. Ensure instruments for the proper management of the PNQ                                | 5.1 The Rules of Procedure of the NQP are drafted, approved and adopted                                                                 |
|                                                                                           | 5.2 The new headquarters of the PNQ is available                                                                                        |
|                                                                                           | 5.3 A monitoring and evaluation system (M & E) is established and implemented                                                           |
|                                                                                           | 5.4 The necessary research partnerships are established                                                                                 |
| 6. Stimulating tourism growth in the PNQ                                                  | 6.1 Tourism in PNQ increases and is ecologically and socially sustainable                                                               |
| 7. Improve the economic and financial capacities of the PNQ                               | 7.1 Funds derived from tourism increase and are reinvested in the PNQ                                                                   |
|                                                                                           | 7.2 Funds derived from carbon credits transactions are reinvested in the PNQ                                                            |
| 8. Disseminate at local, national and international level the potential of the PNQ        | 8.1 The PNQ is known nationally and internationally for its tourism and conservation potential.                                         |

The administrative structure is organized according to the figure 6. Within the scope of the National Government (ANAC), the Ministry of guardianship is the most superior hierarchical level, followed by the National Administration of Conservation Areas; In the framework of the Provincial Government, the Quirimbas National Park Management Board (CG-PNQ) is coordinated with the

Quirimbas Development Committee (COMDEQ); Then to these two bodies mentioned above, the Administration and departments of the PNQ appear. At the level of these three management bodies there is room for Co-Management with National or International entities and there is also the need for external technical advice.



**Figure 12:** Management Structure of the PNQ MPA (Source: Adapted: Plano de Maneio 2012-2021)

- According to figure 12, there is the possibility of *establishing public/ private partnerships* for the management of the PNQ. The objective is to determine if a model of delegated management is feasible for the Park, where a non-governmental institution is responsible for the management of the PNQ. It is possible, for example, to imagine that a non-governmental organization, public or private, can provide technical and financial support to the park and preside (or be represented in) the CG-PNQ. In this way, it is mainly intended that structures outside the conservation area, also of an international nature, may play a relevant role in the support, development, and some measures in the management of the PNQ;
- A certain degree of *technical assistance may and should continue to be provided* according to the Park's management needs. This assistance should be more of a character of training and less of a substitution of executive functions, as happened in the first years of life of the PNQ.

It is important to emphasize that technical assistance does not mean the "incapacity" of the park technicians, but the recognition that the management of a conservation area so vast and with very complex dynamics is not possible and profitable only with a fixed team, but always there will be a need to seek outside competencies (figure 12).

### 3.2.1.3. Protected Ecosystems

#### i) Marine flora and fauna

The marine component is rich in habitats and species of flora and fauna. The vegetation is composed of mangrove (figure 13), marine grasses and macro algae. The distribution of the mangrove is probably conditioned by factors such as the type of soils and the degree of exposure of the place in relation to the action of the tides. The degree of exposure may influence salinity and pH which in turn may determine the structure and specific composition (GNRB, 2009).



**Figure 13:** Vegetation of mangrove of PNQ (Photo: Andrea Bogarello, Biofound site)

The main mangrove species that occur in the PNQ are: *Avicennia marina*, *Bruguiera gymnorrhiza*, *Ceriops tagal*, *Rhizophora mucronata*, *Sonneratia alba* and *Xilocarpus granatum* (GNRB, 2009). *Sonneratia alba* has a restricted distribution; occurs only in the northern and central areas of

Mozambique (Bandeira et al, 2009). Therefore, their registration of presence in the PNQ confers this park a responsibility for its conservation.

According to GNRB (2009), the highest number of trees per species of mangrove is recorded in the Sencar and Ibo islands, while the highest average diameters and the relative density of trees were observed in Sencar, Quirimbas and Ibo. The Quirimbas and Sencar islands present the highest total basal area of the forest and the highest regeneration of the species *C. tagal*, *R. mucronata* and *X. granatum* were found in Sencar, and *S. alba* in Mefunvo.

The most frequent species of seagrass in the PNQ are *Thalassia hemprichii*, *Thalassodendron ciliatum*; The species *Cymodocea serrulata* occurs less frequently. The islands of Ibo, Quirimbas and Matemo are the most frequent species of seagrass species. The species *Enhalus acaroides* has a restricted distribution in the country and is rare in southern Mozambique ([www.seagrassnet.org](http://www.seagrassnet.org)). Because of this, measures for its preservation in the PNQ where it has been observed have to be adopted.

The macroalgae Cyanophytes (blue-green algae), Rhodophytas (red algae), Clorophytas (green algae) and Phaephytas (brown algae) occur in the PNQ. However, species of red algae have been observed on all islands. The islands Quirimba and Ibo harbor the largest group of Rhodophytas, Clorophytas and Phaephytas.

The substrate of the coast of Cabo Delgado is coral, and was consolidated from coral reefs during the Pleistocene (Ngusaru, 1997). It presents a succession of sandy beaches, dunes, coral reefs, rock and mangrove mainly at the mouths of streams (Fischer et al., 1990). Some areas are covered by sand, sea grass and pebbles from coral collapses. Therefore, the taxonomic composition of the marine fauna in the Quirimbas Archipelago is tropical with predominance of species with Indo-Pacific affinity, apparently due to the presence of coral reefs and the direct influence of the South Equatorial Current.

About 525 km<sup>2</sup> of fringed coral reefs (figure 14) occur in the province of Cabo Delgado. The main types of reefs found in the PNQ include abrupt walls, often found in the south-east of the islands,

and shallow, smooth-sloping coral gardens (GNRB, 2009). In total, 160 species representing 55 genera were registered in the park. The greatest diversity was recorded in the southern islands of Quirimbas. In the northern islands of Quirimbas, Telford et al. (1999) identified 20 genera (of which 15 of hard corals and 5 of soft corals) belonging to 11 families. Apparently, *Acropora* and *Porites* and the species *Favites* spp., *Platygyra* spp., *Lobophyton* spp., *Sinularia* spp. And *Sarcophyton* spp., were the most common.



**Figure 14:** Reef corals of PNQ MPA (Photo: Tembe S.A., 2017)

A total of 375 fish species are registered in the PNQ; of these, 300 spp only in the southern reefs of Quirimbas. The families Acanthuridae (47%), Lutjanidae (22%), and Chaetodontidae (14%) are the

ones that have been observed the most. Herbivores (48%); Carnivores (37%) and coralivores and omnivores (10% each) of reduced size have been of greater abundance. There are pelagic species of smaller and medium; there are large-size pelagic as *Thunnus albacores* (Personal Communication, fishermen of PNQ) (figure 15).



**Figure 15:** Different type of fisheries resources of PNQ (a<sub>(1)</sub> and a<sub>(2)</sub> - Fish, b- oysters; c – oluturians. Photo: Tembe S.A., 2017)

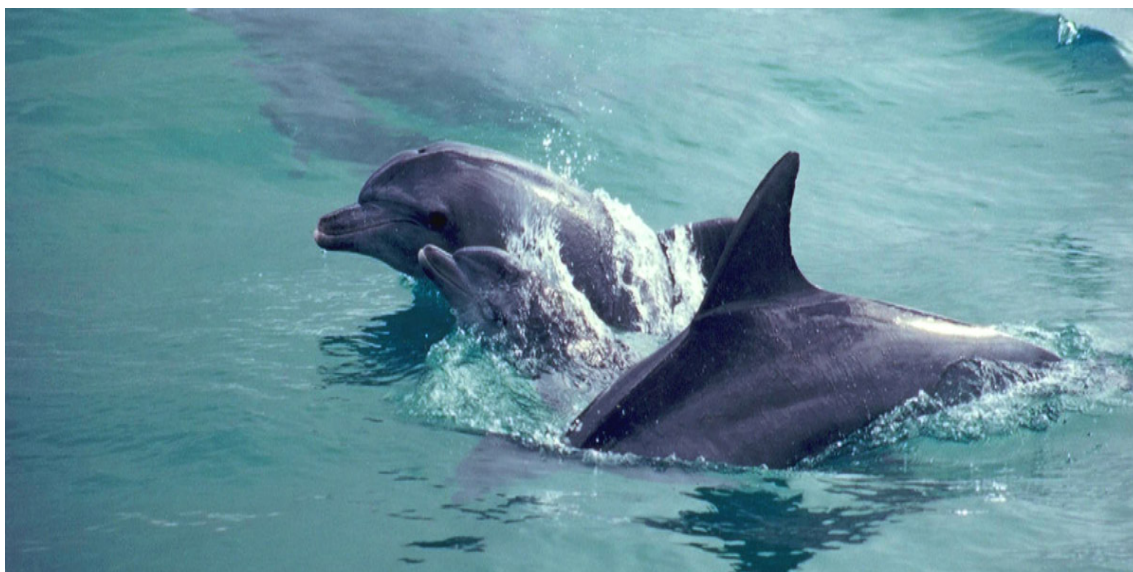
All five species of turtles (figure 16) existing in the Indian Ocean occur in the PNQ, thirteen sites were described with ideal conditions for the nesting of sea turtles (Louro et al., 2006). The most

frequent species are *Chelonia mydas*, *Lepidochelys olivacea* and *Eretmochelys imbricata*. The islands Ibo, Matemo, Sencar, Quilalea, Mefunvo and Quisiva are those that present greater abundance. In Ibo Island there are plenty of green turtles *Chelonia mydas* and *olivacea Lepidochelys olivacea*, while in the Quilalea and Sencar Islands the turtle *Eretmochelys imbricata*.



**Figure 16:** Marine turtles founded in PNQ (Source: <http://www.divequirimbas.com/gallery/>, 2017)

Marine mammals are in descending order, the longfinned dolphin (figure 17) *Stenella longirotris*, the *Tursiopsis truncatus* dolphin and the *Grampus griseus* dolphin and the whales *Peponocephala electra*, *Globicephala nacrorrhynchuse*, *Physeter mcrocephalus* and humpback whale *Megaptera novaeangliae* (GNRB, 2009).



**Figure 17:** Dolphin of PNQ (Source: <http://www.divequirimbas.com/dolphin-safaris/>, 2017)

## **ii) Terrestrial Flora**

The terrestrial vegetation of the PNQ is still little known. However, Bandeira et al. (2008) identifies six (6) types of terrestrial vegetation. It is thought that the distribution of the different types of vegetation in the park obeys the altitude gradient that varies from the coast to the interior. Vegetal communities from the coast to the interior are: mangrove, coastal thickets, *Acacia-Grassland*, miombo woodland, mixed woodland and mountain vegetation occur (Inselbergs) (*miombovelloziace*) (Bandeira et al., 2008). The miombo forest and the vegetation of *Acacia-capinzal* are the most extensive types of vegetation, with the coastal brena being the smallest extension.

## **iii) Terrestrial fauna**

There is little documented information on the terrestrial fauna of the province of Cabo Delgado in general and the PNQ in particular. However, evidence supports the notion that the province of Cabo Delgado is rich in terrestrial wildlife both in diversity and abundance. Birds are the most abundant group.

At least 46 mammal species occur in the PNQ and surrounding areas (Bento 2003, Schneider 2004, Araman 2007). Other than the rhinoceros, four of the "*big fives*" occur in the park (GNRB, 2009). In general the number of animals of the different species in the PNQ is low. The most abundant species



include *Papio cynocephalus*, *Potamochoerus porcus*, *Phacochoerus aethiopicus*, *Kobus ellipsiprymnus*, and the changane antelope *Neotragus moschatus* (GNRB, 2009). The innermost areas of the districts of Meluco, Quissanga, Macomia and Ancuabe are those that support higher density of medium and large animals (Ntumi et al., 2005)

In addition to the species of greatest abundance, other mammals who come but with a localized distribution within the PNQ are: elephant *Loxodonta africana*, bull-riding blue wildebeest, buffalo *Syncerus caffer*, common duiker *Sylyicapr agrimmia*, klips pringer *Oreotragus oreotragus*. Natal red duiker, *Cephalophus natalensis*, eland *Taurotragus oryx*. Imbabala *Tragelaphus scriptus*, impala *Melampus aepyceros* hippopotamus *Amphibius hippopotamus*, Piva Waterbuck zebra, sable Antelope *Hippotragus niger*, and carnivores lion *Panthera leo*, wild dog *Lycaon pictus*, striped coyote *Canis mesomelas*, calico *Jubatus jubatus*, hyena *Crocuta crocuta* spotted leopard *Panthera pardus* (Ntumi et al., 2005; Araman & Mahommed, 2006; Araman, 2007).

As in the Province of Cabo Delgado in general, in the PNQ there is a rich diversity of birds. The diversity of habitats and micro-habitats for birds is also huge and includes the Indian Ocean, spaces between sea, mangroves, grasslands, inland / wetlands bodies of water, islands, forest regeneration, miombo forests, forests and cultivated fields (Bento, 2003). At least 447 species of birds exist in the PNQ (Bento, 2003). Of the species identified at least one, the *Calau do solo Bucorvus leadbeateri* is threatened with extinction.

