UNIVERSITY OF PORTSMOUTH

A critical evaluation of the cetacean-based tourism impacts to a resident population of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), on the Ponta do Ouro Partial Marine Reserve (PPMR) - Mozambique

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STATEMENT OF ORIGINALITY

This dissertation is submitted in partial fulfilment of the requirements for the degree of MSc Coastal and Marine Resource Management

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Preface

ABSTRACT

The impacts of a CBT industry to a population of Indo-pacific bottlenose dolphins resident in the PPMR (Mozambique) was analysed in order to provide recommendations to the present management of the MPA.

Data was gathered through opportunistic observation onboard the commercial vessel of DERC, an authorized CBT operator. For the purpose of this study the years of 2008, 2013, 2017 and 2018 were analysed statistically.
To complement this information the attitudes and perceptions of the commercial marine operators as well as the participants of CBT activities were studied through the means of two close-ended hand-out questionnaire surveys. And, semi-structured interviews took place with local government representatives for a more in depth discussion of some aspects of this research.

The results confirm that the adherence to the PPMR code of conduct and permit conditions is effective in minimizing the effects of CBT. However, changes found in this study are biologically meaningful for the population. Both human and vessel interactions are disrupting the population's behavioural budget and may alter long-term survival and reproduction at the individual and population level.

In order to improve the CBT industry and achieve ecotourism standards recommendations were devised that included changes to the code of conduct for dolphins, whales and whale sharks; more information dissemination and stakeholder involvement to increase their sense of ownership and responsibility towards the PPMR.

ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS & ACRONYMS

ANAC	Agência Nacional de Áreas de Conservação (Conservation Agency)
CBT	Cetacean based tourism
Code	Code of conduct
DERC	Dolphin Encountours Research Center
Dolphin	Indo-pacific bottlenose dolphin
EAME	Eastern Africam Marine Ecoregion
EEZ	Exclusive economic zone
ICZM	Integrated coastal zone management
INAMAR	Instituto nacional da marinha (Navy institute)
IUCN	International union for the conservation of nature
KPA	Key performance área
LME	Large marine ecosystem
MC	Marine conservation
MICOA	Ministry of coordination of environmental affairs
MOU	Memorandum of understanding
MPA	Marine protected área
MSP	Marine spatial planning
MSR	Maputo special reserve
NGO	Non-governmental organisation
Operators	PPMR comercial marine operators
PA	Protected área
PPF	Peace parks foundation
PPMR	Ponta partial marine reserve
SAC	Special área of conservation
SD	Sustainable development
Tourists	CBT activity participants
UNEP	United nations environmental programme
WWF	World wildlife fund

CHAPTER ONE

1.1 CHAPTER INTRODUCTION

This dissertation investigates the impacts of CBT on a resident population of bottlenose dolphins in the PPMR, Mozambique. As well as the attitudes and perceptions of CBT tourists and marine operators towards these impacts. In order to determine and asses these parameters a mixed methods approach was conducted with the observation of human/dolphin interactions, questionnaire surveys to the tourists and marine operators and, interviews with local government representatives.

This chapter will explain the current relevance and need for this research. Followed by a discussion of the rationale, aims and objectives of the study.

1.2 FOCUS AND RATIONALE OF STUDY

Cetacean-based Tourism (CBT) in specific observing and swimming with wild dolphins, has become a “must do” item on many holiday maker´s list. Both short and long term effects to the animals have been shown in several studies (Constantine, Brunton, & Dennis, 2004; Lusseau & Higham, 2004; Lusseau, Slooten, & Currey, 2006; Bejder et al., 2006). Different approaches have taken place to attempt to regulate these activities (Hoyt, 2001) such as a voluntary Code of Conduct between CBT operators (Allen, Smith, Waples, Harcourt, 2004) the issuing of permits and licences (Allen, Smith, Waples, Harcourt, 2004; Constantine et al., 2004; Bejder et al., 2006) and the implementation of government legislation and guidelines (Allen, Smith, Waples, Harcourt, 2004; Filby, Stockin, & Scarpaci, 2015). Many countries were faced with an exponential increase in CBT activities before appropriate management measures had taken place.

In Mozambique there is no CBT legislation therefore the operators only have to follow the Environment law n. 20/1997 (Boletim da Republica, 1997) and law for the protection, conservation and sustainable use of biodiversity, n. 16/2014 (Boletim da Republica, 2014). CBT began is Mozambique in the early nineties, after the civil war ended and the tourism industry began to grow once again (ANAC, n.d.).

The Ponta do Ouro village is the number one destination in Mozambique for wild dolphin-swim activities (ANAC, n.d.). A Marine Protected area (MPA) was

implemented in the area in 2009 (Decree 2009 PPMR), denominated Ponta Partial Marine Reserve (PPMR).

The management plan for the PPMR addresses unregulated CBT and presents a code of conduct (hereafter referred to as “code”) to be followed by all CBT operators as well as a licensing system. The code was designed based on the voluntary one adopted by the first CBT operator of the region, Dolphin Encountours Research Center (DERC) when only one company operated in that area (DNAC, 2011).

DERC has a long term data set from the monitoring of the resident bottlenose dolphin population and concerns have been raised about the impacts resulting from the increase on CBT operators and the usage of recreational boats (Gullan, n.d.).

1.3 AIMS AND OBJEVTIVES OF STUDY

The overarching aim of this study is to determine the impacts that cetacean-based tourism activities have on a resident population of bottlenose dolphins in a marine protected area (MPA), Ponta do Ouro Partial Marine Reserve (PPMR) – Mozambique. In order to provide recommendations for the present management plan and support the devising of the guidelines at national level.

To accomplish the aim specific objectives were devised:

- Objective one will comprise a critical review of existing research on CBT, international and national legislation for marine mammals and CBT, all PPMR research conducted to date and potential gaps in the literature.
- Objective two will involve the presentation of the ten year data-set collected on board the Dolphin Encountours Research Center (DERC) boat, during dolphin swim tourism activities. As well as the vessel traffic data collected by the PPMR office. The two data sets will then be compared for possible correlations.
- Objective three will utilise questionnaires and interviews to ascertain the level of knowledge on local marine mammal regulation and the impacts of recreational marine activities to the environment and to the resident dolphin population. The questionnaires will be submitted to the local marine

operators and dolphin-swim activity tourists. The interviews will be conducted to local government representatives.

- Objective four is to undertake a critical discussion and analysis of the research results in order to find possible applications to the management of CBT.
- Objective five will devise a series of recommendations intended to improve future management practice of CBT and marine mammal conservation.

1.4 DISSERTATION SUMMARY

This research project will be divided into nine chapters that will now be explained into further details:

Chapter	Name	Description
Chapter one	**Introduction**	Provides an overview of the project explaining the focus and rationale for the study, the overall aim and specific objectives are detailed and a summary of each chapter of the dissertation is provided.
Chapter two	**Literature review**	Is a critical review of existing literature related to the research undertaken in this study. This chapter will be divided into key themes.
Chapter three	**Research Methods**	Provides a detailed description of the data collection and research methods applied to obtain the primary data (data set, questionnaires and interviews). Presents an explanation for the secondary data utilised (long term data set from DERC and vessel traffic data from PPMR).
Chapter four	**Research & Analysis – Dolphin data set**	Reports the findings of this research with an analysis and interpretation of the data set.
Chapter five	**Data analysis & discussion – Questionnaire for CBT participants**	Presents the analysis and interpretation of the data gathered from the questionnaires to tourists.
Chapter six	**Data analysis & discussion – Questionnaire for marine operators**	Presents the analysis and interpretation of the data gathered from the questionnaires to marine operators.
Chapter seven	**Analysis and discussion – interviews with local government**	Presents the analysis and interpretation of the data gathered from the semi-structured interviews with local government representatives.
Chapter eight	**Critique and Recommendations**	This chapter will identify areas for further study, detail the limitations of the project and suggest recommendations for future management practices.
Chapter nine	**Summary and Conclusion**	Summarises this study with key conclusive statements.

2. LITERATURE REVIEW

2.1 CHAPTER INTRODUCTION

Chapter two critically evaluates the literature on coastal and marine management, in specific the use of ICZM and MSP for MC. In addition, it considers the literature on the use of MPAs as a tool for MC. It than reviews the literature of research conducted in the PPMR. Concluding with a analyses of CBT history and tools and management techniques that aim to achieve SD.

2.2 COASTAL AND MARINE RESOURCES: THE NEED FOR MANAGEMENT

Coastal zones (Figure 2.1) are all the areas affected by offshore and near-shore natural processes; areas of potential tidal flooding and erosion; enclosed tidal waters such as estuaries and surroundings, and areas directly visible from the coast; with the inland limit directly depending on the maritime influence (Defra, 2008).

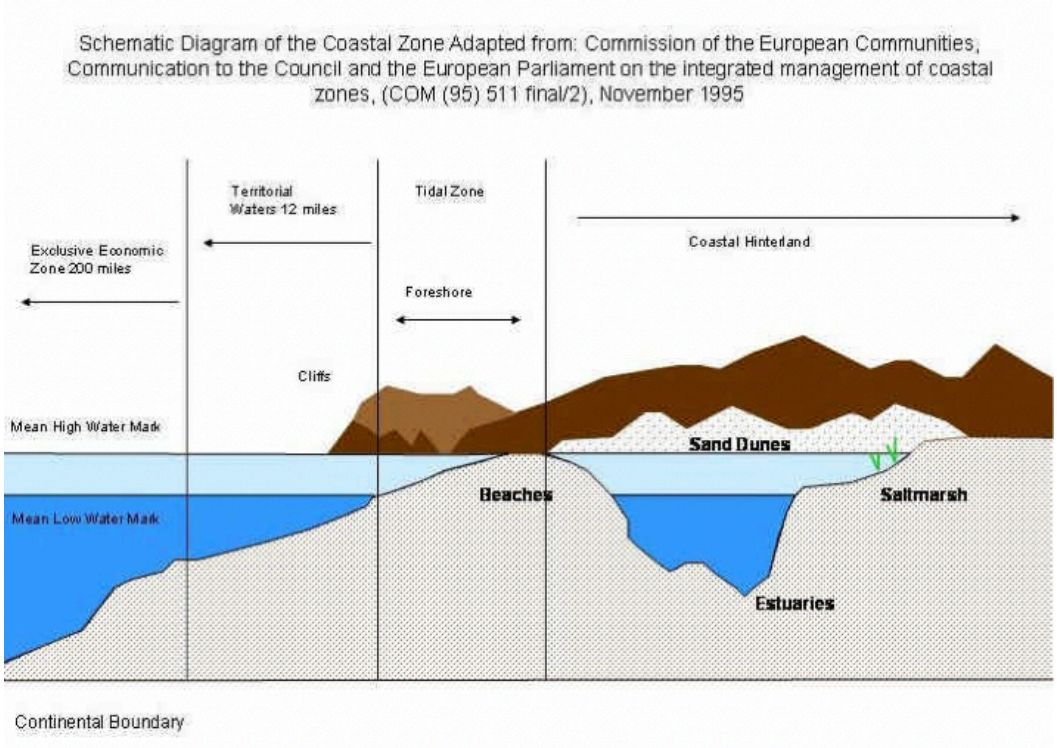


Figure 2.1 - Schematic diagram of coastal zone (Atkins, 2004).

The coastal area contains diverse and productive habitats important for human settlements, development and local subsistence. More than half the world's population lives within 60 km of the shoreline, and this could rise to three quarters by the year 2020 (UNCED, 1992). The continuous growth of world's

population, specially within coastal zones, has resulted in exploitation of resources, increased pollution levels and reduced space, which has generated conflicts (Kay & Alder, 2005).

Our ancestors have treated the sea as a free and limitless resource with very few regulations in place (Slater & Read, 2017). As a consequence of population growth and economical and technological development the sea uses (table 2.1) increased translating into a myriad of conflicts as described on table 2.2 (Douvere, 2008).

Table 2.1 – Examples of Marine activities (Slater & Read, 2017).

Marine activities	
Fishing	Disposal
Scientific research	Tourism
Oil and gas exploration	Transport
Mineral collection	Heritage sites
Renewable energy	Recreational activities

Table 2.2 – Sea use conflicts (Douvere, 2008).

Sea use conflicts
Conflicts caused by spatial and temporal overlap of human activities, in the coastal and marine environment (user-user and user-environment conflicts);
The authorities responsible for individual activities and the environment as a whole lack in communication;
A lack of connection between the resource users, which is the onshore communities that depend on them and the offshore activities that produce or extract them;
The conservation of marine areas that are biologically and/or ecologically sensitive;
Marine developers and users of ocean resources lack on investment certainty (Douvere, 2008).