The highest concentration of birds is recorded in lakes and rivers with permanent water in general and in the lake Bilibiza and surroundings in particular. The PNQ offers a unique opportunity to observe a wide variety of birds from the coastal zone to the dense forests and water bodies within the continent, especially during the rainy season when migratory birds have returned from Asia (GNRB, 2009).

Mozambique's herpetofauna, including the PNQ, is poorly documented. There are at least 23 species of reptiles in the PNQ and in the bordering areas, among lizards, terrestrial and marine turtles, snakes (Bento, 2003; Schneider, 2004; Araman, 2007)

Among the species of reptiles there is the python *Python natalensis sebae* which is locally rare, occurring in the vicinity of rivers in Muagamula region and which is protected by law in Mozambique. Other species also occur in the PNQ as are the cases of *Varanus nilotic*; The crocodile *Crocodylus niloticus*; The black mamba *Dendroaspis polylepis*; *Mabuya quinquetaeniata margaritifera*, *Ornata nucas*, *Agama mossambica*, *Thelotornis capensis*, *Psammophis subtaeniatus orientalis*, *Nucas caesicaudata*, *Philothamnus semivariatus* (Benedict, 2003; Ntumi et al., 2005; Araman, 2007).

At least 10 species of amphibians occur in the PNQ and surroundings, between frogs and frogs (Doggart & Burgess, 2002; Schneider, 2004). However, only 5 of these species were seen (Schneider, 2004). Species identified include *Phrynobatrachus mababiensis*, *Chiromantis xerampelina*, *Ptychadena sp.*, *Arthroleptis sp.*, *Afrixalus sp.* And *Hyperolius sp.*

Although no insect study was carried out in the PNQ, the results of Schneider (2004) in the "Mareja Reserve", located in the southern zone of the PNQ and in the buffer zone of the PNQ showed a diversity of insects, represented by about 750 species associated to a high heterogeneity of habitats in these areas with climate and vegetation similar to PNQ. At least 60 species of butterflies, 60 species of moths, about 450 species of coleopteran and other orders within the class of insects have been identified.

#### **3.2.1.4. Population and Socio-economic activities**

The area is inhabited by people, whose livelihoods mostly depend on natural resource utilization. Consequently, the park is committed to working with local communities and the business sector to ensure that the benefits and the responsibilities of managing the natural resources in a sustainable way is equally shared among all actors. In this context, ecotourism is one of the most promising economic sectors where environmental conservation and socio-economic development can be successfully combined.

There are currently about 166 000 people living in the PNQ area, with 95,000 (57%) residing within the park boundaries and 71,000 (43%) residing in the buffer zone. These data suggest that one of the main challenges of the PNQ is the oversight of these inhabitants.

Although this is not the only case in Mozambique, where in most conservation areas there are human settlements, due in particular to the conflict between man and wildlife fed by the large number of people and animals that are constantly competing by the same resources, such as water and land.

Agro-livestock and fisheries are the predominant activities among households, with agriculture predominating in the interior and fishing on the coast. Agricultural activity is practiced manually on small family farms.

#### **3.2.1.5. Community and fisherman View of the PNQ**

In principle, the study plan designed interviews for managers of all Marine Protected Areas of Mozambique, which initially consisted of sending the interview by e-mail to all above mentioned. However, there was a limitation on the sharing of information requested to be shared. Most MPA managers did not respond to emails. In these terms there was a need to move to at least one of the MPAs to have direct contact with the managing entities and the resident community.

##### **i) Management of the MPA**

According to the interviewees, all ensure that the community is included in the management (monitoring) of Quirimbas National Park, precisely in the supervision of Sanctuaries. According the group there are case of infraction of the Management Plan. In current year was reported plus of 2 cases of violation of the law, which has usually been in the night, period in which according them there is less supervision of the area. Depending on the type or level of the infraction the offender may be fined or arrested; from 2 to 8 years; or 12 to 20. To avoid future offenses, the interviewees affirm that there is work of sensitized the violators to follow the law.

To make monitoring a reality, some members of the CCP, who also work together in management and monitoring, said that the Park faces great difficulties regarding the means of supervision. The lack of boats and fuel is an example. According to them, sometimes due to the fact that there are few boats for the activity, there have sometimes to use boats with no engine, called "canoes" (figure 18); and there are cases where fuel is requested for existing motor boats, but most of times is not possible to have fuel.



**Figure 18:** Type of boats that used to monitoring the area; (a-engine boat; b-canoes, Photo: Tembe, 2017)

According to the interviewer group for successful management and monitoring first of all, it must be ensured that there are means capable of responding to reality. Increase the means of supervision.

The members of the CCP mention some prohibited practices in the MPA of the Quirimbas National Park as that are usually neglect by fisherman.

- Fishing with trawl (rafia bag);
- Fishing with mosquito net (figure 20b);
- To fish with the use of toxicants;

- Fish sea turtle, ray, octopus, manta, and dolphin (figure 20 a);
- Fishing in the corals area, on the harness banks;
- For example in the Songusore area;
- Fishing in the Sanctuary of the Community (figure 19).



**Figure 19:** One of prohibited practical in Quirimbas National Park MPA, “To Fish in the sanctuary” (Photo: Tembe S.A., 2017)



**Figure 20:** Type of prohibited practical in Quirimbas National Park MPA; (a- Fish sea turtle; b-Mosquito Net, Source: a: WWF, 2016; b: Tembe S.A.)

Face of these prohibited activities, most members of the community comply, but there are some fishermen who neglect the orders, justifying that to fish is all they have to survive.

## ii) Fisheries developments in relation to the creation of the PNQ

One of the members of the CCP that was born and raised in the Ibo Zone (PNQ), which has been fisher since child, states that MPA implementation has brought improvements to the local fishery stock, however assures that despite the MPA, fish in relation to the generation of their parents and or grandparents tends to reduce, according to him this is due to a problem of supervision. Laws are very clear, yet what happens on the ground is sometimes different than expected.

Overall, respondents say Quirimbas MPA has had a positive impact on catches; improving quality and quantity. At one time in the fishing campaign, surrounding communities were invited to prove the advantage of MPAs. The members of the CCP and the community have the strength to continue the work of the MPAs and have as examples the success stories of Madagascar in the process of protection of the octopus.

The members of the CCP and some of the fishermen suggest that in the vicinity of the PNQ there are regions that deserve great attention for the productivity and existence of species that should also be protected; they gave examples of: Mecufe, Memba, Simadjula, Iland Fión, Moma, Nacala Velha, and Angoche. According to them, these areas need a rebuilding of fish stocks as fishermen leave these areas for the PNQ, claiming that in their areas of origin, there is no larger fish.

In the community of Ilha do Ibo (PNQ), there are 125 fishermen of both sexes, where women only dedicate themselves to the collection of "coure (cipreia)", octopus, oysters and "macaza (Pen shell, pinas)"; Fishing is only allowed in the surrounding areas to the forbidden fishing zone. There are seasonal fishermen from Mecufe, Changa, Nacala, Angoche.

### **iii) Socio-economic impact of MPA**

The socio-economic impact of the MPA of the Quirimbas National Park according to the interviewees involves sensitive issues. They said that with tourism profits among other activities that generate foreign exchange in the MPA, the community use to attribute to 20% of the total. In the year 2015 - 2016, this part was offered to the community, concretely to the community leaders of the Area, however it was not known in what it was applied. And according to the plans of the community with the value could have improved conditions of wake of the members of the community, improving the mosques, among other services that are lacking in the community.

### **iv) Opinion on MPAs in Mozambique**

According to the fishermen interviewed, the community in general and some members of the CCP affirm that the Marine Areas, when well managed, can bring great advantages, as was the case of the

PNQ, which with the establishment of the MPA the fishery has increased what it raised fishermen and communities in surrounding areas to pursue the creation of MPAs in their areas. However, there is still a great challenge regarding the application of this measure of restoration of the fishery stock since the coastal communities in their majority depend on the fishery for the sustenance, it is under these conditions that no matter how much the importance of the MPAs is sensitized even for the community itself, It is difficult for them not to infringe the law because the sea is a good on which they depend to live.

With the visit and the exchange with the fishermen and the community, they thanked the opportunity, because according to them are rare times that the opinion of the community about the protected area is sought. And according it would be a pleasure to receive more often people who wanted to understand their point of view.

One CCP member adds that at the time the CCP faces a problem regarding CCP chairman elections, instead of following the rules, some leaders appear with the chairman's imposition to defend their own interests or a certain group of the community.

#### **v) Critical points**

According to management members of the PNQ, in the different blocks of the park there are no fixed staff. The group of inspectors is in some of blocks: as the island of Ibo, Quirimbas, environs of Pemba, ect. In this way to patrol the surveillance team must move to the various blocks of the park; so the safety net should be spread over the Marine area.

According to some group of interviewees, the monitoring is once per month for each block of the Quirimbas Park, due to lack of means of inspection and difficulty in having fuel for the daily patrol. This allows fishermen to fish in areas that are closed to fishing (figure 21 a).

Other critical is related of cutting of mangroves (figure 21 b) that usually are man that are involved. The finality of this activity is to build houses and make combustive to cook.

Another problem has to do with corruption in the management of the area. When the inspection day arrives, there is people that advise fishermen to not to fish in that inspection day; therefore, the



inspection team goes to the site and does not find anyone fishing. Fishermen usually already have an entrepreneur to whom they resell the fish, which according to some respondents may be one of the team's management or monitoring team of the park.



**Figure 21:** Example of challenge in Quirimbas National Park MPA; (a- illegal fishing; b-cutting of Mangrove; Photo: Tembe S.A.,2017)

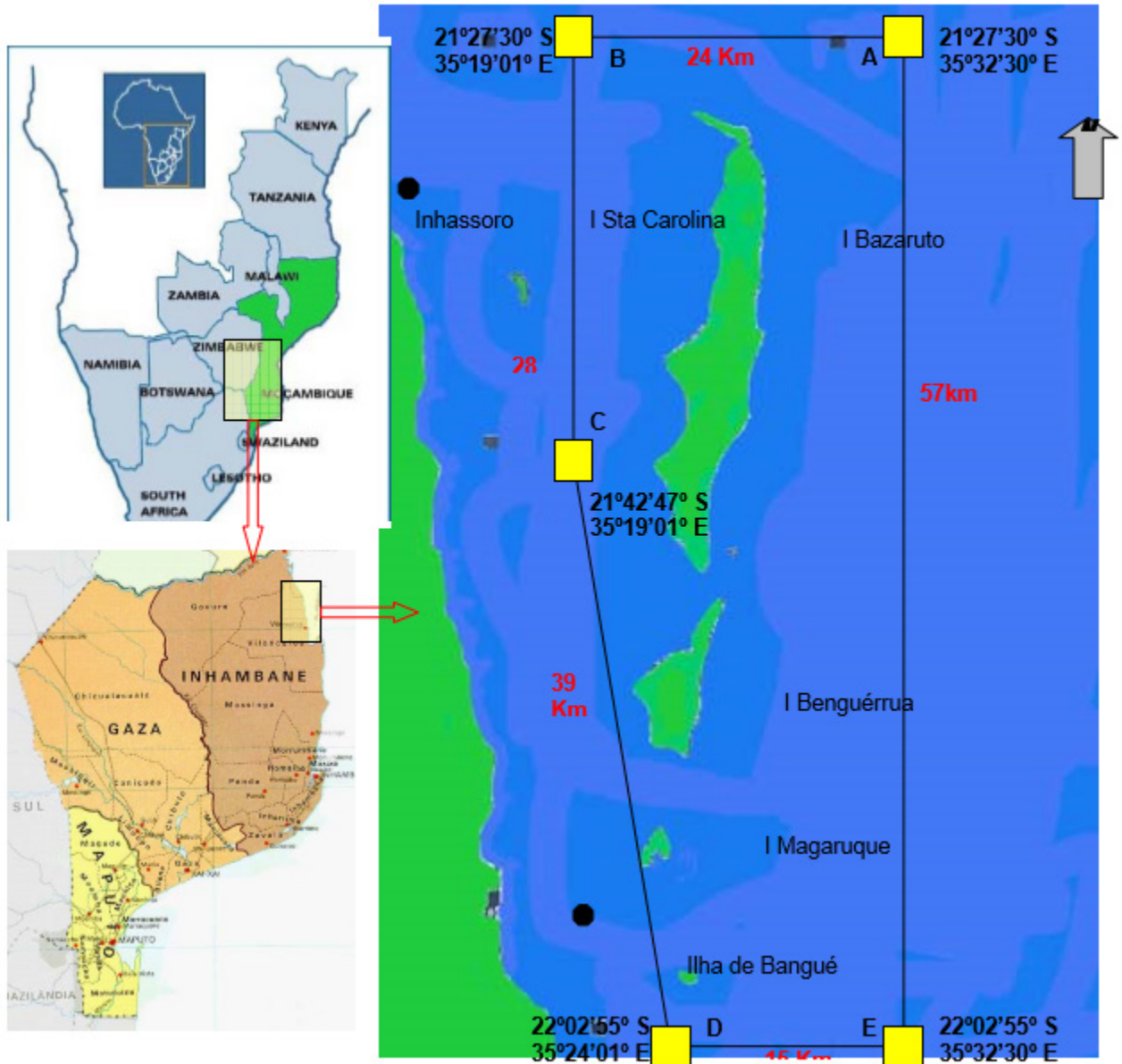
### **3.2.2. Bazaruto Archipelago National Park (PNAB) MPA**

#### **3.2.2.1. Location and Background**

The Bazaruto National Park was created in 1971 by Legislative Diploma N<sup>o</sup>. 46/71 of May 25, and with the main objective in the conservation of dugongs and sea turtles.

The PNAB, prior to the approval of its MPAs, developed two guiding instruments, namely: the Bazaruto Archipelago's Long-Term Development Master Plan and the Bazaruto Archipelago's Sustainable Development Conservation Master Plan to contribute to the sustainable use of natural resources and improve the lives of local communities. However, the last master plan was not approved as it did not present a concrete management and implementation strategy, but provided a basic description of the ecological and socioeconomic environment of the archipelago (Louro et al., 2017).

Bazaruto archipelago is located up to 20 km off the Mozambique coast within latitudes 21°30'22° 10'S and longitudes 35°22'-35° 30'E (figure 22). The climate in this region is moderately humid with annual rainfall dominated by two climate systems namely the Indian Ocean Subtropical Anticyclone System of the sea trade winds zone and the southern end of the East African Monsoonal system. The average annual temperature and precipitation in the archipelago is about 24 ° C and 978 mm respectively. Since 1971 the area has experienced some legal protection and has been proposed to be the natural park by Tinley around Santa Carolina Island to protect the vulnerable population of Dugong and sea Turtles (Bandeira et al., 2008).



**Figure 22:** Location of Bazaruto Archipelago National Park (Source: Plano de Maneio de PNAQ, 2008-2012)

The Bazaruto Archipelado is made up of five islands. The Bazaruto island is the most extensive with about 12000 ha, Benguérria with 2 500 ha, Magaruque 600 ha, Santa Carolina (formerly called Paradise island) with 500 ha and the smallest island is Bangué covering 5 ha. The main geomorphological features of Bazaruto are the unweathered yellow-white sand forms climbing dunes of Holocene and modern age along the ocean margin of the islands. The islands comprise the core of Pleistocene dunes that are exposed to several localities on the western margin of the islands as

weathered and largely structureless sand with an orange-red coloration (Andrew et al., 2002). The Bazaruto Archipelago National Park (BANP) is a protected area and is one of two marine National Parks in Mozambique. It was established to protect marine and terrestrial resources and to provide tourism activities that would generate income that could be channeled into the development of the communities associated with the park.

The Bazaruto Archipelago is situated onshore from the Mozambique coastal plain, which is largely composed of ancient delta deposits of the Limpopo and Save rivers. The Bazaruto Archipelago is located south of the modern delta of the Rio Save.

It was recommended the creation of the Bazaruto Archipelago National Park (PNAB) in 1969 by South African ecologist Ken Tinley. He highlighted the need for marine and coastal protection and conservation of this region in the extreme north of the southern province of Inhambane, given its importance for the survival of two marine species: the tortoise and the dugong. But even with the actual creation of the park in 1971, which led to the "first occurrence of a marine area as an ecosystem" in Mozambique, it took several years for a program to be designed to respond to the challenges that threatened (<sup>1</sup>).

The Bazaruto National Park was created in 1971 but it was only after 1989 that an administration was put in place, nominated by DNFFB, at that time the authority for parks in Mozambique. The area of the Park only included the Islands of Benguerra, Magaruque and Bangue plus five nautical miles surrounding them (600 km<sup>2</sup>). The largest Island of Bazaruto and the much smaller Santa Carolina were classified as areas of vigilance. The principal objective of this Park was to protect the endangered dugong and marine turtles (WWF, 2005).

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(<sup>1</sup>) [www.wwf.org.mz/?1960/Saiba-Mais-Sobre-o-Parque-Nacional-do-Arquipelago-de-Bazaruto](http://www.wwf.org.mz/?1960/Saiba-Mais-Sobre-o-Parque-Nacional-do-Arquipelago-de-Bazaruto)

The Bazaruto complex is clearly one of the most outstanding MPAs and conservation success stories. Besides its rich biodiversity and various habitats, it is home to indigenous people that are sustained by the archipelagos' resources, while tourists flock to the islands by plane or cruise ship, attracted by the archipelago's beauty and rich marine life. Five islands make up the Bazaruto Archipelago. The largest is Bazaruto, covering approximately 12 000 ha. Next are Benguérua at 2 500 ha; Magaruque at 600 ha; Santa Carolina (previously called Paradise Island) at 500 ha and the minuscule island of Bangué at about 5 ha. These islands are located up to 20 km off the Mozambique coast within latitudes 21°30' - 22°10' S and longitudes 35°22' - 35°30' E. They are situated in the province of Inhambane, between the districts of Vilankulo and Inhassoro (Everett et al., 2008).

### **3.2.2.2. Management and monitoring**

The information related to management of the PNAB was basely from the Management plan (2008-2012) of the protected area. The National Park only in 1989 began with an Administration proper and management subordinate to the National Directorate of Forestry and Wildlife (DNFFB). Recently Ministerial Diploma 17/2001 has transferred the protection of National Parks to MITUR / DNAC. Until 2001 the Park only included the Benguérrua, Magaruque and Bangué Islands including 5 nautical miles around it (with an area of 600 km<sup>2</sup>). The other islands were considered as surveillance areas.

In terms of management of the area, the PNAB had the implementation of three PMs (PM 1997 - 2001, PM 2002 - 2006, and PM 2009 - 2013). PM 2017-2025 is currently being reviewed and approved. PM 2009-2013 is in force until the new PM is approved. Each of the MPs presented a research and monitoring plan with their specificities, the latter two presenting the same strategy, objectives and actions linked to the Ecological Management principle of adaptive management, where monitoring results should contribute periodically to the Management measures (Louro et al., 2017).

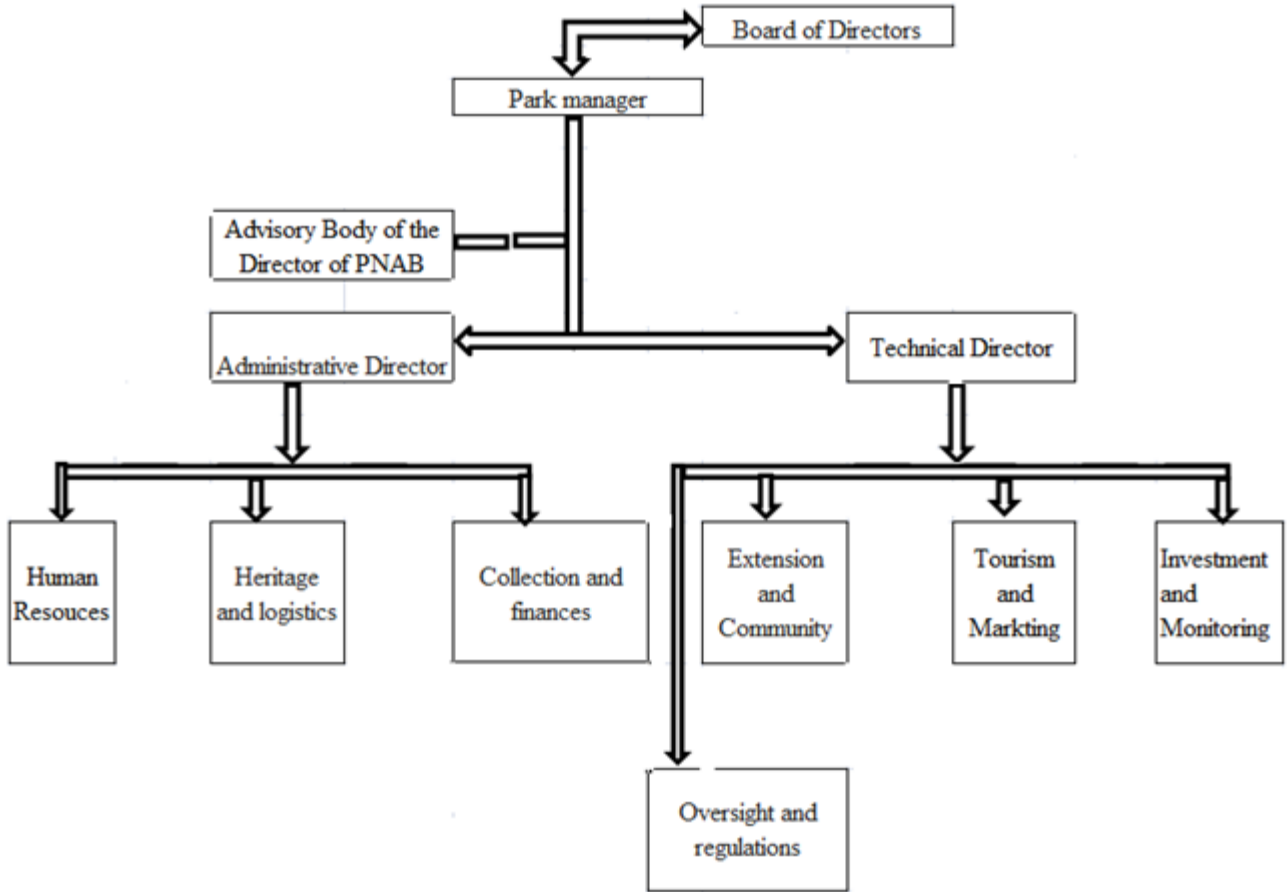
Placing a Park Warden in Bazaruto was made possible due to support from WWF South Africa and EWT (Endangered Wildlife Trust, now FNP, Forum Natureza em Perigo, a national NGO) which

financed the establishment of the current camp-site in Sitone, developed a number of studies and implemented a community Rangers program.

From 1994-1998 the Park received project funding from the European Union through WWF International and WWF SARPO. This was a very ambitious project with several objectives and represented the first large funding support to Bazaruto. One of the most important out-puts of the project was the intended approval of the then drafted Management Plan and the extension of the Park to reflect a more coherent ecosystem approach. This was never implemented by the Government and thus the European Union (EU) support was not renewed. In 1998 WWF Switzerland initiated support to the Park, through funding the Multiple Resource Use Project (MRUP). In 2001, WWF Switzerland extended their support to the Park under a second phase of the Multiple Resource Use Project designed for 2001-2005. Several other significant developments also occurred. The authority for protected areas was transferred from the Ministry of Agriculture to the Ministry of Tourism (MITUR) and its National Directorate for Conservation Areas (DNAC). The Park was finally extended to include all five islands in the Archipelago and surrounding waters now called the Bazaruto Archipelago National Park.

In 2002 the management plan was approved (for the period 2002-2006), a new park administration was put in place and a larger project proposal was developed, approved by DNAC and circulated to donors for funding (the Bazaruto Archipelago National Park Conservation and Collaborative Management Programme or CCMP).

In the Management Plan 2008-2012, based on the experiences of other parks in the region and in the consultations carried out, the management structure of the BANP was created. In this proposal, the Bazaruto Development Management Council makes strategic decisions, proceeds to arbitration of conflicts, and suggests to MITUR necessary changes to the Management Plan itself. Although the representativeness of the related institutions is important, the Director's Counseling Center supports the director in forming opinions on implementation issues. This nucleus has the role of informing and advising the Director of the park (figure 23).



**Figure 23:** Management Structure of the PNAB (Source: Plano de Maneio PNAB, 2008-2012)

The Bazaruto Archipelago first enjoyed some legal protection in 1971. Subsequently the protected area was enlarged and the legislation strengthened. Support from government institutions and NGOs, especially WWF, have contributed enormously to improving the archipelagos’ protected status (Personal Communication, CCP Members).