These human pressures combined with climate change and sea level rise, resource abundance, and the underdevelopment of many overpopulated coastal areas (less developed countries concentrate within inter-tropical latitudes; the more destruction of biomass in those areas, the more the availability of natural coastal resources is jeopardized), are the four motivations that sustain Agenda 21´s approach to pursue sustainable development by carrying out integrated coastal management (Vallega, 1997).

In sum, the effects ocean and coastal uses (Table 2.3), as well as activities inland, can have on ocean and coastal environments, and the effects ocean and coastal users can have on one another (Table 2.4) are the main reasons why an integrated approach is needed.

Table 2.3 - Principal Ocean and Coastal Activities (Cicin-Sain et al., 1998).

Activities
Navigation & Communications
Living Marine Resources
Mineral & Energy Resources
Tourism & Recreation
Coastal Infrastructure Development
Waste Disposal & Pollution Prevention
Ocean & Coastal Environmental Quality Protection
Beach & Shoreline Management
Military Activities
Research

Table 2.4 – Ocean and Coastal users relationship classification (Couper´s Global marine interaction model,(Couper, 1983)).

Classification
Harmful or conflicting
Potentially harmful
Mutually beneficial
Harmful to one user but beneficial to another

2.3 ICZM AND MSP

Often these ocean and coastal activities and conflicts are managed individually and fail to account for the cumulative impacts (Lester, Ruff, Mayall, & McHenry, 2017). The single-sector management approach can also delay the development on new sectors such as offshore renewable energy and aquaculture due to the lack of an overarching representative body and framework (Young, 2015).

Integrated Coastal Zone Management (ICZM) was created to address the problems of coastal governance, planning and management through an integrated and adaptive process. This continuous process aims to achieve sustainable management of the coastal zone over the long-term and considering the limits set by natural dynamics and carrying capacity. However, it can only manage the activities that take place within the ICZM coastline boundaries, excluding all remaining marine activities within the exclusive economic zone (EEZ) (Douvere, 2008; Smith, Maes, Stojanovic, & Ballinger, 2011).

Marine Spatial Planning (MSP) is a multi-based, multi-sectoral management approach that determines which activities, where and when they can occur in the marine spaces (Lester et al., 2017). MSP has a broader range of action encompassing ICZM and EEZ activities (Douvere, 2008).

Both MSP and ICZM are characterized by adaptive management, stakeholder participation throughout the process and integration of uses and interests with a broader aim of reducing conflicts and achieving SD (Douvere, 2008; Smith et al., 2011).

2.4 MARINE CONSERVATION

2.4.1 HISTORY

Marine conservation (MC) is the planned management of the natural resources (Webster dictionary) to preserve, protect and restore the natural environment or ecosystem (Parsons, MacPherson, & Villagomez, 2017). It is an interdisciplinary field (Parsons & Macpherson, n.d.) of science, education, social marketing, economics, resource management and policy (Parsons et al., 2017). It is a combination of biodiversity maintenance, resource sustainability and human well-being, that encompasses procedures and regulations on how to conduct conservation (Ray & McCormick-Ray, 2014).

The main objective of MC is to slow and stop the ecological downfalls resulted from social and ecological imbalances by protecting restoring and sustainably using resilient ocean systems and living components (Ray & McCormick, 2014).

MC is a relatively new concept with roots in nature conservation (land). In 1864 George Perkins Marsh published Man and Nature, this was the first link between culture and nature, science and society, landscape and history and leaded to the beginning of nature conservation (Ray & McCormick-Ray, 2014).

MC reached a climax in the mid 1970s when the International Union for Conservation of Nature (IUCN), promoted by the United Nations Environment Programme (UNEP), created the Marine Programme. This programme worked towards the organization of regional-seas agreements, but it still lacked appropriate mechanisms (Ray & McCormick-Ray, 2014; Gjerde, 2016). It was only from the 1980s into the beginning of the 21st century that a new approach towards MC was established, with the creation of biodiversity hot - spots and the need to restore natural systems, this shift was mostly because human – caused ocean change was at its biggest. Bringing us to the present time with a comprehensive ecosystems approach that includes both species and spaces, combined with the need for coherent national ocean policies and the formulation of international policies (Ray & McCormick-Ray, 2014).

2.4.2 ISSUES FOR MARINE CONSERVATION

MC issues can be categorized into primary, secondary (those caused by the concentration of human activities impinging on the marine ecosystems) and tertiary (caused by multiple sources that together undesirably change the ecological environment, causing unexpected and unintended outcomes from the marine ecosystems) (Table 2.5). Population growth and increase resource demands are also issues for MC known as 21st century issues (Ray & McCormick-Ray, 2014).

Table 2.5 – Marine conservation issues categorised, adapted from Ray & McCormick-Ray (2014).

Category	Issues	Examples
Primary	Depletion of species	
	Overabundance of species	
	Ill health and degradation of habitats	
Secondary	Extractions (over - harvesting)	Overfishing, minerals, fossil fuel & ocean energy
	Introductions (adding into the ecosystem)	Adding nutrients, adding petroleum and by-products, PBTs, litter and persistent plastics, harmful species, noise, heat, light pollution & collisions
	Physical alterations (structural change on ecosystems)	Reclaimed land, obstructed water flow, ports & coastal urban centres
Tertiary	Degraded coastal water quality	Expanding anoxic bottom waters, regional change
	Global ocean change	Climate & ocean warming, sea-level rise, altered water cycle, altered biogeochemical cycle & ocean acidification

2.4.3 TOOLS AND MANAGEMENT TECHNIQUES

MC has a toolkit of legal and social mechanisms that have evolved side by side with MC practice, through science, public participation, governance, law administrative processes, politics and the dedicated actions of governments, individuals, groups and organizations (Ray & McCormick-Ray, 2014).

These mechanisms and tools can be organized into five groups (Table 2.6).

Table 2.6 – Mechanisms used for MC (Ray & McCormick-Ray, 2014).

Mechanism	Description
Biological conservation	The conservation of species is done through international, national and regional laws and agreements; habitats are conserved through international conventions and treaties; and the CBD convention protects against loss of biodiversity and genetic uniqueness.
Environmental policies	Depend more on political expediency than environmental paradigms. Tend to happen by default (unplanned) and lack focus on ultimate outcomes. Successful conservation strategies will provide a preventive action plan with precautionary approaches, public participation and constant research and monitoring. The Rio Earth Summit (1992) brought together 178 nations and initiated two important legally binding conventions, the climate change convention known as the Kyoto protocol (1997) and the CBD convention (1992) that urged for conservation strategies and sustainable use of the environment. The Rio Summit also developed an action plan know as the Agenda 21 which comprises of a chapter on marine and coastal biodiversity (Chapter 17).
Agents for Conservation (NGOs)	Can influence the direction of environmental and development policies through advocacy and "on – the – ground" action. They can change society's direction and alter resource abuse.
Development and Financial assistance organizations	E.g. World Bank acts as a partner for environmental programs and is also a primary funder for many projects. International Monetary Fund (IMF), United Nations Development Programme (UNDP) and other development banks.

Spatially explicit conservation	By designating protected areas. In the past centuries, for cultural reasons - war location, hunting & fishing. Towards the mid 20th century – for the protection of habitats, species, scenic and cultural areas.

The management of MC is based on goal-oriented mechanisms, these strategic action plans are created under designated authority (Table 2.7). They act as a dynamic tool that adapts to new information and seeks solutions for long – term resource issues (Ray & McCormick-Ray, 2014).

Table 2.7 – MC management concepts and descriptions, adapted from Ray & McCormick-Ray (2014).

Management concept	Description
Fisheries management	Regulates exploitation and manages fish stocks, it is a ecosystem based fisheries management. Resulted in the designation of 64 large marine ecosystems (LME).
Coastal Management	Determines how to use, conserve and value resources and opportunities within the coast. Development of Integrated Coastal Zone Management (ICZM) with a bottom-up approach, stakeholder involvement and emphasis on long-term sustainability, integration amongst sectors for information exchange, communication, collaboration and coordination (Payne, 2017).
Marine Protected Area (MPA)	Managing environmental and biodiversity protection as well as scenic and socio-economic value. Has different types that can vary from strict to multiple-use; public to private organizations; and have distinct management regimes.
Biosphere Reserves	Combines conservation with human activities, fostering sustainable development (SD) and dialogue/conflict resolution for resource uses. Integrates cultural and biological diversity with traditional knowledge. Has 3 interconnected functions: conservation, development and logistics. Have a hierarchical spatial planning with a core zone, buffer zone and transition zone.
Restoration Management	Aims to renew degraded and damaged ecosystems through active human intervention, to prevent further degradation and to achieve

	sustainable ecosystem rates. Ex: government mandated restoration of ecosystems damaged by human-use incidents such as oil spills and pollutant releases (Peterson; Kneib & Manen, 2003).
Ecosystem Base Management (EBM)	Integration of all management concepts with focus on the protection, restoration and management of functioning ecosystems, within a spatially designated area. Aims to conserve species, maintain biodiversity and place human-uses in n environment context (Leslie, 2009). Adopts the precautionary principle to impacts of human activities.

2.5 MARINE PROTECTED AREAS (MPAs)

Designating MPAs has become a popular tool for the conservation of marine biodiversity and habitats (Martin, Momtaz, Jordan, & Moltschaniwskyj, 2016; Maypa et al., 2012), for example the protection of marine mammal populations, seabird colonies (McDermott et al., 2017) and fish stocks (Hamilton, 2012), from human pressures. They are considered the most reliable tool for defining species vulnerability hotspots in spatial scales (Agardy, di Sciara, & Christie, 2011) and determining/protecting critical habitats (E Hoyt, 2012).

In order to manage and protect marine and coastal resources these anthropogenic activities and pressures are restricted and their distribution controlled (Cleguer, Grech, Garrigue, & Marsh, 2015; Gallacher et al., 2016; Hoffmann & Perez-Ruzafa, 2008).

MPAs have an integrated management approach that considers societal, political, biological and ecological ideals in which a consultation process with stakeholders is of great importance (Collins et al., 2010; Martin et al., 2016).

Currently MPAs cover around 3,6% of the world's oceans (Juffe-Bignoli et al., 2014; Marine Conservation Institute, n.d.) with only about 2% being strongly protected marine reserves (Figure 2.2)(Marine Conservation Institute, n.d.).

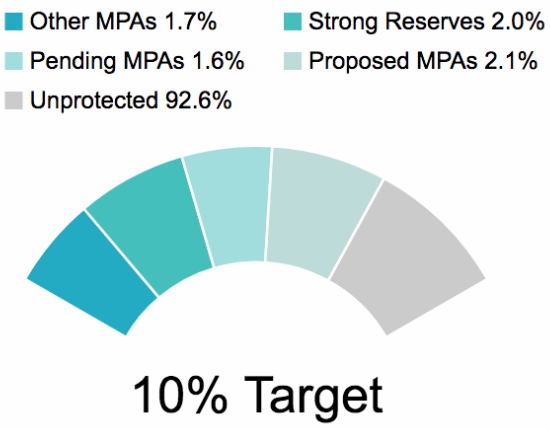


Figure 2.2 – How much of the ocean is currently protected (Marine Conservation Institute, n.d.).

2.5.1 THE DIFFERENT MPAs

According to the IUCN the ecosystem-based management approach is part of a broader framework that uses integration for planning and developing conservation as well as the management of land and water uses. Through the different MPA regimes it can address most cetacean habitat needs and is considered, if not the most, one important tool (Dudley, 2008; E Hoyt, 2012).

The definition of a protected area, according to IUCN is

"A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values" p.8 (Dudley, 2008).

The IUCN has divided protected areas into six categories, that are applied to land-based, riverine and marine protected areas (Table 2.8) (Dudley, 2008).

The most common and consistent worldwide terms used among MPA practitioners are listed and explained in Table 2.9.

Table 2.8 – IUCN management categories for PAs (Dudley, 2008).

Category	Name	Description
Ia	**Strict nature reserves**	To protect biodiversity and geological/geomorphological features, where human visitation and impacts are strictly controlled and limited. Indispensable for scientific research and monitoring.
Ib	**Wilderness areas**	Unmodified or slightly modified areas that retain the natural character and influence, with little or none human habitation. Managed to preserve their natural condition.
II	**National parks**	Large natural or near natural areas to protect large-scale ecological processes combined with species and ecosystem. Offers environmentally and culturally compatible spiritual, scientific, educational, recreational, visitor options.
III	**Natural monuments or features**	To protect a landform, seamount, submarine cavern, geological feature. Usually small protected areas with high visitor value.
IV	**Habitats/species management areas**	Management reflects the protection of a specific species or habitat
V	**Protected landscape and seascapes**	Area of distinct character with significant ecological, biological, cultural and scenic value produced by anthropogenic interaction with nature.
VI	**Protected areas with sustainable use of natural resources**	Conserves ecosystems and habitats combined with cultural values and traditional natural resource management systems. Large areas with mostly in natural conditions with a small portion under natural resource management activities.