There are three protection zones established (Plano de Maneio do PNAB, 2008-2012 & 2016-2025; figure 24):

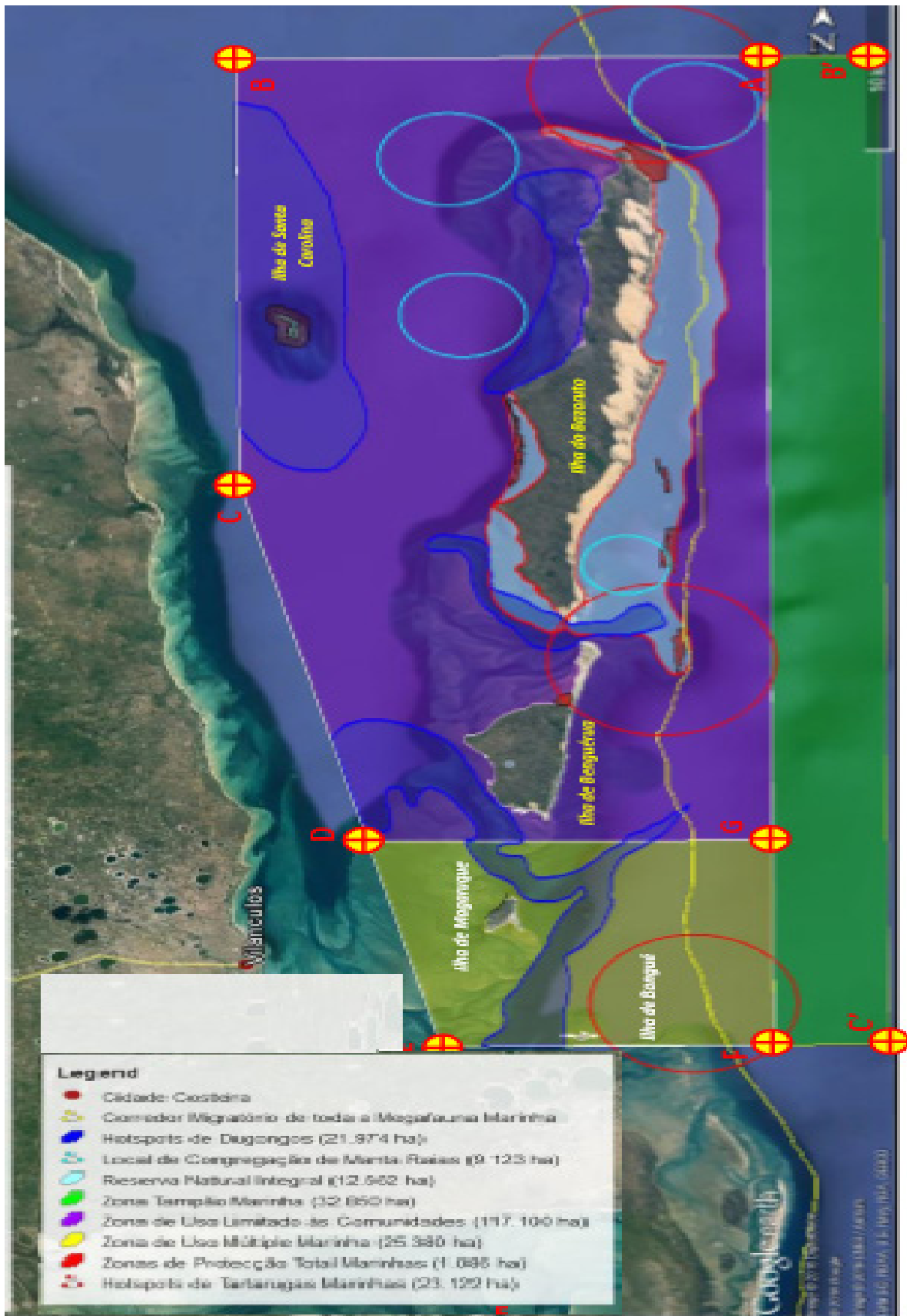


Figure 24: Zoning of the PNAB MPA (Source: Adapted from: Plano de Manejo do PNAB, 2016-2025)



- a) **Total Protection Zones (ZPT):** these areas are considered to be the first level of protection within the PNAB, protect the integrity of the environment (terrestrial or marine habitat), and which constitute a refuge or trophic dependence on important species (MITADER, 2016); are all areas whose characteristics provide protection for the integrity of the terrestrial or marine environment constitute refuge or trophic dependence on important species. The marine total protected zone has 1 086 ha of extension.

In this zone is prohibited any activity extractive or occupation of space. Only forms of reduced (pedestrian) traffic without the use of engines (except in the Park's mission) are allowed, so no stings or crossing routes are allowed on such areas.

**Codes of conduct for the practice of recreational diving, including:**

- Prohibition of removal of plants and animals on any reef within the BMP;
- Prohibition of the use of a lead belt by apnea and glove divers on any reef;
- The competence of the divers should determine where they can dive;
- Prohibition of anchoring to reefs together (<25 m);
- Restriction of the number of divers in the ZPT.

i) **Prohibited species:** protected marine species, without directed fishing, are; *Cephalopholis argus*, *Epinephelus merra*, *E. flavocaeruleus*, *E. flasciatus*, reef parrots (*Scarus spp.*), sharks (all species), *seahorses* Chaetodontidae (butterfly fishes - all species) and Pomacanthidae (hare fish - all species);

ii) Underwater hunting is restricted to islanders and be carried out outside buffer zone;

iii) Directed fishing for certain endangered or rare species is not permitted;

iv) Since the **conservation of sea a turtle is** one of the main reasons for the existence of the Bazaruto MPA. There are some measures to protect them as:

- Fishing for gillnets and trawling is baned;
- Increasing the effectiveness and consolidation of the nest monitoring system, and if possible use of volunteer staff to support nesting season;

- Initiate a flood nesting re-nesting program;
  
- v) Prohibition of holothurians collection;
  
- vi) **Regarding sport fishing;**
  - Sport fishing should is not allowed in the total protection zones;
  - Prohibition of retention of fish (regardless of species) by sport fishermen and lodges;
  - Obligation to use circular hooks in the fishery of chickpeas, in order to ensure a higher probability of fish survival after release;
  - Promoting the marking of fish, so that it can be used in biology and species ecology studies;
  - Licensing of fishermen, in accordance with the Regulation on Recreational and Recreational Fisheries;
  - Sport fishing competitions must be authorized and monitored by Bazaruto MPA staff.

**b) Limited Use Zones for the Communities (ZULCL):** are all zones between-tides, sand banks, location where the islanders develop fishing activities, marine resource harvesting areas, anchoring of boats, all seagrass beds and coral reefs, which were not considered Within the ZPT management category will be considered within the ZULCL. Has 117 100 ha of extension.

Assuming that local communities contribute greatly to the surveillance and conservation of existing resources, and also because their survival largely depends on the degree of access to the ancestral resources of this archipelago. These zones within the limits of the Park are designated expressly limited to the traditional use for the native communities.

**c) Multiple Use Zones (ZUM):** these are about 25 390 ha (marine area) of extension are reserved areas to promote the installation of leisure concessions for commercial use and improvements for socio-cultural benefit.

The activities allowed in these areas are intended to reduce the pressure on resources in other areas with a higher level of protection. In the marine part, these areas are prioritized for the fishermen of the region of Vilanculos and Inhassoro, corresponds only to the maritime portions of the archipelago. These zones are open only to artisanal-islands fishermen, and artisanal and semi-industrial of these districts. In these areas, only line fishing are permitted. Industrial fishing, the use of gillnets, trawls and other fishing gear and gear shall are not permitted. Multi-use zones are areas that do not fall within the criteria established in previous zones.

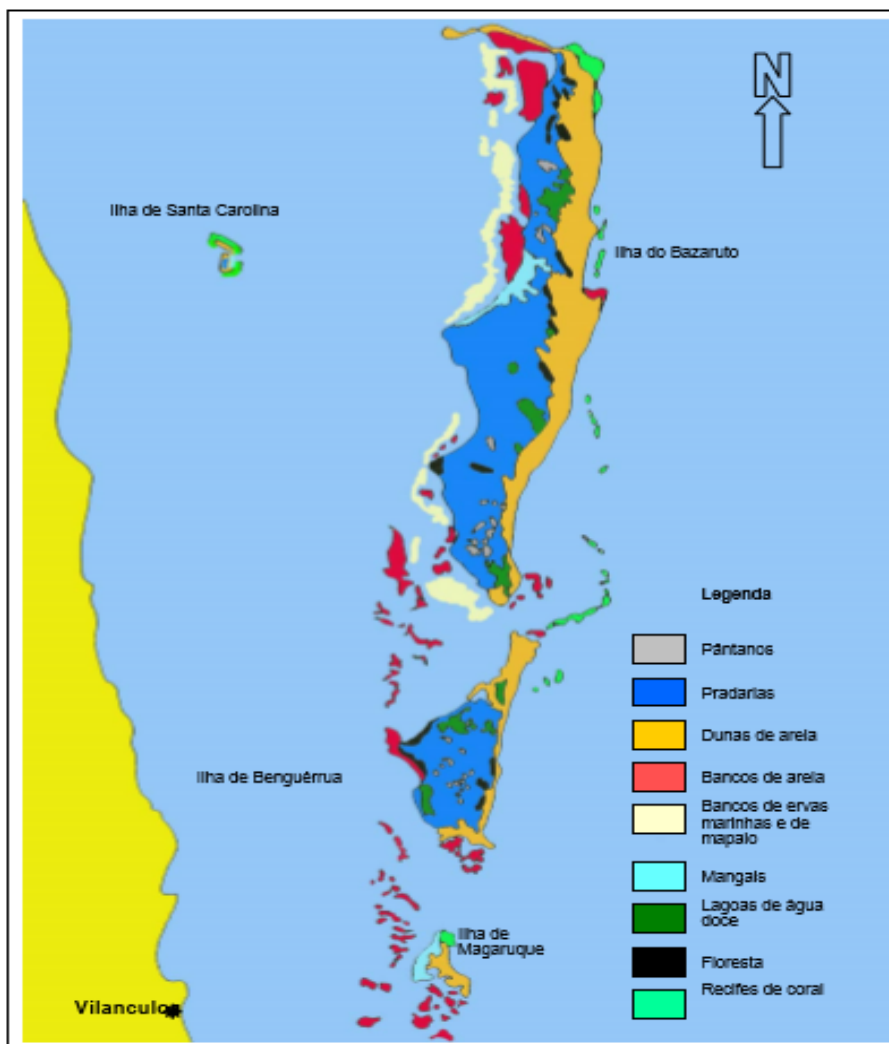
- a) **Buffer zone (ZT):** are areas created with the aim of limiting impacts on protected areas, with a minimum of 10 km and 32 850 ha along the boundaries. They are areas outside but adjacent to the boundaries. The PNAB has no specific limitation in this regard. The buffer zone helps marine surveillance and policing activities.

Related to the monitoring, per year, 12 are being doing (1 is not done by the park), of which:

- 3 are monitoring the use of resources (mapalo, holothurians and crab; fishing camps);
- 6 are ecological monitoring (1- Dugongs , Dolphins and sea turtles, 2- turtles nests, 3- crocodile nests, 4- burned, 5- coastal dunes and 6 sheep and goats) and
- 2 socio-economic monitoring (1 - Movement of tourists of hotels and lodges and 2- markets and banks); this monitoring is used to assess the level of improvement of socio-economic conditions in the archipelago and their impacts.

### **3.2.2.3. Ecosystems protected**

The archipelago was formed from the present Cabo Sebastião Peninsula about 7 000 years ago and has a wide range of terrestrial and marine habitats including coastal sand dunes, rocky and sandy shores, seagrass, coral reefs, mangrove forests, sea grass meadows (figure 25). These habitats provide refuge for a great variety of plant and animal species. Over 180 species of birds, 45 species of reptiles, and 2 000 species of fish have been recorded here (Everett, 2008).



**Figure 25:** Habitats founded in PNAB MPA (Source: Plano de Maneio PNAB 2008-2012)

The area is important for nursing and growth of coastal species due to the combination of mangroves and seagrass meadows. Invertebrates thrive successfully in the area. Statistics of Save river fish production report that 20 tons of dried fish sold weekly by trader;

There is high numbers of sand oyster (*Pictata capensis* and *P imbricata* “mapalo”) epiphytic on the seagrass *Thalassodeondon ciliatum*. And high numbers of blue crabs (*Portunus pelagicus*) (Bandeira et al., 2008).

The most common terrestrial fauna resources are small species of mammals such as red-duiker, red squirrel, toed elephant shrew, bushbuck, night ape and monkeys. Also common are reptiles including lizards and snakes. There are also a variety of birds found on the island. These resources are fully protected by the law and are not allowed to be used for any purpose, such as food and skins (Matusse, 2010).

These islands are important due to the largest and considered the most viable dugong population along the east African coast with about 130 individuals in the Bazaruto bay, Rocky areas are present in the Archipelago and provide habitats for coral to colonize and form small reefs with suitable conditions to support a typical reef-associated fauna and protecting the associated beaches zone and infrastructures (Cockcroft et al., 2008). Both soft and hard corals are more abundant and diverse on the Bazaruto reefs. Three types of reefs can be found in the archipelago namely submerged sandstone reefs, submerged fringing reefs and patch reefs. Reefs in the archipelago are concentrated around Bazaruto Island making it the major attraction for the ecotourism industry. Most of corals found in the Archipelago have a wide IndoPacific distribution although the new soft coral species (*Cladiella kashmani*) is found in Bazaruto Archipelago appearing to be limited in its distribution to the east Africa. Other mega fauna is green sea turtles, humpback whales, large fishes such as marlin, sailfish, and sharks (some i.e. figure 26).



**Figure 26:** Different resources founded in PNAB; i.e: a) fish, b) dolphins, c) dugongs, d) sharks (Source: Adapted and available in Bazaruto website)

#### 3.2.2.4. Population and Socio-economic activities

While the more than 2 000 island people are part of the overall Tsonga ethnic group whose distribution extends from Save River southwards, there has been considerable influence from other communities. Tourism and the influence of other cultures have also changed lifestyles, especially with the introduction of new fishing technologies and the high demand for products from Asian markets – such as sea cucumbers.

Artisanal fishing with traditional methods is the main economic activity for more than 70% of the local population. The islands have a long history of artisanal fisheries, evident from age-old maddens containing clay pottery and a variety of shells. As many as 60 fishing camps may be found in the archipelago, providing either fresh seafood to communities and tourists or dried products which are sold and bartered with mainland people.

Although tourism to the Bazaruto Archipelago can be traced back to the 1950, recent upgrading and new developments of hotels and resorts indicate a growing industry (figure 27). Cruise ships also visit the archipelago, with more than 5 000 visitors being transferred to its beaches every year (Everett et al., 2008).



**Figure 27:** Upgrade of hotels and resorts; growth of tourism industry of PNAB MPA (Source: Available at Bazaruto website)

The people of Inhambane Province make up about 7% of the total population. The demographics people in Inhambane Province are strongly influenced by the distribution resources, agricultural land and fisheries resources (Everett et al., 2008).



**Figure 28:** Community of PNAB MPA doing their fishing activities for income generation and livelihoods (Source: photo by: Ricardina Matusse, 2010)

The Bazaruto population is extremely poor (figure 29) and dependent on local natural resources for survival. Most inhabitants are fishermen; over 70% of families derive income from small-scale fishery activities, gathering of sand oysters and other marine resources. These communities also raise goats and some cattle.





**Figure 29:** Life status style (poor) of the communities in PNAB MPA (Source: photo by: Ricardina Matusse, 2010)

They use palm leaves to make mats and baskets for sale to hotels and tourists and to make traditional wine known as “utchema”. Women practice small-scale agriculture. Poor soil fertility and the conservation policy governing BANP, limits land-use and restricts agriculture inside the park (WWF, 2006).

### **3.2.3. Ponta de Ouro Parcial Marine Reserve (RMPPPO) MPA**

#### **3.2.3.1. Location and background**

The Ponta do Ouro Partial Marine Reserve (RMPPPO) was proclaimed on 14 July 2009. The Council of Ministers gazetted the proclamation in terms of the Fisheries Law of 26 September 1990, Decree 3/90 (Articles 35 and 69) and supported by the Environmental Law of 1 October 1997, Decree 20/97 (Article 11) (Plano de maneio 2010-2015).

The reserve extends from Ponta do Ouro close to the South African boarder to the north of Maputo River (figure 30). The RMPPPO envisages to the establishment of a network of protected areas to facilitate the establishment of transfrontier conservation areas that can develop human resources by supporting economic sustainable development and conservation of biodiversity and regional peace and stability <sup>(2)</sup>.

The RMPPPO has a total surface area of 678 km<sup>2</sup> and intends to conserve and protect coastal and marine species and their habitats. With a starting point from Ponta do Ouro in the south of Mozambique, it extends on a straight line 100 meters to the interior, with a seaward extent of 3 nautical miles into the Indian Ocean, all the way up to Inhaca Island, including Baixo Danae. On the west side of Inhaca the marine reserve has a seaward extent of one nautical mile (Frida book, 2012).

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<sup>(2)</sup> [www.peaceparks.org](http://www.peaceparks.org)



Figure 30: Location of RMPPPO (Source: Plano de Maneio 2010-2015)

### **3.2.3.2. Population and Socio-economic activities**

There is about 49 000 people that inhabited in Matutuine District, and hence a low average population density of 9 people per km<sup>2</sup>. There are more than 5 000 people in the Machangulo Peninsula, and there are about 7 000 people on Inhaca.

The residents of the district are mainly small-scale farmers and subsistence fishers, who use a wide range of natural resources. Many of the men on the mainland immigrated to South Africa to look for work during the civil war, but many returned with the cessation of hostilities. Men practice hunting and fishing. Harvesting of fish from the shore occurs by local subsistence fishermen and sport fishermen using hook and line. The former sector tends to catch smaller rock-associated fish.

There is substantial participation in fishing by sport fishermen on ski boats; this sector mainly targets pelagic species such as tunas, king mackerel *Scomberomorus commerson* and kingfish, although demersal, reef-associated species are also caught (van der Elst et al. 1996). Harvesting of fish occurs by means of spearing, hook and line, traps, deep and shallow gill nets and beach seines.

The main socio-economic activity from foreign and domestic investors is ecotourism the key components in the business management (Frida book, 2012).

### **3.2.3.3. Ecosystems protected**

The RMPPO mainland eastern coastline is linear, consisting primarily of extensive sandy beaches interspersed with minor rocky points, and with well-vegetated sand dunes. The rocky shores comprise about 13% of the length of the coastline on the mainland, and consist of wave cut sandstone platforms with large tidal pools and gullies. Most of the rocky shores are submerged at high tide. Inhaca's eastern shores comprise of similar habitat to that of the Machangulo Peninsula while mangroves (figure 32) with intertidal sand/mud flats fringe its western shores. The area within Maputo Bay, are markedly different, being sheltered from the open ocean unlike the exposed stretch between Ponta do Ouro and Cabo de Inhaca. The shores shelf gradually, are composed of fine sediments, and are lined by mangrove forests and associated flora.

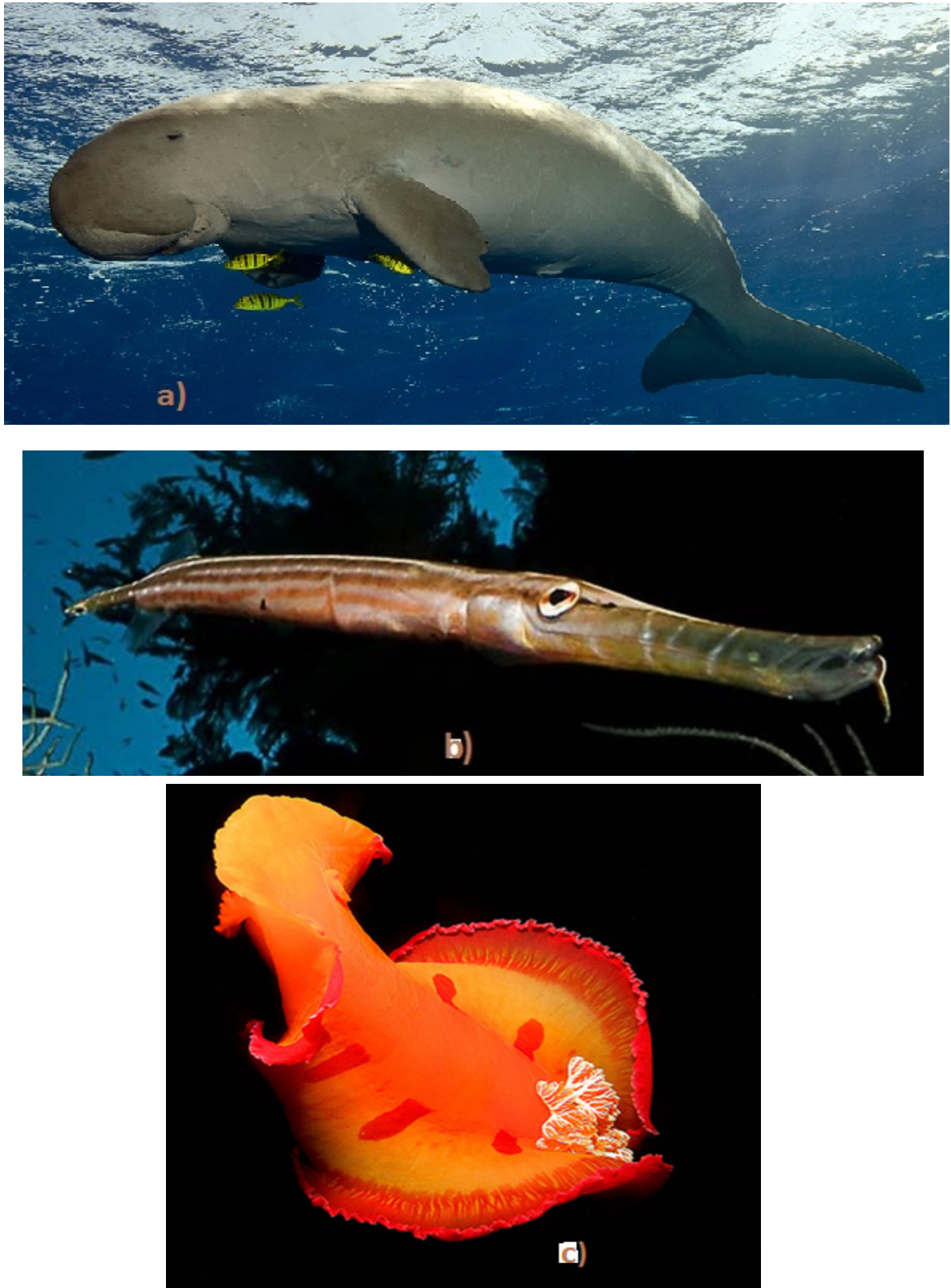
These are found on the northern and southern inter-tidal sand flats, including a small patch on the western side of Inhaca Island. The sea-grass beds described provide an important refuge for dugongs

(*Dugong dugong*) (figure 31 a) and their protection is therefore very important for the conservation of among other this species. Nine (9) species of sea grasses occur around Inhaca, making up 75% of the total number of seagrass species occurring in Mozambique and 16% of the 58 world wide seagrass species. Seven (7) seagrass community types were identified within the MPA: *Thalassia hemprichii*, *Zostera capensis*, *Cymodocea serrulata*, *Thalassodendron ciliatum*, *Cymodocea rotundata*, *Cymodocea serrulata* and *Halophila ovalis*. Overall, seagrasses covered around 50% of the entire intertidal area around Inhaca.

The Bembi River estuary in the bight of the Machungulo Peninsula is strongly affected by the state of the tide. It is lined with Mangroves along its banks and has important nursery functions for many marine fish species that are dependent on it during the later stages of their life cycle.

The coastal dunes are generally well vegetated, with the primary colonisers including *Ipomoea brasiliensis* (goat's foot), *Scaevola plumiera* and *Arcotheca populifolia*. Ghost crabs (mostly *Ocypode ryderi*), mole crabs (*Emerita austroafricana*) and whelks (*Bullia natalensis*) dominate the macro fauna, which inhabit the sandy shores (Robertson et al. 1995). Beach traffic has a detrimental effect on sizes and densities of ghost crab populations.

Two species of turtle nest along the beaches between Ponta do Ouro and Inhaca Island, namely the loggerhead turtle *Caretta caretta* and the leatherback turtle *Dermochelys coriacea*. Indian bottle-nose dolphin and humpbacked dolphins occur in Maputo Bay and the coastal waters, and humpback whales *Megaptera novaeangliae* offshore.

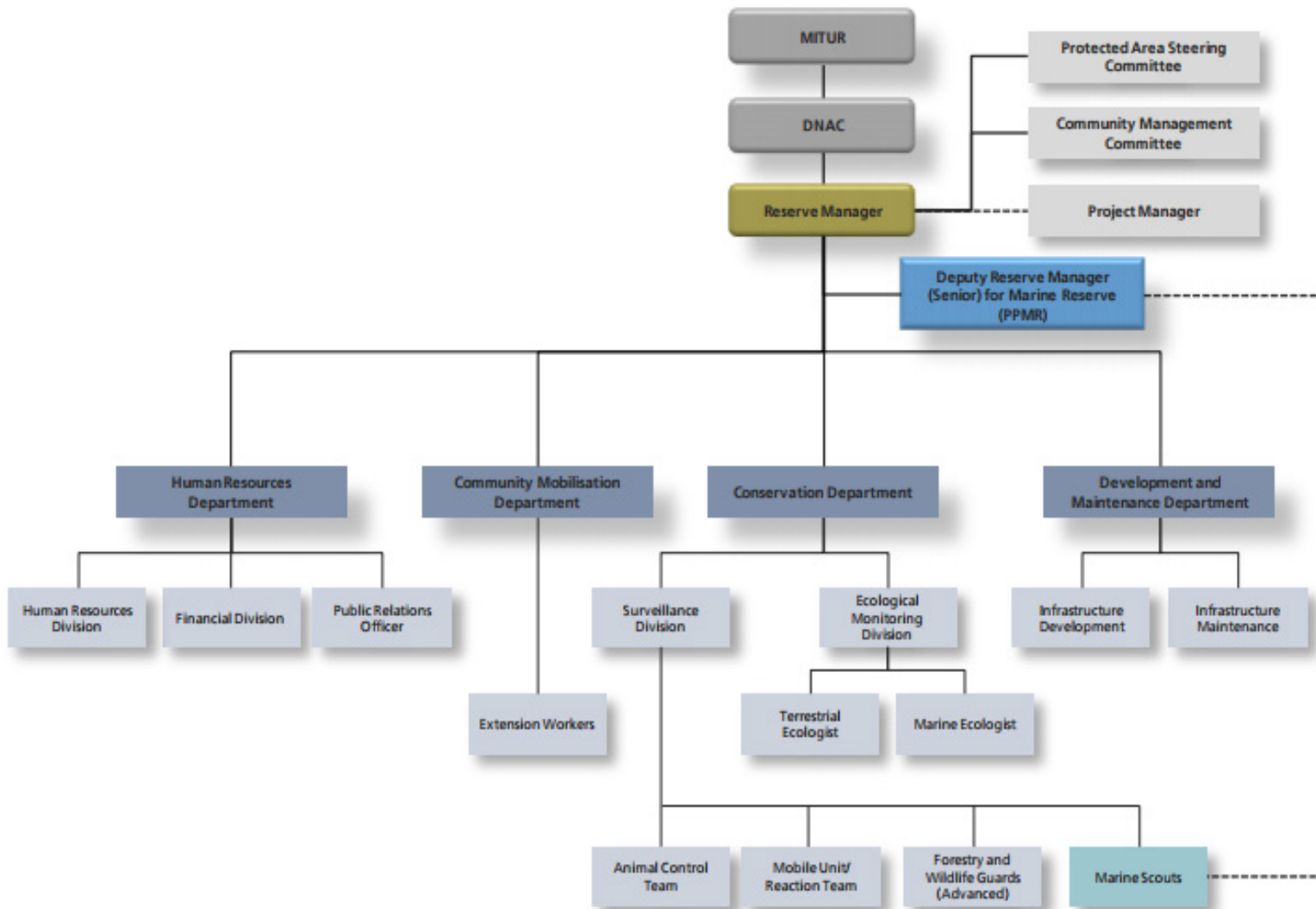


**Figure 31:** Different species of organisms founded in RMPPPO; a) dugong, b) trumpet fish, c) Spanish slug dancer (Source: Available in database Biofound database).