Table 2.9 – MPA types/terms and definitions, adapted from Hoyt (2012).

Name	Definition
Protected area (PA)	Generic term used by most PA and MPA practitioners, but usually refers to land-based protected areas, including freshwaters rivers and lakes. Defined as per IUCN definition mentioned above.
Marine protected area (MPA)	Applies specifically to marine habitat. Same general definition as PA above.
High sea marine protected area (HSMPA)	MPA on the high seas, outside the limits of the EEZ.
Marine reserve or strictly protected area	A no-take reserve of highly protected area (IUCN category I). Can also be a core protected zone within an MPA or, a strictly protected area within a PA.
Marine biosphere reserve	United nations (UN) designation for a MPa that features various levels of protection and zoning (highly protected, multi-use and transition areas).
National sanctuary or national cetacean sanctuary	Not an MPA. Large ocean area within a nation's EEZ to stop the hunting of cetaceans or whales. Usually comprises all of the nation's EEZ territory.
International whaling commission (IWC) sanctuary	Not an MPA. IWC designation. Sanctuary on the high seas protecting whales from hunting.

2.6 PONTA PARTIAL MARINE RESERVE

2.6.1 FORMATION

PPMR is a MPA designated at national level as a marine partial reserve. It was proclaimed in July 2009 with immediate effect. The government based the proclamation in international and national legislation (Fig 2.3) but the three main laws underpinning the MPA are the Fisheries law (1990), Environment law (1997) and the Marine General Fishing law (2003). This legislation combined with a memorandum of understanding (MOU) between the Fisheries department, Navy National Institute (INAMAR) and Ministry for the Coordination of Environmental Affairs (MICOA) were the main drivers for the creation of this reserve (DNAC, 2009; Rosendo, Brown, Joubert, Jiddawi, & Mechisso, 2011).

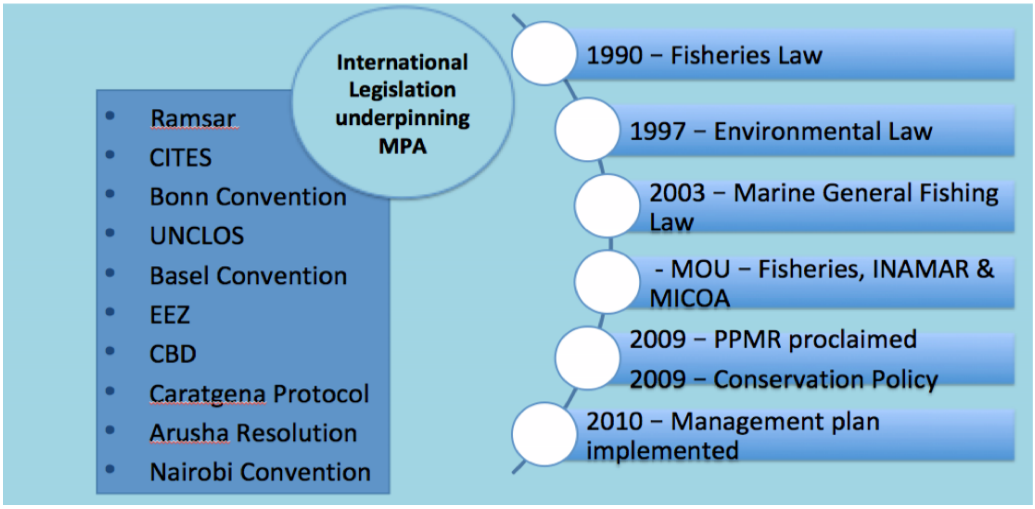


Figure 2.3 – International and National legislation, conventions and agreements underpinning the establishment of the PPMR (DNAC, 2009; Rosendo et al., 2011).

The creation of MPAs in Mozambique is strongly supported (technically and financially) by international bodies such as the World Wildlife Fund (WWF) and World Bank (Rosendo et al., 2011).

Mozambique is part of the Eastern African Marine Ecoregion (EAME)(WWF Tanzania Programme Office, n.d.) and is represented by nine priority sites for conservation (Table 2.10), these sites are categorized according to their importance as Global, Ecoregion and Sub-region (WWF Tanzania Programme Office, n.d.).

Table 2.10 – WWF priority sites in Mozambique (WWF Tanzania Programme Office, n.d.).

Priority Sites #	Location/description
1	Mtware-Quirimbas Complex (cross-border site between Tanzania and Mozambique)
2	Nacala-Mossuril
3	Ilhas Primeiras and Segundas
4	Zambezi Delta System
5	Sofala Bay
6	Bazaruto Archipelago
7	Inhambane Bay
8	Inharrime Complex
9	Maputo Bay-Machangulo Complex-Greater Saint Lucia Wetlands (cross-border site between Mozambique and South Africa)

The Ponta do Ouro Partial Marine Reserve (PPMR) is within priority site nine (Figure 2.4) which is a site of Global importance because of the area's main features (Table 2.11).

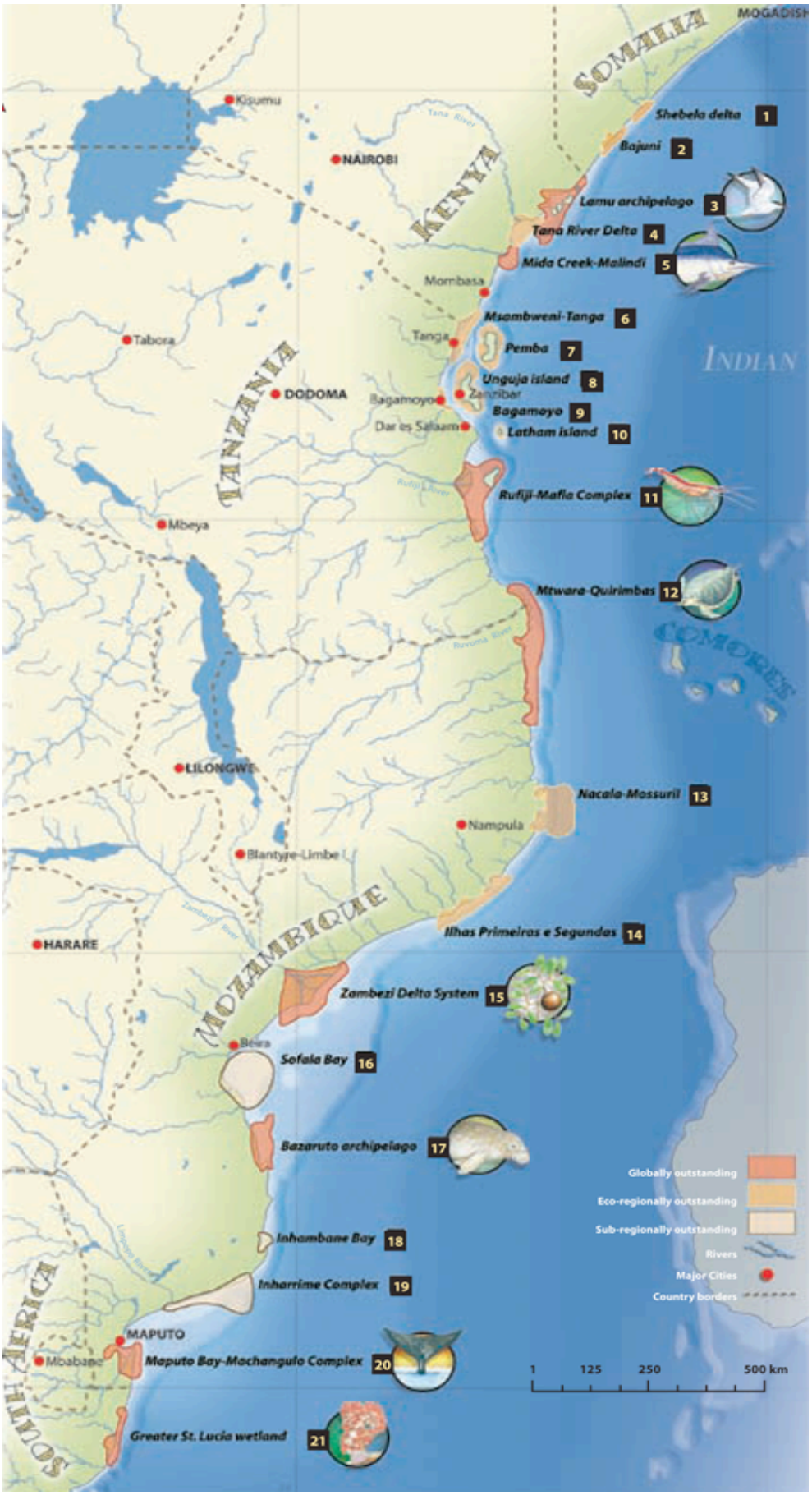


Figure 2.4 – EAME priority sites (WWF Tanzania Programme Office, n.d.).

Table 2.11 – Main Features of the Maputo Bay-Machangulo Complex for globally outstanding importance ("Identifying priority areas | WWF," n.d.).

#	Features
1	Important feeding area for turtles, dugongs and migratory feeding birds (e.g. Whimbrel and Flamingos);
2	Extended marshes and flooded grasslands with endemic fish and plants;
3	Important for Dugong, whales, white and whale sharks;
4	Turtles nesting area (Loggerhead and Leatherback);
5	Northern limit for migration of Southern Right whale;
6	Endemic fishes and unique tube-worm reefs
7	Deep rocky formations dominated by gorgonians.

There has been an influx of Mozambican people back into the area after the civil war ended, and the area became popular amongst international tourists and developers. This resulted in a variety of activities taking place that threaten the conservation status and management actions were required to protect and maintain the natural heritage while responsibly developing the ecotourism industry (DNAC, 2009). The main threats to the area are listed in table 2.12.

Table 2.12 – Critical areas that require management actions (DNAC, 2009).

Threats to the conservation status of the area
1. Ponta Techobanine Port Development
2. Fishing
3. Scuba Diving
4. Use of vessel/Launch site management
5. Dolphin and Whale Watching
6. Shark Diving
7. Jet Skis
8. Coastal Development
9. Community Pressures

The management plan was implemented in mid 2010 and is divided into three Key Performance Areas (KPA) namely, Biophysical, Socioeconomic and Governance, for each there is a list of objectives (Table 2.13). An important objective of the establishment of this reserve is to achieve resource protection through compliance with the declaration of the reserve, its regulations and applicable laws. This should increase the level of success by contributing to resource protection, facilitating fisheries management and reducing user conflicts resulting from the competing uses of the area. Successful compliance is expected to be achieved through community involvement and education, the traditional enforcement operations (e.g. patrols, apprehensions, confiscations and convictions) and signage and brochures (DNAC, 2009).

Table 2.13 – PPMR management plan KPA objectives (DNAC, 2009).

KPA	Objectives
Biophysical	To protection of marine habitats that represent the subtropical coastal zone.
	To protection of overexploited fish stocks, endangered and endemic species.
	To ensure sustainability of marine fisheries.
	To provide opportunities for research and training of managers.
Socioeconomic	To promote non-consumptive ecotourism opportunities.
	Maintenance of high quality ecosystems attractive to quality ecotourism development.
	To improve the understanding of the marine ecosystem by local communities and resource users, for conservation and tourism purposes.
Governance	To reduce conflict between users
	To ensure the development of legal structures for the protection of the MPA's biodiversity.
	To ensure cooperative management and funding.
	To fulfil Mozambique's international commitments to marine protection.

The reserve adopted the spatially restricted mechanism and zoning as a tool, with restricted zones (marine sanctuaries), multiple-use zones, and a buffer zone. It defines permitted activities and prohibitions within specific geographic areas (zones) (DNAC, 2009).

2.6.2 CURRENT STATUS

One of the main marine tourism activities in the PPMR are the dolphin tours (M. Gonçalves, personal communication, April 10, 2018). In these, tourists expect to observe closely and interact in-water with the resident population of bottlenose dolphins in their wild environment.

Dolphin, whale and whale shark activities are regulated (Table 2.14) and have a code of conduct (hereafter referred to as "code") (Table 2.15) that is to be adhered by both commercial boat operators and recreational boaters within the PPMR. The permit holder must operate in accordance with the code, failure to comply with the above carries a fine (DNAC, 2009).