### 3.2.3.4. Management and monitoring

The purpose of RMPPO is to contribute to the attainment of national conservation targets within Mozambique. The Management Plan for the reserve, which is issued by Ministry of Tourism under the government, aims to prescribe the management of the MPA (figure 33). It is based on relevant guidelines published by the International Union for the Conservation of Nature (IUCN) and incorporates legal and institutional requirements. The management plan for RMPPO is regularly reviewed and if appropriate modified to be able to heighten performance in achieving its biodiversity objectives.



**Figure 33:** Management structure of the RMPPO (Source: Plano de Maneio 2010-2015)





As seen in the table 6, the management plan comes with different kind of restrictions regarding fishing and harvesting intertidal organisms. Commercial fishing are prohibited in all zones, this means that all of the commercial fishing will have to move from the area. Harvesting intertidal organisms are being permissible for subsistence use or with special permits such as research and education purposes. Bottom fish are prohibited both when it comes to subsistence and commercial fishing.

In terms of monitoring, the RMPPPO has a concerted turtle monitoring effort occurs over the border in South Africa within the Maputaland MPA where Ezemvelo KZN Wildlife's monitoring programme records about 590 nestings each year (Hughes, 2002). Based on mark and recapture data, the turtles do migrate across the border, suggesting that the entire region from St. Lucia to Inhaca represents a turtle-nesting zone. Turtles are CITES listed species and are a priority in terms of protection and monitoring are concerned.

**Table 6:** Zone description concerning fishing regulations (Source: Frida Book, 2012)

| <b>Zone</b>                 | <b>Permissible activities and use</b>                                                                                                                                              | <b>Non-permissible activities and use</b>                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sanctuary zones</b>      |                                                                                                                                                                                    | Offshore:<br>- All forms of extractive use<br>- Use of motorised vessels except for essential management, research, monitoring and vessels that have the right of passage.                                                                                                                                                                                                                                              |
| <b>Restricted use zones</b> | Inshore:<br>Recreational spear fishing (pelagic species only)<br><br>Offshore:<br>- Recreational fishing (pelagic only)<br>- Recreational spear fishing (pelagic game fish only)   | Inshore:<br>- Harvesting of intertidal organisms other than subsistence invertebrates or under special permit.<br>- Commercial fishing<br><br>Offshore:<br>- Fishing, or being in the possession of bottom fish<br>- Vertical jigging from or the possession of vertical jigs on vessels<br>- Use of fish aggregating devices, anchored or drifting<br>- Commercial fishing<br>- Anchoring except in cases of emergency |
| <b>Multiple use zones</b>   | Inshore:<br>- Recreational spear fishing (pelagic species only)<br><br>Offshore:<br>- Recreational fishing (pelagic only)<br>- Recreational spear fishing (pelagic game fish only) | Inshore:<br>- Harvesting of intertidal organisms other than subsistence invertebrates or under special permit.<br>- Commercial fishing<br><br>Offshore:<br>- Fishing, or being in the possession of bottom fish<br>- Vertical jigging from or the possession of vertical jigs on vessels<br>- Use of fish aggregating devices, anchored or drifting<br>- Commercial fishing<br>- Anchoring except in cases of emergency |

### 3.3. DISCUSSION

#### i) General characteristics of the MPAs

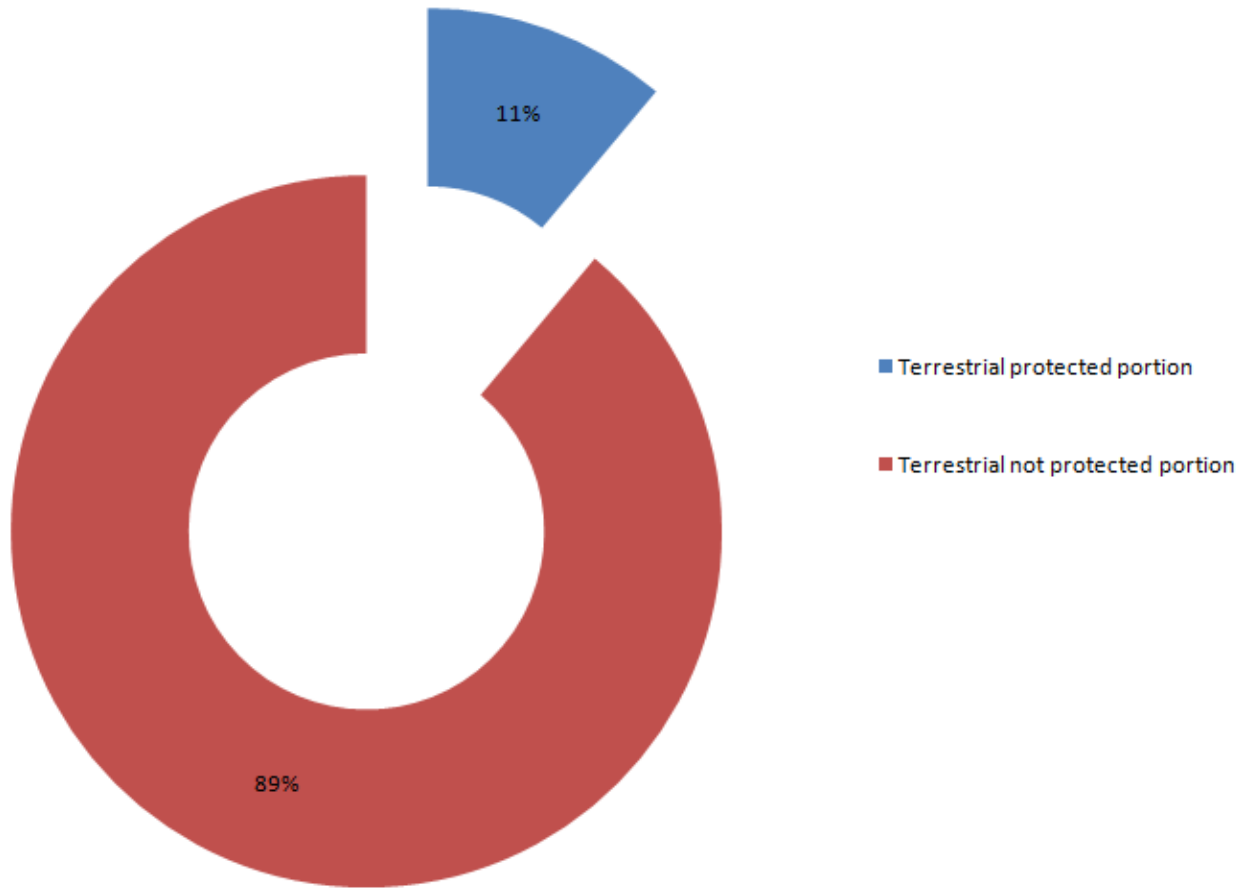
The review on the status of the Mozambican network of MPAs shows strengths and weaknesses. Generally, according to the many criteria listed by Day & Roff (2000) (in, Samy et al., 2011) such as their habitat, biological, geologic and recreational value allowed that the networks of MPAs of Mozambique been properly selected and despite the many challenges, they are meeting some of their conservation objectives. Most of MPAs was created to protect and preserve relevant ecosystem as coral-reefs, sea grass or mangroves and or species endangered such as turtles, dugongs, dolphins, among others.

According to the location to the location of the Ecoregions (see Introduction) and hotspots the marine protected areas of Mozambique are well located also. The most recent relevant event was the creation of the Environmental Area Protected of Ilhas Primeiras e Segundas (2012), becoming the largest Environmental Reserve PA in Africa.

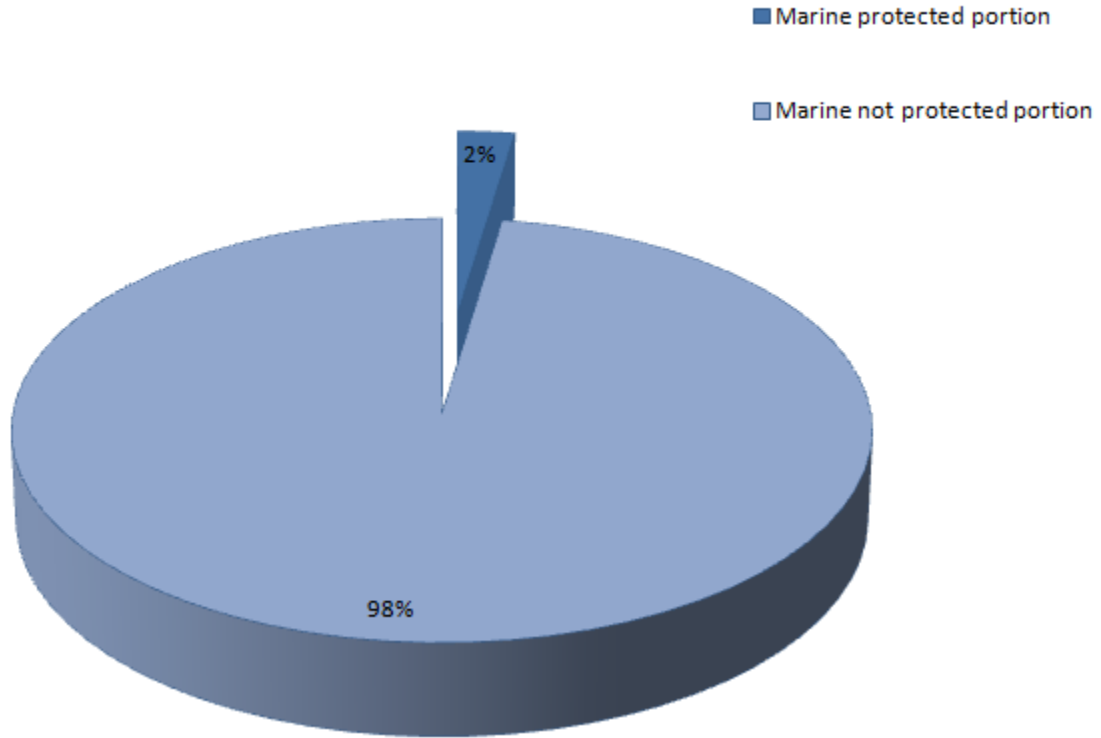
Management plans are available for ten (10) Protected Areas. Other Seven (7) PAs also have the Management Plan, although are not available in Biofound database. In Mozambique, NGOs as WWF, Ama, Centro de estudos Terra Viva, CEPAM, ect.; are the most important in supporting MPAs. The Eduardo Mondlane and Unilúrio Universities also contribute on researches and suggestions to improve the management of the areas.

Mozambique has total area of 779 380 km<sup>2</sup>, of those about 11, 1 % are protected terrestrial areas (figure 35; corresponding 86 847, 68 km<sup>2</sup>); while of 578 986 km<sup>2</sup> of ZEE Mozambique only 2, 4 % are marine protected areas (figure 36; about 13 836 km<sup>2</sup>) (appendix 3: detailed calculation), which is under 20% recommended by IUCN and others authors (Samy et al., 2011, Sánchez Lizaso et al., 2000, Ballantine 1991; Kelleher et al., 1995; Roberts & Hawkins, 2000). In this country the marine portion protected is much smaller that the terrestrial protected portion; in another point of view, the PAs of Mozambique is possible to see that from the different levels of protection available, the zone that reflects the real protection (ZPT) for all PAs is smaller than other levels of protection. However,

the Protection Networks in Mozambique have been growing, according to statistics, from 11,4% protected in 1995 improved to 13,5 % (2017, present study).