Table 2.14 – Number of permits per relevant areas (Direcção Nacional de areas de Conservacao, 2009).

Area	Number of permitted operators
Ponta do Ouro	2
Ponta Techobanine	1
Santa Maria	1
Inhaca Island	1

Table 2.15 – Code adapted from the PPMR management plan (Direção Nacional de Áreas de Conservação, 2009).

Code of Conduct (CC) for dolphins, whale and whale sharks
No person will chase, herd, catch, kill, harass, feed or disturb marine mammals at any time. Keep a slow, steady speed without changing course. If your vessel is approached by marine mammals to bow ride, refrain from altering course to approach them. Always approach from the side, never from directly behind or from front. Minimize noise disturbance by maintaining a slow, steady speed. Do not approach dolphins/whales with small power craft i.e. jet skis.
Marine mammals have right of way.
Unless authorized, vessels are not to approach marine mammals within 300 meters.
Avoid mother and calf units. Do not enter into the water with

newborns/calves.
Only enter into the water with qualified and authorized personnel.
Keep noise levels to a minimum. No shouting or loud whistling.
A 20-minute viewing time is to be followed. If marine mammals move off within this time, they must be left alone.
Refrain from interference if signs of disturbance are apparent (change of directional swimming, fast 'escape' swimming or extended dive times, erratic directional surfacing).
Fishing – dolphins may not be pursued for capture or attempt to be caught.

Due to a decrease in the quality of the dolphin/human interactions the authorized operators decided that changes were required on the code. The management plan and its regulation was expected to be revised in 2015 (DNAC, 2009). However, structural changes to the responsible government department have led to delays. From September to November 2017 meetings between the stakeholders and the reserve took place followed by stakeholder only meetings that led to a modification of the code. This was implemented under general consensus of all the CBT operators. It aimed to reduce pressure on the animals during the holiday peak seasons by (meeting proceedings, November, 2018):

- Reducing the number of swim attempts per dolphin group to one;
- Reducing the number of groups approached per tour to one;
- Adopting a "No queue" policy – if one boat is engaged with a dolphin group no other boats are to wait, instead boats must move on seeking other dolphin groups.

2.6.3 KEY STAKEHOLDERS AND THEIR PARTICIPATION

Stakeholder groups were incorporated in all phases of the process of design and implementation of the PPMR (DNAC, 2009). Stakeholders include:

- Management agencies – Ministries of Tourism, Fisheries and Transport;
- INAMAR – issues fishing licenses
- Maputo special reserve (MSR) – issues fishing licenses
- Local communities including hotels, restaurants and marine operators
- PPF and World Bank

Mozambique is characterised by a top-down and centralised resource management approach. Local stakeholders were mostly consulted about details such as boundary settings and if a MPA was the appropriate tool. (Rosendo et al., 2011).

Artisanal fishermen communities, marine operators and related seasonal workers that generate revenue directly from the PPMR resources feel that the external management and control does not have their interests at heart and mention communication and trust issues (Lucrezi et al., 2017).

2.7 CETACEAN BASED TOURISM

2.7.1 HISTORY AND EVOLUTION

Marine tourism has rapidly grown throughout the world (Miller et al, 1993) in specific cetacean-based tourism, where tourists seek activities on which they can observe or swim-with dolphins and whales (Zepel & Muloin, 2009; Filby et al, 2015). CBT is known as one of the fastest growing industries in the world (Crosset et al., 2004; Constantine et al., 2004; Christiansen, Lusseau, Stensland, & Berggren, 2010; Filby et al., 2015; Guerra & Dawson, 2016; Pérez-Jorge et al., 2016), with activities in 119 countries, a return of 13 million tourists per year and a value of two million dollars (World Cetacean Alliance | Sustainable Cetacean Tourism," n.d.). This industry can have positive impacts (Table 2.16) (Constantine et al., 2004; Christiansen et al., 2010; Filby et al., 2015) but has proven to cause many negative impacts to the animals (Table 2.17) (Constantine et al., 2004; Allen et al., 2004; Bejder et al., 2006; Christiansen et al., 2010).

Table 2.16 – Positive impacts that CBT can have.

Positive impacts that CBT can have
Promote public support for cetacean conservation issues (Duffus & Dearden, 1993);
Economic benefits to local communities (Hoyt, 2001);
Increase people's knowledge (Zeppel & Muloin, 2009);
Encourage behaviour modification (Orams, 1997).

Table 2.17 – Negative impacts of CBT for the cetaceans.

Short term impacts	Long term impacts
Changes on behavioural budgets (Steck; Christiansen);	Changes in distribution and residency patterns (Lusseau 2005a)
Increase physical demand (Steck; Christiansen);	Decrease of relative abundance (Bejder et al, 2006)
Animals temporarily emigrating to tourism free areas (Perez 2016);	Decrease of female reproductive success (Lusseau 2006)

2.7.2 TOOLS AND MANAGEMENT TECHNIQUES

CBT occurs worldwide with a myriad of regulations, codes of conduct (Code) and guidelines, however there is no international agreement on how to manage this activity. With this in mind many cetacean conservation non-governmental organisations (NGO) have designed guidelines, codes of conduct and accrediting systems to be adopted by their members (HEPCA, n.d.; "Sea Watch Foundation » Marine Code of Conduct," n.d.; World Cetacean Alliance | Sustainable Cetacean Tourism," n.d.). CBT companies operating within the same area have also gathered to voluntarily create and adopt a code (Guerra & Dawson, 2016; Steckenreuter, Möller, & Harcourt, 2012b). Both actions are commendable but are not applicable to recreational boats and lack legislative power (Steckenreuter et al., 2012b) therefore not encompassing all activities responsible for these pressures.

2.7.3 HOW SUSTAINABLE IS CBT?

Often CBT is mislabelled by the tourists or falsely labelled by the businesses as ecotourism. Also known as sustainable tourism, ecotourism can benefit socio-

economic growth (Hassan, Nurlaili, & Syed, 2017). It involves education and interpretation of the natural environment (conservation) and is managed to be ecologically sustainable, minimizing negative impacts (Burgin & Hardiman, 2015; Lopez-Espinosa, 2002; Neill, Barnard, & Lee, n.d.). In order to achieve this status CBT must fulfil a list of achievements (Table 2.18)(Honey, 1999; Lopez-Espinosa, 2002) but often faces problems as described on table 2.19 (Trave, Brunnschweiler, Sheaves, Diedrich, & Barnett, 2017).

To be successful ecotourism must adopt an adaptive management framework (Table 2.20) (Trave et al., 2017).

Table 2.18 – List of ecotourism requirements (Bentz, Lopes, Calado, & Dearden, 2016a; Honey, 1999; Lopez-Espinosa, 2002).

Ecotourism requirements
Travelling to natural destinations;
Minimize negative impacts on the environment and local communities;
Build environmental awareness;
Provide direct benefits for conservation;
Provide financial benefits and empowerment for local population;
Respect local culture.

Table 2.19 – List of most common problems that sustainable tourism encounters (Trave et al., 2017).

Ecotourism most common problems
Lack of proper structure and coordination;
Conflictive and ineffective policies (due to lack of proper scientific knowledge);
Lack of enforcement of set regulations

Table 2.20 – List of the major points that characterise an adaptive management framework (Trave et al., 2017).

#	Description
1	Well organised plan with clearly delineated aims and stakeholders' roles;
2	Development of clear policies and guidelines based on scientific knowledge and on-field observations;
3	Structured and strict enforcement pf rules and involvement of the local government authorities with the education of tourists;
4	Long-term monitoring of the activities to provide information to researchers and stakeholders which is required to upgrade policies and management frames;
5	Increasing ecological awareness, education and involvement of both tourists and operators.

2.7.4 CONSERVATION STATUS OF THE BOTTLENOSE DOLPHIN

The bottlenose dolphins belong to the order *Cetacea,* suborder *Odontoceti* (toothed whales) and family *Delphinidae*. There are two species of bottlenose dolphin, the "Common Bottlenose Dolphin" *Tursiops truncatus* and the "Indian Ocean Bottlenose Dolphin" *Tursiops aduncus* (IUCN, 2000). This study will focus on the second, hereafter referred to as "bottlenose dolphin".

Distribution: According to the IUCN Redlist (2000) the bottlenose dolphin has a discontinuous distribution in the warm temperate to tropical Indo-Pacific, from South Africa in the west, along the rim of the Indian Ocean to the southern half of Japan and southeast Australia in the east. It is also found around oceanic islands that are distant from major land masses within this range (Figure 2.5).

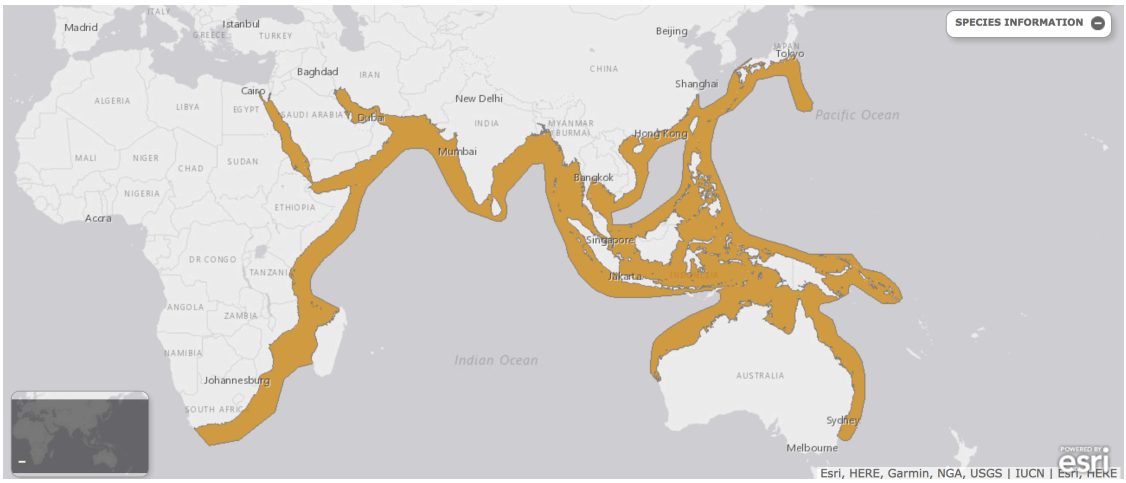


Figure 2.5 – Distribution map of the Indo-Pacific bottlenose dolphin (IUCN, n.d.).

Conservation status & threats: They are categorised as Date Deficient because although the species is widespread in Indo-pacific coastal waters and they probably have an abundance of tens of thousands in many local populations, there is a lack of information on whether habitat destruction and incidental takes could have a significant impact on this species (IUCN, 2000).

In addition to indirect and direct takes, dolphins in coastal areas become exposed to a wide range of threats:

1) chemicals contamination of the water;
2) reduced prey availability caused by environmental degradation and overfishing (Jackson *et al*. 2001);

3) direct and indirect disturbance and harassment (e.g. boat traffic and commercial dolphin watching and interactive programs);
4) marine construction and demolition (e.g. harbour, ports and pipelines);
5) other forms of habitat destruction and degradation (including anthropogenic noise) (IUCN, 2000).

Bottlenose dolphins are known for having a high site fidelity and short home range when found in high quality habitats (Passadore, Möller, Diaz-Aguirre, & Parra, 2018). They live in a fission and fusion society (Vermeulen, 2018) which aims to balance the costs and benefits between living in a group and mating, predation risk, and food availability (Grove, Pearce, & Dunbar, 2012). These pressures are habitat-specific and therefore vary according to the population's location (Connor, Wells, Mann & Read, 2000).
The bottlenose dolphins are a highly targeted species for CBT. Because of their long life expectancy (40 – 50 years)(Constantine et al., 2004) combined with other species specific characteristics (Table 2.21) they are strongly exposed to anthropogenic pressures (Constantine, 2001; Bejder et al., 2006).

Table 2.21 – Characteristics from bottlenose dolphins that cause high exposure to anthropogenic pressures (Lars Bejder et al., 2006; Constantine et al., 2004).

Characteristics
Global distribution
Isolated populations
Resident along the coastline
High site fidelity

2.8 Summary & Conclusion

Recommendations proposed in scientific literature suggest that for smaller and resident dolphin populations, in which the same individuals can be targeted for interaction at a daily basis, the management strategies should be more stringent (Allen et al., 2004; Bejder et al., 2006; Steckenreuter et al., 2012).