**Figure 35:** Proportion of terrestrial protected area in Mozambique



**36:** Proportion of marine protected area in Mozambique

According to Russi et al. (2016) MPAs are important tools for the conservation of marine and coastal biodiversity; also provide a range of co-benefits in the form of ecosystem services (i.e. direct and indirect contributions of ecosystems to human wellbeing). The establishment and good management of MPAs can improve the provision of regulating ecosystem services and cultural ecosystem services. They may also provide protection for commercially targeted fish stocks inside the protected area as well as a certain degree of “spillover” of adult fish into nearby fishing grounds, thereby improving the food provisioning ecosystem services related to fishing. Drawing on these various advantages of MPAs, in Mozambique there is a need to improve the marine protected area network, to achieve the recommended percentage of MPAs. On recommendation chapter there are some areas recommended to PAs.

**ii) Budget, staff and benefits delivered to the community**

The table 7 summarizes the aspects related with budget, the staff and social benefits delivered to the community of MPAs. According to the table of the 3 areas considered the PNAB has the highest annual budget, about 325 596,2 € and the lower in PNQ with 38 373,87 €. The managers as the other members of management ensure that the budget is low to meet the needs of the park; this can be seen from the reported difficulties by the members of the management and monitoring team (i.e.: PNQ). The PNAB and RMPPOs have the very low benefits delivered to the community; these low benefits reflect whether the social status (poor) of the community living around the MPAs; i.e.: no potable water, adequate toilets, hospitals, ect. The low benefits possible are related to relatively low taxes used for tourism, the low number of tourist and or corruption. On the other hand, the annual budget for management per 100 km<sup>2</sup> has to increase to improve the performance of MPAs; as well as staff in MPAs, there is still little staff in all MPAs, and a typical case is the NPQ that allocates 1 person to 100 Km<sup>2</sup>.

**Table 7:** Allocation of budget and staff in the MPAs (Source: Own elaboration)

| <b>MPA</b>                                                 | <b>PNQ</b> | <b>PNAB</b> | <b>RMPPO</b> |
|------------------------------------------------------------|------------|-------------|--------------|
| Area (km <sup>2</sup> )                                    | 9 130      | 1 430       | 678          |
| Annual budget (€)                                          | 38 373,87  | 325 596,2   | 62 133,73    |
| Number of staff (people)                                   | 95         | 49          | 16           |
| Annual benefits to the Community (€)                       | 16 714,85  | 520,95      | 84,51        |
| Annual budget/100 km <sup>2</sup> (€/100 km <sup>2</sup> ) | 510        | 22 680      | 9 140        |
| Personal/100 km <sup>2</sup> (people)                      | 1,0        | 3,4         | 2,4          |

The experience in many countries shows that protected areas often earn significant revenue and make an important contribution to local economies. In case of Mozambican MPAs, generally the entrance fees are significantly lower than fees for comparable natural attractions in other developing countries. Most of the benefits of the MPAs comes from tourism revenue, that also from entrance fees, overnight camping and other accommodation facilities; use of equipment and recreational and educational facilities; use of park transport; and from photography, game walks, canoe and boat safaris, observatories of marine habitats with glass-bottomed boats, by snorkeling or scuba diving and other recreational activities. Kenchington et al. (2003) reiterate that the quality of these

experiences depends on the ability to see large fish and the diverse life of algal beds, rocky sea beds and reefs undisturbed and undamaged in their natural environment and free from the debris of lost fishing gear, discarded plastic and drink containers. It is therefore recommended to increase entrance fees for all MPAs to be equivalent to their comparable developing countries. Also it is necessary to improve tourism attractiveness, because tourism plays an important role in the economy of Mozambique; in this terms the expectation is to tourism activities and the money attracts also contribute significantly to the development of the people who live in or near these protected areas.

On the other hand as a case of Egypt (Sammy et al., 2011) one of the main limitations to effective management areas in Mozambique is the few staff and instruments or material for oversight, very low levels of government funding. Inadequate management resources and poor infrastructure facilities are also important constraints (i.e.: Quirimbas MPA, the main office is located somewhere where there is no electric light, in rains days the electronic material has limited function, because depend on solar panels). In addition to the need of the local Government increase management funding for the protected areas of Mozambique, Russi et al. (2016) reiterate to reinforce the management funding of the MPAs using the revenue and fees generated from tourism to help finance management of MPAs is another opportunity to reconcile economic and ecological objectives in coastal and marine areas.

In relation to the staff of the MPAs, in general the staff skills technical still need improvement. Although for improve the network protection in Mozambique occur training or abroad, there are also PhDs or master's degrees technical. The technical skills for the PNAB is good, this can be seen of the plan of monitoring that the MPA has and occurring. The PNQ has been improving his skills technical and CCP members; one of examples is the seminaries, courses, workshops, conferences, campaigns for evaluation of resources and biodiversity; recently have been organized course off the Managers and Fiscals in collaboration of Madagascar to improve the skills of technicians of the protection areas.



### **iii) Surveillance and monitoring**

In the present study surveillance is one aspect that deserves attention. The results show that there is poor surveillance of Mozambique's protected areas, particularly the maritime portion, which requires efforts and means. In particular the PNQ has evidence of the little patrol made in the area; the absence of a fixed staff of inspectors in each block of the area and low number of patrols causes the emergence of several opportunities for illegal fishing in the protected area. According to some CCP members that worked together with park managers, scarce means (i.e. few boats, none availability of fuel in some times that patrol is needed) are one of the main reasons for poor surveillance.

Surveillance is one of the important tools to achieve the evidence of the expected results of MPAs. Can be assumed that without a adequate vigilance is possible to not achieving the expected results, such as the reconstruction of protected ecosystems, the recovery of the fisheries stock, ect.; because the lack of means of surveillance probably allows fishermen to continue fishing. Another point to consider is the scarce equipment to make the patrol that may difficult the interdiction of illegal fishermen (i.e. industry fisherman that assumed that have modern boats).

On the other hand, monitoring is the basis for certifying the impacts (ecological, social, and economic) of MPAs. In general, in Mozambique there are still few monitoring programs for protected areas.

For the Bazaruto Archipelago MPA, monitoring programmers is adequate for assessing the status the habitats and existing resources protected, also to assessing the social impact of the MPA. The park has one of the most organized programs of monitoring of the MPAs in Mozambique. Although in Quirimbas NP and Ilhas Primeiras e Segundas there is still difficult for assessing the MPA. In particular, the RMPPO still have a big challenge to elaborate and make work the monitoring programs. As a newest MPA there is little information related what had been done to this area.

According WWF (2005), if there is little or no enforcement and monitoring of the protected area, then the expected biological benefits might not be realized. In this way there is needs to be long-term commitment to funding management of MPAs, and budgets on time scales that allow planning for immediate needs as well as longer term programmers such as public education, research and monitoring. Modern techniques and instruments are also necessary to improve the monitoring of

MPAs in Mozambique, such as: high-resolution and multi-spectral satellites designed to measure ocean wave heights, currents and phytoplankton productivity; acoustic techniques for mapping of water column and seabed habitats; and video techniques for improved census of fish populations in continental shelf waters.

There are three tasks that should be included in a well-designed monitoring program: (1) assess management effectiveness; (2) measure long-term trends in ecosystem properties; and (3) evaluate economic impacts, community attitudes and involvement, and compliance. Monitoring programs should track ecological and socioeconomic indicators for inputs to and outputs from the MPAs at regular time intervals. Inputs might include water quality, sedimentation, immigration of adults and larvae of key species, number of visitors, and volunteer activities. Outputs might include emigration of adults and larvae of key species, changes in economic activity, and educational programs and materials (National Research Council, 2001). Considering this base, in Mozambique there is needed to improve the monitoring to increase funding and personal to improve the actual status of the MPAs.

#### **iv) Degree of community satisfaction with MPAs**

Regarding the level of satisfaction with regard to protected areas in Mozambique, each MPA presents its particularity. For the PNQ, that I had contacted with the local community in particular of Ilha do Ibo and locality of Tanganhane most of the inhabitants expressed satisfaction with the conservation zone of the Quirimbas. For this case of the PNQ, mainly the protected land area of the park, the community satisfaction is perceptible, since it was the same one that requested the creation of the park, before the creation of the park elephants, buffaloes, monkeys, ect. , invaded the fields of cultivation and destroyed several cultures, thus damaging the community. Regarding to the protected marine portion there are diversity of points of view; some members of the community said that the park has brought benefits, because with closing of some areas allowed to restore fishing stock (i.e. the communitarian sanctuary are helping the restore); one of the reasons they agree with the conservation measure is the clear evidence of decreasing of catches in recent years, both in quantity and quality, so they believe that it is important to take action on the conservation of resources; in

addition, there are sure that the creation of the MPA has created opportunities for job, the case of some members of the community who provide services to the PAs tourist resorts. On the other hand, there is a minority of the PNQ community that are not satisfied for the closed areas; because their dependent on fishing to survive, as not all of them has jobs resulting from tourism.

The establishment of conservation areas has often led to conflicts with local communities living in or around them. These conflicts are particularly evident in sub-Saharan Africa where the majority of rural populations rely heavily on natural resources for their livelihood. So, while the benefits of MPAs for fisheries are not clearly understood, such as: the value of marine ecosystem services, including waste assimilation, coastal protection, flood management and the provision of critical environmental requirements for fished species, would make it difficult to ensure satisfactory of the local community in relation to MPAs in Mozambique.

To improve the understanding of the MPAs benefits in Mozambique there is need to detail explanation to the local and national stakeholders that have come to depend on the ocean for their livelihood that MPAs can also increase the market value of a fishery by changing the composition of the catch. One of the uses of traditional area and time closures has been to provide protection to stocks to enhance market value by altering selectivity (OECD 1997). Another possible to increase in revenues could occur if the changes in catch composition from smaller to larger fish are accompanied by a shift to a more valuable product form (such as frozen to fresh product) (Sanchirico et al., 2002). To improve the community's understanding of the benefits of creating MPAs, another possibility of reducing fishing pressure in MPAs may be the creation of new income activities in communities.

Others authors as Kenchington et al. (2003) say that are often conflicts between fisheries and protected areas even though marine protected areas provide benefits to both fisheries and conservation. One approach is to encourage the fishery to be managed in a way that is designed to be environmentally sustainable, but also protects other areas from these impacts to ensure the viability of marine species and their habitats. Such 'offsets' can compensate for areas that have been selected for fishing and other activities that have an ongoing impact on the marine environment. In

this way to the successes of MPAs depend also of the acceptance of the local communities. There is needs improve the understanding of the benefits of the MPAs for the community.

#### **4. PROBLEMS and RECOMMENDATIONS of the MPAs**

Generally the MPAs of Mozambique have similar challenges to improve their present situation. Each problem or challenge has a recommendation.

##### i) Representability of MPAs

- The marine protected areas are underrepresented and do not reflect the recommended percentage (20%) of protection and the importance of coastal marine habitats of the country.

For this point to improve the network of the MPAs there are ecologically relevant areas that should be protected under the status of "conservation areas". In addition to the areas proposed by Pereira et al (2014), but not yet approved as Benguelene Island, Incomáti estuary, Bilene marine area, Inhambane (Tofo and Paindane), Nacala (Nacala bay and Relanzapo), Mossuril, Mozambique Island and Lumbo; other suggested areas are good point of analyze are:

- Coastal and marine areas north of the Sofala Province;
- Coastal areas of Inhambane, Gaza and Maputo Provinces;
- Panda Region in Inhambane Province;

##### ii) Illegal fishing and fishing of protected species

- The main threat to the biodiversity of the MPAs are represented by illegal fishing mainly consists of artisanal fishing as well by external agents using drag and mosquito nets. Other problem is the fishing of prohibited species as marine turtles;
- To combat the illegal fishing is recommended the managers of the MPAs to provide an increase of patrols, especially at night;

- Employ new technology such as a global positioning satellite network that can automatically monitor the location of fishing vessels, or alert authorities if a fishing vessel enters a closed area;
- To register all fishermen active in each PA by the Protected Area Management Unit;
- For the illegal fishing of turtles, even at fishing sites (multiple use), artisanal fishermen should attach the sea turtle breakdown device.

iii) Deforestation of mangrove

- There is extensive mangrove deforestation by the local populations that represent a serious danger to vegetation.
- To reduce the pressure on natural resources as deforestation of mangrove, from the revenues of the MPAs, should be create other income activities that could divert attention for this activities that are threat for the biodiversity; as i.e. the creation of Community Savings Associations (ACPs) that have resulted in other coastal communities, such as Nsangué Ponta, Quiwia, Quirinde and Quifuque, implemented by AMA. Should also create carpentries, anchorages, ect. to create job posts for the community and sell the products to the community of surrounding cities.

iv) Poverty of the MPAs communities and corruption in application of the benefits delivered to the community

- The quality of life and standard of living of the local community adjacent to the PNQ can be improved by investing the revenues generated from entrance fees into social development projects. This also helps to instill husbandry for the natural resource base; about corruption of the community leaders reported by the community for the application on revenues the suggestion may be to apply the revenues for something material according to the necessity of the community instead of giving money of the representative of those.
- Also to ensure that revenue benefits local communities economically, socially and through community conservation, government should give immediate attention to the social

infrastructure essential for any basic economic development. This implies that the ministries of tourism, public works, health, education, transport and communication and social services need to develop and implement a practical plan to co-ordinate the services on MPAs, to free the community members to use tourism revenue to improve their livelihoods.

#### v) Management

- Insufficient financial, technical resources and infrastructure to develop and implement management plans, and lack of trained staff;
- Human Resources: Senior management and technical staff require specialized training in the management of protected marine areas and park rangers need to be trained in resource/ecological monitoring and education skills;
- Physical Resources: Infrastructure requirements include; larger and modern boats for improved communication and facilitating monitoring programs;
- Technical information gaps: More detailed resource monitoring and assessment is needed; stock assessments and biological studies of exploited resources are required to improve current estimates. Carrying capacity studies and sensitivity analysis relating to eco-tourism are a priority activity.

#### vi) Co-management

- Poor coordination between governmental institutions and NGOs.
- To improve the coordination on MPAs management should be harmonization of procedures in all related government institutions;
- Coordination among agencies with different jurisdictions will improve the representation of on-site and off-site user groups so that the general public's cultural and conservation values, as well as commercial and recreational activities, receive consideration.

vii) Other recommendations

- Lack of data for management decisions, including information on the impacts of resource use and on the status of biological resources is needed.
- Lack of public support and unwillingness of users to follow management rules, often because users have not been involved in establishing such rules.
- The relationship and communication between MPA rangers, responsible authorities and Bedouin should be fostered.
- To increase the MPAs income; that hence will contribute to increase the benefits to the community it is suggested to improve the tourism industry (the main source of incomes) and also increase the taxes of entrance in the MPAs.
- Guarantee adequate management bodies and strengthen their management capacity.
- Conduct regular monitoring assessments and share results to show actual and potential MPA benefits to stakeholders.

## 5. CONCLUSIONS

Creating a Marine Protected Area requires a holistic approach that includes and integrates ecological, biological, social, and economic considerations. This approach cannot be successful without proper legislation, a functional institutional framework, financial resources, and active engagement of stakeholders that support the approach through unique experience and skills.

The network of MPAs of Mozambique has an important regional significance. All of the principal habitats that typify the coastal zone occur within their boundaries. Furthermore, the MPAs are characterized by high biological diversity and representative habitats of endangered and endemic species. Generally the MPAs have good selection, management plans, legal framework and attraction of tourism providing income.

To achieve the effective management and protection of the MPAs of Mozambique there is a need to implement the Management plan properly and some constraints need to be addressed to improve the management of the network as manly; increase and train the staff, increase the management budget, harmonization of the procedures between the Government institutions an national or international NGOs to improve the protection network of the MPAs. To work towards creating favorable conditions for increasing the benefits of tourism is important that the introduction and development of tourism is carefully planned to ensure that it is acceptable and sustainable for the local human communities. With appropriate training and support, local communities can gain additional economic benefit through managing the MPA and involvement in businesses that take visitors to the marine reserve, as well as receiving the benefits of improved local fishing.

Part of the community is satisfied and understands and values the benefits from the MPAs; however it was found that these communities are not satisfied with the amount of money being invested in improving the community because it is insufficient for basic community needs.

The integrated approach of MPAs takes time to be successful and can be divided into three distinct phases from a Preliminary, Pioneering, to a Self Sufficient phase. These phases may not occur necessarily in the same sequence and they can also vary among MPAs. In practice, managers adapt the implementation of different tasks according to actual circumstances, capacity, and resource availability. However, to achieve functional and effective management, all steps have to be fulfilled.



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# **7. Appendix**



## **Appendix 1**

### **Interview Form to the “MPAs Managers”**

#### 1. Management of the Marine Protected Area (MPA)

- i. Do Quirimbas Nacional Park have management plan? If have; are they implemented properly?
- ii. Who is the manager entity? Are there public, private management or co-management of the protected space?
- iii. Is there an oversight of the MPA? If is, how is they implemented?
- iv. How many management measures are there implemented in the MPA? How do they work?
- v. How the community reacts front the prohibited activities? Do they accept? If not, what is the punishment?
- vi. What happen to people caught breaking the rules and regulation of the MPA? Is there any kind of fine to pay?
- vii. Description: material used to manage the protected area; how many boats and other materials used to monitoring the protected area.
- viii. How many staff are there allocated just for an oversight and how is it work?
- ix. As managers; what is your opinion about MPAs (Positive/negative)? Should be good to expand or create new areas? What should be the constringent?
- x. For the MPA, what should be done to improve the management?

#### 2. Data about the staffs of MPA's

- i. How many staff the MPA's have? What is the percentage of each gender? And, from the total stuff, how many are allocated to work just in monitoring?
- ii. Where do they are from; are they only from the community or do they from others districts or provinces?
- iii. What are the main activities responsible of the staffs in the MPA?
- iv. Is there enough? Is there MPA miss for more stuff?

v. How much do the MPA spend to annual staff budget? Who pay it; government, NGO's or the benefits of visitors?

### 3. Ecology and socio-economic of MPA's

i. How MPAs will affect local, regional, and national stakeholders that depend on the oceans for their livelihood, recreation, and overall well-being.

ii. Are the MPAs effective? Do the populations recovered, the abundance of fish increased, including the number of older and larger fish that would have been caught if fishing were allowed to continue?

iii. What is the impact of the MPA's in catches; catches around the MPA's are increasing or not. If there are increasing, what is the percentage?

iv. Which ecosystems produce more in catches; are mangroves, sea grass, coral reefs, ect?

v. How do incentives, property rights, and institutions affect the economic and social value derived from MPAs?

vi. To create this MPA's what were the challenges with the community?

### 4. Benefits of MPA's

i. What are the benefits of MPA's: Per year, how much do they produce?

ii. Which kind of activities brings more benefit?

iii. Per year, what is the number of visitors to the MPA?

iv. The economic benefits are they used for the community?

v. What are the benefits of the MPA for the communities? Details in which kind of investments the benefits are used?

vi. Considering the actual political and economic situation of the country, which kind of changes does the Marine protected areas had in terms of benefits, tourism and monitoring?

5. Probable challenge and constringent

- i. Which problems the Marine area has?
- ii. Are there enough resources for monitoring and manage the protected areas?
- iii. What do the marine area managers miss from the government or private entities to improve the protected area?
- iv. What is other challenge do Quirimbas National Park has?

## **Apendix 2**

### **Interview form to the “general community, fisherman”**

#### **1. Management of the Marine Protected Area (MPA)**

- i. In the management of marine protected areas, is the community included in the process? Describe what the inclusion consists.
- ii. When an infringement occurs in the management plan by fishermen, how is it proceeding?
- iii. How many and what are the management measures implemented in the Marine Protected Area. How do they work?
- iv. How does the community react to prohibited activities? Comply with the rules or commit offenses? If they do not comply, what has been the penalty?
- v. As a community around the AMP; What is your opinion about the Marine Protected Areas in Mozambique (Positive or negative)? Could it be good to expand or create new areas? What would be the embarrassment in expanding or creating new areas?
- vi. In your opinion, what should be done to better manage MPA?

#### **2. Ecology and socio-economic of MPA's**

- i. How is the Marine Protected Area affecting or contributing to community or contributing dependent on the ocean for livelihood, recreation, and well-being?
- ii. What is the impact (positive / negative) of AMP on local catches? Are catches around the protected area increasing?
- iii. In catches, what are the ecosystems that produce the most catches? Are mangroves, seagrass, coral reefs, others (mention which).

3. Benefits of MPA's

- i. In your opinion, what are the benefits of AMP?
- ii. What are the benefits of AMP to communities? Detail in what types of investments are the benefits intended?

4. Probable challenge and constringent

- i. What is the relationship between the community and the marine area? Is there a good relationship? If it is bad, what kind of disagreements is there?
- ii. Other challenges?

**Appendix 3**
**Portion of marine and terrestrial protected area**

| <b>Exclusive economic zone (km<sup>2</sup>)</b> | <b>% Marine Protected Areas</b> | <b>Total Marine Protected Areas (km<sup>2</sup>)</b> | <b>Proportion of Marine Protected areas</b> | <b>Name of PA</b> |
|-------------------------------------------------|---------------------------------|------------------------------------------------------|---------------------------------------------|-------------------|
| 578986                                          | 2.4                             | 13836                                                | 1500                                        | PNQ               |
|                                                 |                                 |                                                      | 1274                                        | PNAB              |
|                                                 |                                 |                                                      | 678                                         | RMPPPO            |
|                                                 |                                 |                                                      | 10384                                       | APAIPS            |
| <b>Continental shelf (km<sup>2</sup>)</b>       | <b>% Terrestrial PA</b>         | <b>Total Terrestrial PA\ (km<sup>2</sup>)</b>        | <b>Proportion of Terrestrial PA</b>         | <b>Name of PA</b> |
| 94 212                                          | 11.1                            | 86847.68                                             | 7613                                        | PNQ               |
|                                                 |                                 |                                                      | 156                                         | PNAB              |
|                                                 |                                 |                                                      | 0                                           | RMPPPO            |
|                                                 |                                 |                                                      | 25                                          | APAIPS            |
|                                                 |                                 |                                                      | 4086                                        | PNG               |
|                                                 |                                 |                                                      | 7250                                        | PNB               |
|                                                 |                                 |                                                      | 11233                                       | PNL               |
|                                                 |                                 |                                                      | 4000                                        | PNZ               |
|                                                 |                                 |                                                      | 3745                                        | PNM               |
|                                                 |                                 |                                                      | 1500                                        | RNM               |
|                                                 |                                 |                                                      | 2861                                        | RNG               |
|                                                 |                                 |                                                      | 1040                                        | REM               |
|                                                 |                                 |                                                      | 42000                                       | RNN               |
|                                                 |                                 |                                                      | 200                                         | RNP               |
|                                                 |                                 |                                                      | 655                                         | RNCH              |
|                                                 |                                 |                                                      | 5.68                                        | RNMZ              |
| 478                                             | RPLN                            |                                                      |                                             |                   |

## Appendix 4

### MPAs abbreviation

| <b>Abbreviation</b> | <b>Name</b>                                             |
|---------------------|---------------------------------------------------------|
| PNQ                 | Quirimbas National Park                                 |
| PNG                 | Gorongosa National Park                                 |
| PNL                 | Limpopo National Park                                   |
| PNZ                 | Zinave National Park                                    |
| PNM                 | Magoé National Park                                     |
| RNM                 | Marromeu National Reserve                               |
| RNG                 | Gile National Reserve                                   |
| RNN                 | Niassa National Reserve                                 |
| RNP                 | Pomene National Reserve                                 |
| RNCH                | Chimanimani National Reserve                            |
| RMPPPO              | Ponta do Ouro Marine Reserve                            |
| RPLN                | Lago Niassa Partial Reserve                             |
| RNMZ                | Malhazine National Reserve                              |
| REM                 | Maputo Special Reserve                                  |
| APAIPS              | Ilhas Primeiras e Segundas Enviromental Protection Area |
| PNAB                | Bazaruto Archipelago National Park                      |
| PNB                 | Banhine National Park                                   |







El Máster Internacional en GESTIÓN PESQUERA SOSTENIBLE está organizado conjuntamente por la Universidad de Alicante (UA), el Ministerio de Agricultura, Alimentación y Medio Ambiente (MAGRAMA), a través de la Secretaría General de Pesca (SGP), y el Centro Internacional de Altos Estudios Agronómicos Mediterráneos (CIHEAM), a través del Instituto Agronómico Mediterráneo de Zaragoza (IAMZ).

El Máster se desarrolla a tiempo completo en dos años académicos. Tras completar el primer año (programa basado en clases lectivas, prácticas, trabajos tutorados, seminarios abiertos y visitas técnicas), durante la segunda parte los participantes dedican 10 meses a la iniciación a la investigación o a la actividad profesional realizando un trabajo de investigación original a través de la elaboración de la Tesis Master of Science. El presente manuscrito es el resultado de uno de estos trabajos y ha sido aprobado en lectura pública ante un jurado de calificación.

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*The Master is developed over two academic years. Upon completion of the first year (a programme based on lectures, practicals, supervised work, seminars and technical visits), during the second part the participants devote a period of 10 months to initiation to research or to professional activities conducting an original research work through the elaboration of the Master Thesis. The present manuscript is the result of one of these works and has been defended before an examination board.*