3. CHAPTER THREE – METHODOLOGY

3.1 Chapter introduction

This chapter will identify the research methods used for the collection of a data-set required for the development of this project. A detailed explanation of the chosen methodology for each chapter will be provided, and a critical discussion surrounding the advantages and disadvantages of all will be explored. Finally, summary points and conclusions will be drawn with reference to the suitability of each methodology for the data set required.

3.2 Research concepts and methods

In a scientific context research is the entire scientific method, from when a problem, issue or concern arises creating a question that needs and can be answered. A hypothesis is then formulated, data collected and analysed, from which deductions and conclusions can be obtained. Finally these conclusions will be tested against the question or hypothesis (Oppenhiem, 1992; Khotari, 2004)(Figure 3.1).

Figure 3.1 – Research process adapted from Gill & Johnson (1997).

Once the question or hypothesis has been formulated it is time to decide which data collection technique will be used and what type of data will be collected (Kothari, 2004). Table 3.1 describes the two types of data source existent. There are several techniques that can be used to collect primary data (Table 3.2).

Table 3.1 – Application of different data sources (Save The Children, 2014).

Primary Data Sources	Secondary Data Sources
Data that are not pre-existing and are collected by the evaluator using methods such as observations, surveys or interviews	Information that has already been collected, presented and reported out by another researcher/entity
Provides information if existing data on your topic/project is not current or directly applicable to your evaluation questions	Offers an opportunity to review any and all secondary data available for your project before collecting primary data
Can be more expensive and time-consuming, but it enables you to collect data that is specific to the purpose of your evaluation	Will tell you what questions still need to be addressed and what data you should collect yourself

Table 3.2 – Data collection techniques and brief description (Save The Children, 2014).

Technique	Key Facts
Interviews	Can be conducted in person or over the phone
	Can be done formally, semi-structured or unstructured
	Questions should be focused, clear and encourage open-ended responses
	Are mainly qualitative in nature
Questionnaires & Surveys	Responses can be analysed with quantitative methods by assigning numerical values to Likert-type scales
	Results are generally easier (then qualitative) to analyse
	Pre-test/Post-test can be compared and analysed
Observations	Allows for the study of the dynamics of the situation, frequency counts of target behaviours, or other behaviours as indicated by needs of the evaluation
	Good source for providing additional information about a particular group, can use video to provide documentation
	Can produce qualitative and quantitative data
Focus Group	A facilitated group interview with individuals that have something in common
	Gathers information about combined perspectives and opinions
	Responses are often coded into categories and analysed thematically

Ethnography, Oral history & Case Study	Involves studying a single phenomenon
	Examines people in their natural settings
	Uses and combination of techniques such as observations, interviews and surveys
	Ethnography is a more holistic approach to evaluation
	Researcher can become a confounding variable
Documents & Records	Consists of examining existing data in the form of databases, interview minutes, reports, attendance logs, financial records, newsletters, etc
	Inexpensive way to gather information, but may be an incomplete data source

3.3 Study area

Study location – The study will take place in the PPMR, the southernmost MPA of Mozambique (Daly, Fraser, & Snowball, 2015). The reserve has a total coverage of 678km2 and extends (86km) from the northmost point of Inhaca Island (25 55'40.8" S, 33 01'26.4" E), towards Ponta do Ouro (26 51'32.40" S, 32 56'45.50" E) in the south of Mozambique and has an extension of three nautical miles towards the Indian Ocean. It shares a border with South Africa's iSimangaliso World Heritage Site (Figure 3.2)(Daly et al., 2015; DNAC, 2009; Rocha, Stromvoll, & Gullan, 2017).

PPMR is based in the small and remote village of Ponta do Ouro. The area has been suffering from a series of pressures such as unregulated coastal development, pollution, littering (in particular plastics), overfishing (Lucrezi & Saayman, 2017) as well as an increased amount of leisure and commercial vessel traffic (pers.comm Goncalves 2018).

Figure 3.2 – Map of the PPMR (Direcção Nacional de areas de Conservacao, 2009).

3.4 DOLPHIN DATA SET

3.4.1 SUBJECT OF STUDY

The subject of study for this research is a bottlenose dolphin coastal population (*Tursiops aduncus*) that displays residency patterns in the PPMR (Rocha, 2013). This population's characteristics/distribution within the PPMR grounds meets the criteria required to classify the PPMR as a key cetacean habitat and a special area of conservation (SAC) (Canese et al., 2006; La Manna, Ronchetti, & Sarà, 2016):

- Continuous or regular presence of the species (Pulcini, Fortuna, Manna, Triossi, & Pace, 2009);
- Good population density is relation to neighbouring areas (Pulcini et al., 2009);
- High ratio of juveniles to adults all year round (Pace, Pulcini, & Triossi, 2003).

3.4.2 SELECTION OF THE RESEARCH METHODOLOGY

In order to analyse the impacts vessel traffic has on a wild dolphin population the research technique of observation is the most appropriate. Based on table 3.1 the data collected would be considered primary as it was collected by this evaluator, and later on by volunteers trained by the evaluator and, the data has not been reported or analysed by other researchers.

3.4.3 RESEARCH APPROACH AND RATIONALE

The observation method allows direct access to the research object, provides high levels of flexibility for application and generates a permanent record to be accessed later. However, it is time consuming, there are high levels of observer bias, and the observer can influence the dolphin population's behaviour by being present ("Observation - Research-Methodology," n.d.).

3.4.4 FIELD DATA COLLECTION PROCEDURE

The data was collected from a commercial tour operator boat (DERC) during dolphin swim/observation trips. The operator used a semi-rigid inflatable boat with capacity for 16 people (including crew) and two four stroke Suzuki engines.

The same platform has been used in similar projects (La Manna et al., 2016; Martinez, Orams, & Stockin, 2010; Meissner et al., 2015).

The survey was opportunistic and observation effort varied as it was limited to favourable environmental conditions (rain, Beaufort scale state, fog/mist, wave size) and minimum economic requirements (minimum of 6 paying customers to cover overall expenses of the trip). These are common limitations faced by other researchers when working at sea and with commercial tours (Martinez et al., 2010; Meissner et al., 2015).

The collection period was from January 2008 to May 2018. Due to the amount of data obtained only the months displayed in table 3.3 will be used for analysis.

Table 3.3 – Timeframe of the data used for analysis.

	2008	2013	2017	2018
January	X	X	X	X
February	X	X	X	X
March	X	X	X	X
April	X	X	X	X
May	X	X	X	X
June	X	X	X	
July	X	X	X	
August	X	X	X	
September	X	X	X	
October	X	X	X	
November	X	X	X	
December	X	X	X	

The PPMR has dedicated launch sites areas (there are no harbours, ports or any man-made structure). DERC launches from the Ponta do Ouro launch site, it then follows a standard protocol of driving along the coast, approximately 500meters behind backline (area where waves break when approaching the coast). The boat will initially head south towards the border with South Africa (1,5km from the launch site) looking for the animals, if none are encountered the boat will then proceed north for a maximum length of 15km that encompasses

three bays (Ponta do Ouro, Ponta Malongane and Ponta Madejenine) all within the multiple-use zone of PPMR (Figure 3.2).

Dolphin Observation

A dolphin sighting was defined as an observation of one or a group of dolphins. A group was defined as two or more dolphins observed in apparent association, moving mostly in the same direction and engaged in the same activity (Shane, 1990), and where no individual was further than ten meters from the nearest dolphin (Smolker, Richards, Connor, & Pepper, 1992).

Once a group of dolphins was sighted temporal and spatial data was collected. Spatial data was collected based on an alphabetical categorisation of the survey area, a map of the area overlaid with the “Area name” (Figure 3.3). The behaviour and associated data of the dolphin groups was collected once they were sighted and at the end of each observation. Behavioural status was determined and recorded by focal-group scan sample (Altmann, 1974). The behavioural states where determined according to the definitions described in table 3.4.

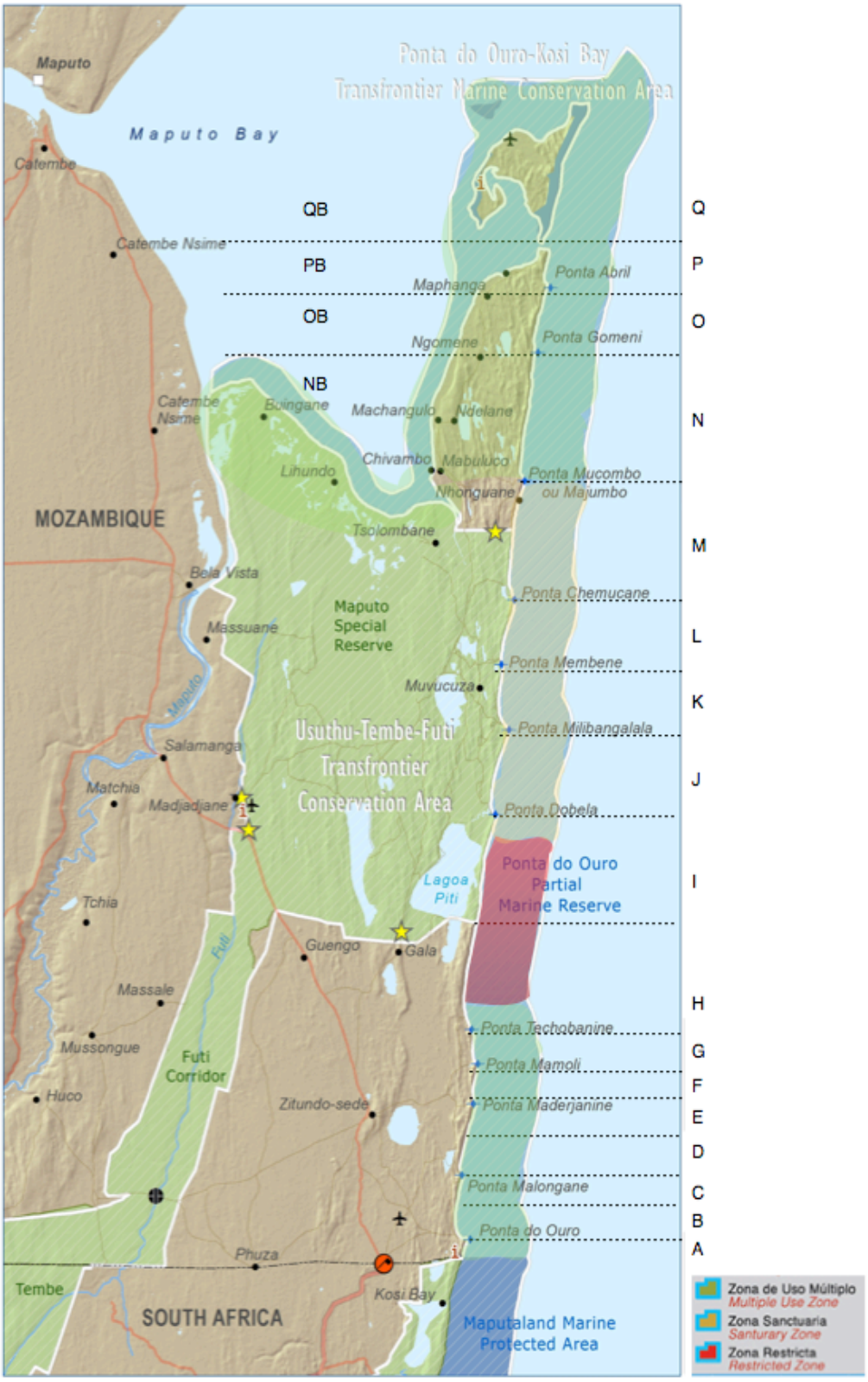


Figure 3.3 - Map with the categorised areas of survey (Rocha, 2013).

Table 3.4 – Definitions of behavioural states used in this study (Constantine, 2001; D. Lusseau, 2003; Shane, Wells, & Würsig, 1986; Steckenreuter, Möller, & Harcourt, 2012a; Stensland & Berggren, 2007; Stockin, Lusseau, Binedell, Wiseman, & Orams, 2008).

Behavioural state	Definition
Foraging	Dolphin involved in any effort to pursue, capture and/or consume prey, as defined by observations of fish chasing (herding), co-ordinated deep and/or long-diving and rapid circle swimming. Prey can often be observed at the surface. Many non-coordinated re-entry leaps, fast changes in direction and long dives.
Milling	Non-directional movement, frequent changes in bearing which prevent animals from heading in a specific direction. Different individuals can head in different directions at the same time within a group, but they keep together.
Resting	Tight group cohesion, less than one body length apart. Slow manoeuvres with little evidence of forward propulsion. Slow and often synchronous surfacing.
Socialising	Diverse interactive events among group members (social rub, aggressiveness, chasing, mating and other physical contact). Aerial behaviours such as breaching.
Travelling	Noticeable headway on a persistent direction and constant speed. Usually faster than the idle speed of boat. Group has constant and short dive intervals.
Avoiding	Changing their path of travel away from the swimmers and boats, or dive and surface away from them.

Swim Classification

Swimming with the dolphin was dependent on the animal's behavioural state, location and environmental conditions (for both safety of humans and dolphins). There are several strategies to approach a dolphin group (Figure 3.4) and to place the swimmers in the water (Table 3.5). DERC would use the "line abreast" (parallel approach) for observation and once the swimmers were ready to get in the water the approach would change to "in path" (J approach). In this case the

boat would drive 100 to 150 meters ahead of the dolphin group and drop the clients in their path, giving the swimmers time to acclimatize and the dolphin time to decide whether they wished to avoid and engage with the humans. These dolphin approach and swimmer placement strategies are widely used (Constantine, 2001; Martinez et al., 2010; Scarpaci, Dayanthi, & Corkeron, 2003; Scarpaci, Nugegoda, & Corkeron, 2004) with exception to free swimming with the animals, most operators use mermaid lines or boom-nets (Lück, 2016).

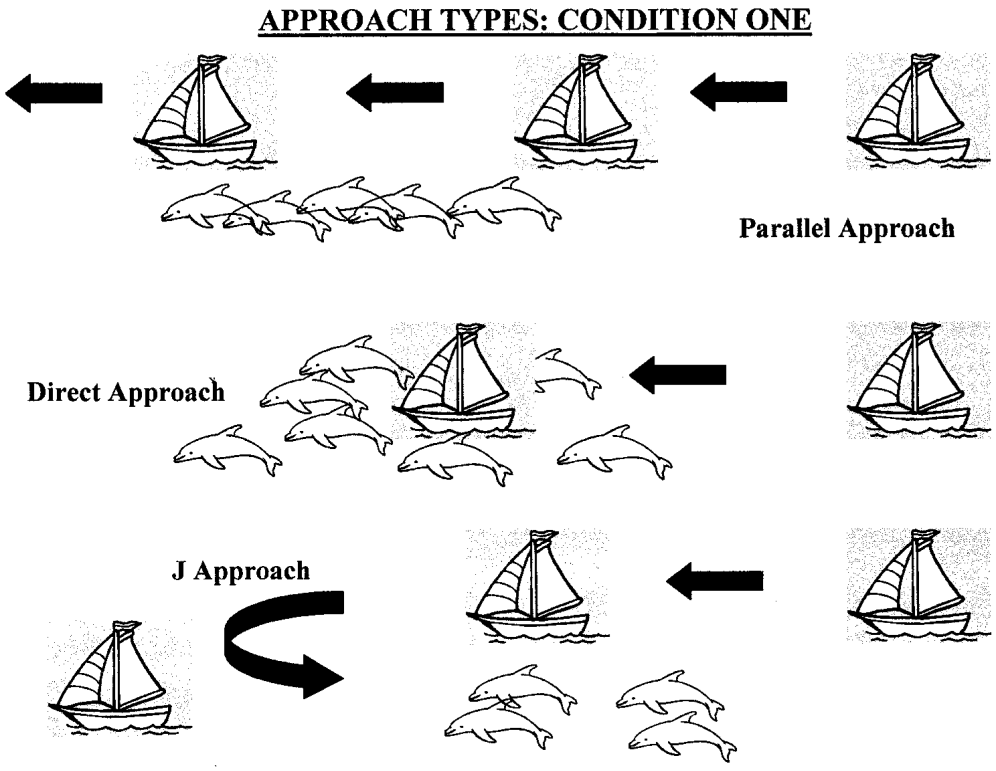


Figure 3.4 – Different approach types used by operators (Scarpaci et al., 2003).

Table 3.5 – Strategies to place swimmers in the water with dolphins (Constantine, 2001; Martinez et al., 2010).

Strategy name	Description
Line abreast (parallel approach)	Swimmers enter the water to the side and slightly ahead of the dolphin group;
In path	Swimmers are placed in the dolphin's path of travel;
Around the vessel	Dolphins are milling around the wake of the stationary vessel when swimmers enter the water.

The group-follows (observation) ended when the dolphin group disappeared or presented an avoiding behaviour, when weather conditions prevented (Christiansen et al., 2010) or when the 20min observation time was reached

(according to the code of conduct). Temporal and spatial data was collected at log-out of the group observation and a class would be allocated to each swim according to the time spent in water with the dolphins and their level of interaction (Tale 3.6). The boat would then proceed further north to find more groups or return to the launch-site, this would depend on the state of the clients (sea sickness and cold) and the time left before the next dolphin trip.
In the event of no sightings during a trip the effort was still recorded by the time spent driving and extent of area covered.

Table 3.6 – Swim classification according to human/dolphin interaction. Similar classifications have been used (Martinez et al., 2010).

Class	Description
A	20min or more interaction
B	10 to 20min interaction
C	<10min interaction
D	Dolphins pass through, no interaction
E	No drop
F	No sighting under water

3.4.5 DATA ANALYSIS

The data will be presented through a descriptive statistical analysis, describing basic features of the data set and summarizing variables through tables, charts and graphs (O'Leary, 2012).
This will be obtained through univariate and bivariate analysis, comparing one variable or establishing relationships between two variables (Bryman & Bell, 2011).
The variables in analysis are:

1. Changes to dolphin behavioral states (Table 3.4) – to determine if there is a change in the behavioral state when the tour boats approach a dolphin group;
2. Changes to dolphin travelling direction – to determine if boats are directly interfering with the dolphin's activity budget;
3. Swim classification (Table 3.6) – to determine if the quality of the human/dolphin interactions has changed;

4. Boat traffic variations during seasonal and non-seasonal periods – to analyze the volume of traffic and find possible correlations with behavioral changes, distribution or swim classification.

The analysis of changes in the behavioral states and impacts to the overall activity budget of the dolphins has been used is various studies (Christiansen et al., 2010; Martinez et al., 2010; Meissner et al., 2015; Steckenreuter et al., 2012b).
The dolphins response to swimmers (swim classification) is similar to that adopted in similar studies (Constantine, 2001; Martinez et al., 2010).

3.5 CBT PARTICIPANTS AND COMMERCIAL OPERATORS - QUESTIONNAIRE SURVEY (QUANTITATIVE DATA)

The second segment (Chapters five and six) is the perception that commercial marine operators and swim-with-dolphin tourists have of the CBT activities, the legislation and impacts.

3.5.1 SELECTION OF RESEARCH METHODOLOGY

The chosen method is a survey. These are systems that gather information to describe or compare attitudes, knowledge or behaviours (Fink, 2003) they are appropriate when your research questions are better answered by the people themselves (Taylor-Poweel, 2000). The two main forms of administering a survey are interviews and questionnaires (Ackroyd, S. Hughes, 1881)(Table 3.7).

Table 3.7 – Best application for questionnaire and interview surveys (Trochim, 2006).

Issue	Questionnaire			Interview	
	Group	Mail	Drop-off	Personal	Phone
Are visual presentations possible?	Yes	Yes	Yes	Yes	No
Are long response categories possible?	Yes	Yes	Yes	???	No
Is privacy a feature?	No	Yes	No	Yes	???

Is the method flexible?	No	No	No	Yes	Yes
Are open-ended questions feasible?	No	No	No	Yes	Yes
Is reading and writing needed?	???	Yes	Yes	No	No
Can you judge quality of response?	Yes	No	???	Yes	???
Are high response rates likely?	Yes	No	Yes	Yes	No
Can you explain study in person?	Yes	No	Yes	Yes	???
Is it low cost?	Yes	Yes	No	No	No
Are staff and facilities need's low?	Yes	Yes	No	No	No
Does it give access to disperse samples?	No	Yes	No	No	No
Does respondent have time to formulate answers?	No	Yes	Yes	No	No
Is there personal contact?	Yes	No	Yes	Yes	No
Is a long survey feasible?	No	No	No	Yes	No
Is there quick turnaround?	No	Yes	No	No	Yes

For the operators and tourists the preferred method is a questionnaire survey filled in by the participant (hand out survey). These are scientific instruments for measurement and collection of a type of data (Oppenheim, 1992) that can be used for the collection of data in a short timeframe (Creswell & Tashakkori, 2007). Table 3.8 lists the advantages and disadvantages of this method.

Table 3.8 – Advantages and disadvantages of questionnaire surveys. (Popper, 1959).

Advantages	Disadvantages
Practical	Lacks validity
Large amount of information from big sample in short time	Can't tell how truthful respondent is replying
Can be carried out by any number of people without affecting validity and reliability	Due to the short time to reply the respondent can be forgetful and lack perspective

Quickly and easily quantified results	Questions are subject to different interpretations and level of subjectivity
Can be analysed more objectively then other methods	Researcher may impose an opinion when developing the questionnaire
Can be used for future comparison and to measure changes/trends	Inadequate to understand some information, such as changes of emotions and feelings

3.5.2 RESEARCH APPROACH AN RATIONALE

There are many administering options but considering the characteristics of study area, a postal, telephone, mail or e-survey would be ineffective due to weak network services and inexistent postal service. The remaining option is the street survey, where a brief face-to-face interview occurs, and the interviewer both, asks and records the answers (Oppenheim, 1992; Trochim, 2006).

The questions can be open ended or closed, the first being difficult to analyse and often avoided in questionnaires (Khotari, 2004) they also require a coding system to categorise people´s answers and opinions (Cerritos College - Office of Research and Planning, 2013). Closed questions, are therefore more appropriate but also have limitations, being that participants may be forced to an answer for lack of options and can't justify or qualify their choices (Khotari, 2004), because the answers are dichotomous, multiple-choice or LIKERT scale type (Broekhoven, 2010).

3.5.3 QUESTIONNAIRE DESIGN

Two different questionnaires were designed for the two sample studies (operators and tourists). They were each specifically designed to accommodate the particular aims of the study for each sample group (Bryman, Becker, & Sempik, 2008). The designing followed a standard procedure (Figure 3.5).

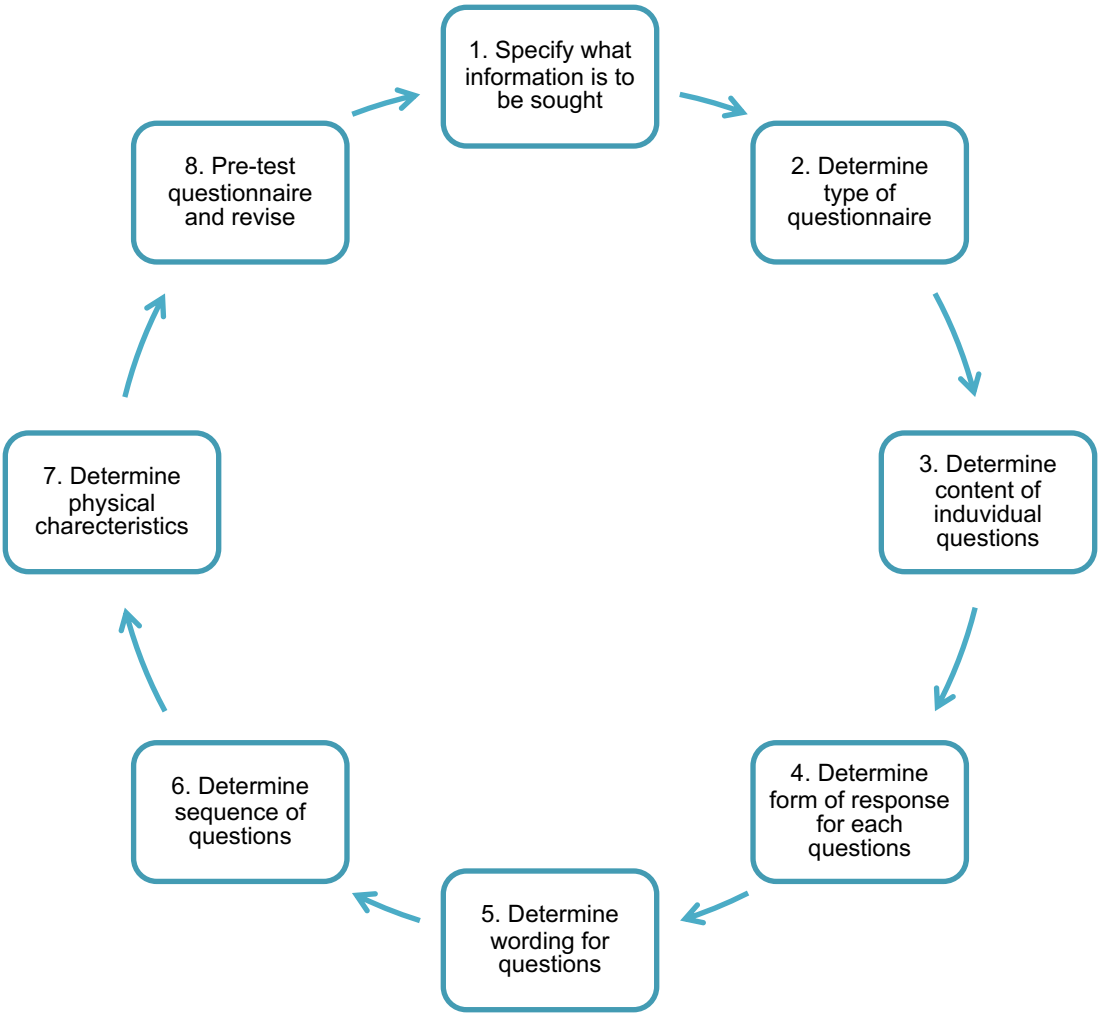


Figure 3.5 – Standard procedure for developing questionnaire (Churchill, 1999).

A good questionnaire must be short as simple, questions must follow a logical sequence, avoiding technical terms and vague expressions that can be differently interpreted, and more personal questions must be left to the end (final section) (Kothari, 2004).

3.5.3.1 Questionnaire applied to CBT participants:

The questionnaire can be found in APPENDIX C. It begins with an introductory paragraph to explain the research, the importance of the subject´s collaboration, ethics and privacy policy, and instructions for the completion of the questionnaire (Gray, 2004). Followed by four sections compiled into three pages (Table 3.9). Each section represents a category of information required to accomplish the aims of the study, practice used in similar studies (Ballantyne, Packer, & Falk,

2011; Bentz et al., 2016a; Draheim, Bonnelly, Bloom, Rose, & Parsons, 2010; Lück, 2015).

No identification information was obtained from the respondents to keep their confidentiality (Draheim et al., 2010).

Table 3.9 – Structure of the questionnaire applied to swim-with-dolphin activity participants.

Section	Contents
1 – Reason for visiting	Close ended questions to determine the implications behind visiting the MPA, such as if they were frequent visitors or if they would revisit.
2 – Marine conservation perception and attitudes	Knowledge of the MPA and the implications to marine activities. (Close-ended and five point Likert scale format).
3 – Dolphin swim activity perception and attitudes	Previous experiences, awareness of local CoC, what is most valued of the experience and post-experience attitudes. (Close-ended and five point Likert scale format).
4 – Respondent details – demographic	Brief section with age, gender and nationality. (Close-ended and open-ended questions).

Sample group

The sample study is an important variable of the research, if the questionnaire is not applied to a correct sample, of the sub-group of tourists that undertake swim-with-dolphin activities, the findings can't be generalised to the whole sub-group. Sample accuracy is more important than sample size, if all respondents have the same academic background, age group or social environment for example, the findings might be biased by an uneven sampling (Oppenheim, 1992). Table 3.10 presents the target groups for each survey.

Table 3.10 – Target group for each survey.

Data type	Survey type	Target group
Quantitative	Hand out questionnaire with close-ended questions (Likert-type scale).	Marine operators – The Whaler, Scuba Adventures, Oceana, Gozo Azul, Back 2 Basics, Blowing Bubbles, The Dolphin Centre, DERC, Halo Gaia & Malongane Dive Centre.
Quantitative	Hand out questionnaire with close-ended questions (Likert-type scale).	CBT participants from three companies – DERC, Halo Gaia, The Dolphin Centre.

Data collection procedures

Three dolphin activity centres from a total of four were used as platforms (Table 3.9). The exclusion of the fourth centre is due to the isolated location and very small and selective group of participants.

The survey was conducted from March 2018 to July 2018, to include the Easter summer holidays as well as June and July winter school holidays, when more tourists are present.

Respondents were selected opportunistically as they returned from the activity and questionnaires were filled in on-site (Ballantyne, Packer, & Hughes, 2009; Draheim et al., 2010; Lück, 2015) to assure that every respondent was an activity participant, and because most repondents are tourists on holiday, making it difficult to reach them at a later stage. This also provides immediate feedback and reduces costs and time (Taylor-Powell & Hermann, 2000).

The survey was presented by a crew member of each member, by being present the person administrating the survey could personally request the respondent's attention and explain the purpose of the survey, guaranteeing higher return rates of fully completed questionnaires, and consequently promoting confidence in the results (Taylor-Powell & Hermann, 2000).

3.5.3.2 Questionnaire applied to commercial marine operators

The process and justifications behind the designing of this questionnaire are similar to of the swim-with-dolphin participants explained in 3.4.4.1.

The questionnaire can be found in APPENDIX D and the specific sections and divisions are explained in table 3.11.

In order to keep the questionnaire concise and fitting in two pages, no demographic information was captured, however there recent studies made with the same sample group from which this data can be sourced (Daly et al., 2015; Lucrezi & Saayman, 2017).

Table 3.11 – Structure of the questionnaire applied to commercial marine operators.

Section	Contents
1 – Job description	Close ended questions to determine area and frequency of engagement with PPMR and clients;
2.A – Marine conservation – PPMR	Knowledge of the MPA and the implications to marine activities. (Close-ended and five point Likert scale format);
2.B – Marine conservation – Marine mammal code of conduct	Knowledge and attitudes towards CoC (Close-ended and five point Likert scale format);
2.C – Marine conservation – contribution towards PPMR	Determining attitudes and level of engagement with marine conservation within the PPMR.

Sample group

The PPMR offices provided a list of all operators within the Ponta do Ouro and Ponta Malongane bays. These two bays represent the majority of commercial operations within the reserve therefore providing good representativeness of the PPMR. Nine out of ten companies participated in the survey. The un-surveyed company is a one-man fishing tour operation that was not present during the surveying period.

Data collection procedures

The survey was administered from the 15th to the 30th of April.

Forms were distributed per each company according to the number of crew members related to marine activities that each company had. This information was provided by each company.

The forms were either completed on-site with the surveyor or the respondent would complete it individually and return afterwards.

The use of questionnaire survey methods has been used in other stakeholder's perceptions surveys related to marine conservation and in specific marine protected areas (D. L. Gray, Canessa, Rollins, Dearden, & Keller, 2010; Hastings & Ryan, 2017; Lester et al., 2017; Mifsud & Verret, 2015).

3.5.4 PILOT STUDY

A pilot survey is a rehearsal of the main survey to detect weaknesses and improve outputs. It is always advisable to conduct a pitlot study with a smaller sample group (Kothari, 2004). A pilot group sample of 15 people from the Ponta do Ouro village commercial marine operators community undertook the test survey. All feedback was taken into consideration and the necessary changes (changes in wording) were made to improve response rates and reduce bias.

3.5.5 DATA PROCESSING

The data will be presented through a descriptive statistical analysis, describing basic features of the data set and summarizing variables through tables, charts and graphs (O'Leary, 2012).

Within this field of academic research this type of analysis is considered to be justified and no statistical significance testing is required. Due to the response types being categorical, non-continuous data it becomes inappropriate for more basic linear regression (Jonhson, 1999).

This will be obtained through univariate and bivariate analysis, comparing one variable or establishing relationships between two variables (Bryman & Bell, 2011).

3.5 GOVERNMENT REPRESENTATIVES – SEMI-STRUCTURED INTERVIEWS (QUALITATIVE DATA)

An interview can be described as “a verbal exchange of information between two or more people for the principal purpose of one gathering information from the other” (p. 126)(Lampard & Pole, 2016).

3.5.1 SELECTION OF RESEARCH METHODOLOGY

For the local government representatives personal semi-structured interviews are the most suitable method.

3.5.2 RESEARCH APPROACH AND RATIONALE

Interviews are usually used when highly personalised data is required, a good return rate is important and there are opportunities required for probing.

A personal interview with a semi structured set of questions is often used to obtain qualitative data (D. E. Gray, 2004). It allows a topic to be explored in more depth which can possibly provide new concepts giving more meaning or context into the subject (Britten, 1995). It is also more flexible and adaptable to different research situations and the correct interpretations of the questions are assured by the interviewer's presence. However, this method also has disadvantages, the data can be influenced by how the interview is conducted and there is no anonymity which can lead to biased responses, in specific to sensitive subjects. They are also time consuming and have a low turn-over of data. (Oppenheim, 1992).

3.5.3 SEMI-STRUCTURED INTERVIEW

There are five interview approaches namely, structured, semi-structured, non-directive, focused and informal conversational interviews (D. E. Gray, 2004).

In a semi-structured interview, the interviewer has a set of issues or questions to be covered but doesn't necessarily need to follow an order. Some questions might not be asked while news ones can be added, depending on the direction the interview takes (D. E. Gray, 2004).

For the purpose of this study a set of eight questions/ideas was drafted to be discussed with four local government representatives that have direct involvement with the local marine environment. These questions were previously sent to avoid forgetfulness or incomplete and short answers (Kothari, 2004; Taylor-Powell & Hermann, 2000).

The interviewees were selected based on their experience, representativeness and knowledge about policies, objectives and programmes within the institutions their represented (Lopez-Espinosa, 2002) as well as the management of the PPMR. The respondents were the manager of the PPMR, the chief patrol officer of the PPMR, the local chief for the Ponta do Ouro village and the Ponta do Ouro maritime officer for INAMAR.

Interviews with stakeholders often take place to complement the information obtained through questionnaire surveys (Bentz, Lopes, Calado, & Dearden, 2016b; Lopez-Espinosa, 2002; Lucrezi & Saayman, 2017; Parsons & Woods-Ballard, 2003).

3.5.4 INTERVIEW BIAS

When an interview is standardized with a set list of questions and ideas to follow the risk of bias reduces but there is still the interviewer bias, how the person makes the questions to each different interviewee can alter the results and perceptions. Interviewer bias can occur in many ways (Table 3.12). To avoid bias a set protocol can be followed (D. E. Gray, 2004).

Due to all interviewees being of high rank positions within a small community, it was not possible to keep the identities anonymous.

The interviewer endeavoured to word all questions carefully and not demonstrate feelings or impose ideals, allowing the respondent to express its own opinions freely.

Table 3.12 – Interviewer bias occurrences (Oppenheim, 1992).

Ways in which bias can occur
Departures from the interviewing instructions
Poor maintenance of rapport with the respondent
Altering factual questions
Rephrasing of attitude questions
Careless prompting
Biased probs
Asking questions out of sequence
Biased recording of verbatim answers

3.6 SUMMARY & CONCLUSION

This chapter has outlined the most appropriate research methods to successfully achieve the aims and objectives of this study. The study will take a mixed method approach collecting quantitative and qualitative data through observations, questionnaires and interviews. The data will be arranged into three segments.

Due to a short timeframe to obtain as much data as possible and the information required being mostly from the tourist´s knowledge and attitudes, a hand out survey with closed questions would be the appropriate approach (Taylor-Powell, 2000).

Several studies on human´s perception or attitudes towards marine regulations have used questionnaires as their preferred technique (Petrosillo, et al, 2007; van Brokboeven, 2010; Trenouth et al, 2012; Hassan, 2017).

The importance of correct sampling and execution of a pilot study must not be diminished as these would avoid future problems and assure reliability and validity of the findings (Oppenheim, 1992; Bryman, 2016).

Survey questionnaires would then be the chosen technique for this project as it would describe in numbers the perception that tourists have of CBT activity regulations (Fink, 2003; D. E. Gray, 2004) through a practical and reliable technique.

4. RESULTS – DOLPHIN DATA SET

4.1 Chapter introduction

Chapter Four presents the key findings of the observation of the resident population of bottlenose dolphins. Beginning with an overview of the results, highlighting essential information which can be drawn from the study. Following this, results are given for the analysis of swim classification, the comparison of sighting locations, the behavioural changes (avoidance and resting) that occur during anthropogenic interaction and an overall vessel traffic analysis.

Results will, along the process, be compared to those of similar research studies.

4.2 Sampling effort

Data collection was conducted from January 2008 to May 2018. Due to the great quantity of data and considering the purpose of this study only the data collected in the years of 2008, 2012, 2017 and January to May 2018 will be considered. These years were chosen based on management changes that had direct affect over CBT in the area:

2008 – A second CBT operator became active, followed by all commercial marine operators in the area to start offering dolphin tours. Until then only one operator with one boat offered dolphin tours, under a code of conduct.

2012 – PPMR's management plan was established in mid 2010 reducing the number of CBT permits to four. In 2011 all unauthorized operators were asked to stop dolphin tours. At the same time the four remaining operators started following the code. The analysis of year 2012 allows for an adjustment period.

2017 & 2018 – Actual time.

The following tables (4.1 to 4.4) present the sampling effort for the above-mentioned years. Remembering that all data was collected onboard a commercial dolphin swim tour boat and therefore effort was not equal for each year. The tables present monthly rates for bottlenose dolphin sightings, number of launches, effort and focal follow in hours.

A total of 995 surveys resulted in encounters with 1202 groups of dolphins resulting in an average of 1,2 groups of dolphins sighted per survey.

Table 4.1 – Sampling effort for 2008.

MONTH	Sighting #	Launch #	Effort (hr)	FF (hrs)
Jan-08	41	36	54	14.7
Feb-08	27	31	46.5	9.4
Mar-08	53	44	66	20.3
Apr-08	50	42	63	18.8
May-08	54	32	48	23.1
Jun-08	39	27	40.5	15.5
Jul-08	46	30	45	20.5
Aug-08	57	27	40.5	17.9
Sep-08	38	27	40.5	12.9
Oct-08	44	32	48	16.4
Nov-08	24	17	25.5	10.3
Dec-08	82	53	79.5	25.8
TOTAL	**555**	**398**	**597**	**205.4**

Table 4.2 – Sampling effort for 2013.

MONTH	Sighting #	Launch #	Effort (hr)	FF (hrs)
Jan-13	34	29	33.6	13.4
Feb-13	26	26	30.2	8.7
Mar-13	43	30	34.8	15.1
Apr-13	19	16	18.6	5.2
May-13	9	9	10.4	3.4
Jun-13	21	17	19.7	5.6
Jul-13	32	33	38.3	8.0
Aug-13	22	23	26.7	7.4
Sep-13	8	18	20.9	3.6
Oct-13	14	17	19.72	5.6
Nov-13	11	10	11.6	4.3
Dec-13	44	31	36	13.5
TOTAL	**283**	**259**	**300.52**	**93.8**

Table 4.3 – Sampling effort for 2017.

MONTH	Sighting #	Launch #	Effort (hr)	FF (hrs)
Jan-17	22	20	22.0	5.9
Feb-17	31	21	36.3	7.4
Mar-17	21	13	18.1	5.5
Apr-17	30	36	45.1	8.1
May-17	12	14	16.9	2.9
Jun-17	10	7	11.6	3.5
Jul-17	21	22	23.7	4.3
Aug-17	23	21	23.9	7.0
Sep-17	16	18	20.5	4.3
Oct-17	20	22	25.0	6.0
Nov-17	14	10	13.7	3.7
Dec-17	41	31	48.7	11.7
TOTAL	**261**	**235**	**305.4**	**70.3**

Table 4.4 – Sampling effort for 2008.

MONTH	Sighting #	Launch #	Effort (hr)	FF (hrs)
Jan-18	26	26	30.5	7.9
Feb-18	8	8	8.8	3.6
Mar-18	20	20	26.7	6.4
Apr-18	33	33	40.5	11.2
May-18	16	16	16.0	5.2
TOTAL	**103**	**103**	**122.4**	**34.2**

4.3 Swim Classification

Dolphin response to swim attempts by human was analysed under the classification explained in table 3.6 from the methodology sub-chapter 3.3.4.

The charts presented in figures 4.1 to 4.4 indicate the percentages of the swims per class for each month of the years 2008, 2013, 2017 and 2018.

In 2008 the percentage of swim class “A” (dark blue) was higher throughout the year, then on any of the compared years. The months of November and December had lower percentages possibly because it corresponds with the calving season as well as peak tourism season. A decrease in swim quality during peak season times has been proposed in other studies (Constantine,

2001; Lundquist, Gemmell, Würsig, & Markowitz, 2013; Martinez et al., 2010; Nichols, Stone, Hutt, Brown, & Yoshinaga, 2001) changes due to calving season and an increase of calves in the population were also suggested (Nichols et al., 2001).

Over the years an increase of class "C" and "D" swims was observed. A possible explanation is the increase of CBT operators and vessel traffic in general, resulting in behavioural changes and possible reduced tolerance to CBT (Constantine, 2001; Constantine et al., 2004; Meissner et al., 2015).

The variation of vessel traffic from the Ponta do Ouro bay is presented in sub-chapter 4.6.

The years of 2017 and 2018 show an increase of Class "B" swims, this could be a result of the reduction of operators offering dolphin tours, resulting in less boats directly approaching the dolphins. The adoption of the PPMR's code of conduct by all authorized operators also reduced stress on the animals (exposure time, swim time, approach type etc) contributing to an increase of quality in human/dolphin interactions. As participants become more interested by the educational and conservation segments of CBT the implementation and compliance with a code of conduct has become an effective tool to protect the animals' wellbeing (Filby et al., 2015; Lück, 2015).

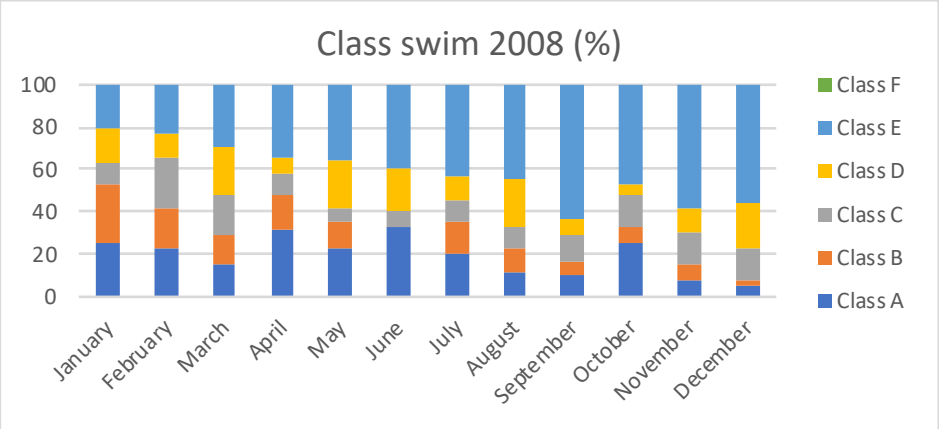


Figure 4.1 – Chart with the percentages of swims per class per month (2008).

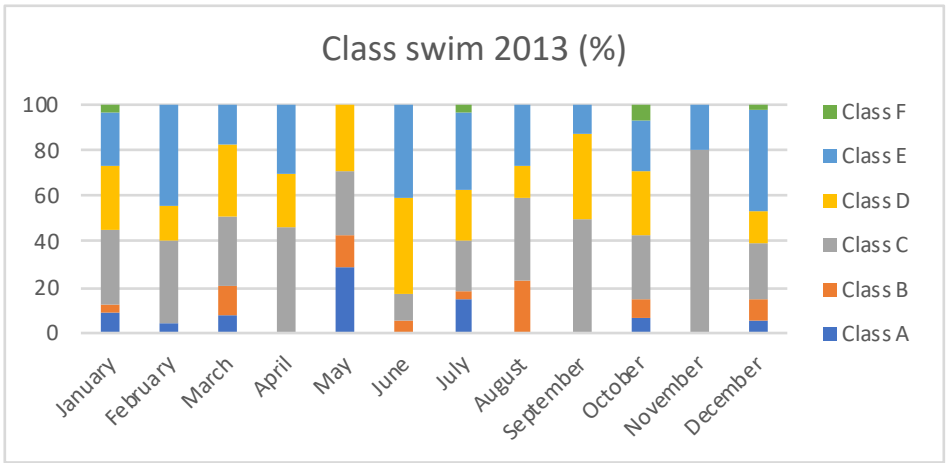


Figure 4.2 – Chart with the percentages of swims per class per month (2013).

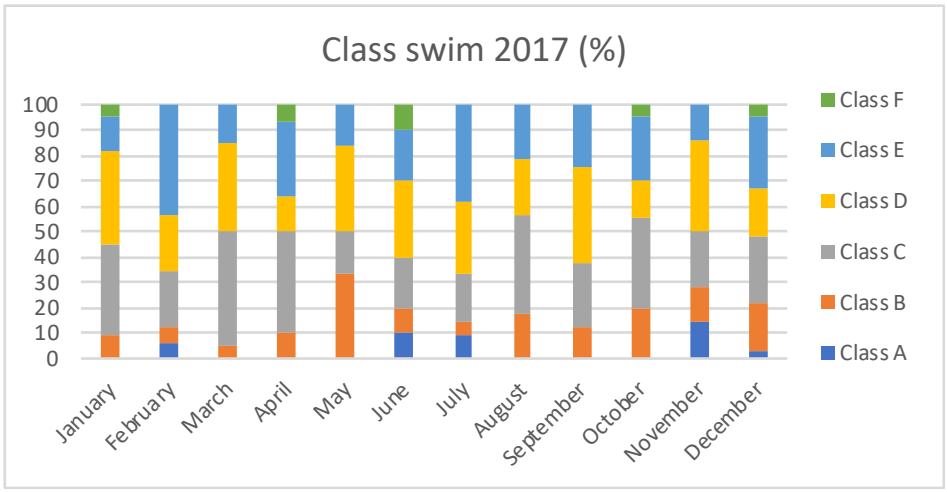


Figure 4.3 – Chart with the percentages of swims per class per month (2017).

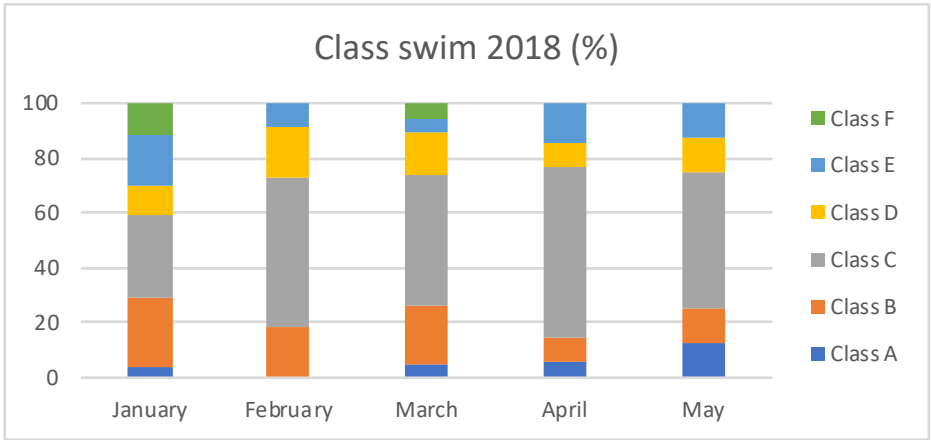


Figure 4.4 – Chart with the percentages of swims per class per month (2018).

4.4 Sighting comparison

For every dolphin group sighting an area was allocated. The areas extend from the South African border (Area “A”) to the beginning to the marine sanctuary (No-take zone) (Area “H”). An explanation of the area categorisation and image of the map can be found in sub-chapter 3.3.4 of the methodology.

All graphs show that areas “C” (grey colour) and “D” (yellow colour) have the highest percentages, indicating that most dolphins were located in the Ponta do Ouro and Ponta Malongane bays. The high number of sightings in these areas could indicate that this could be a critical habitat core area for the dolphin’s population. According to Hoyt (2012) a critical habitat is an area regularly used by a cetacean population to perform day-to-day tasks essential for their well-being, survival and to maintain a healthy population growth rate.

The constant increase of vessel traffic in these areas could be very detrimental to the population’s health. Many studies indicate that boats are a primary source of disturbance (La Manna et al., 2016; Lemon, Lynch, Cato, & Harcourt, 2006; Marega-Imamura et al., 2018; Nowacek, Wells, & Solow, 2001) that could result in changes in their activity budget (Lars Bejder et al., 2006; Christiansen et al., 2010; E. Pirotta, Thompson, Cheney, Donovan, & Lusseau, 2015) or moving of the area (La Manna et al., 2016; Pérez-Jorge et al., 2016).

However, some studies have also proved that the animals may choose not to flee and instead tolerate the disturbance by adjusting their activity budget (L. Bejder, Samuels, Whitehead, Finn, & Allen, 2009; Steckenreuter et al., 2012b).

The survey extent was dependent on the commercial dolphin launch extent which although it has a limit it does not necessarily reach said limit on every trip. Because there isn’t a limit on “dolphin groups observed per trip” even if a group was located in areas “A” or “B” the trip can continue surveying further north therefore, not limiting the extent of the survey.

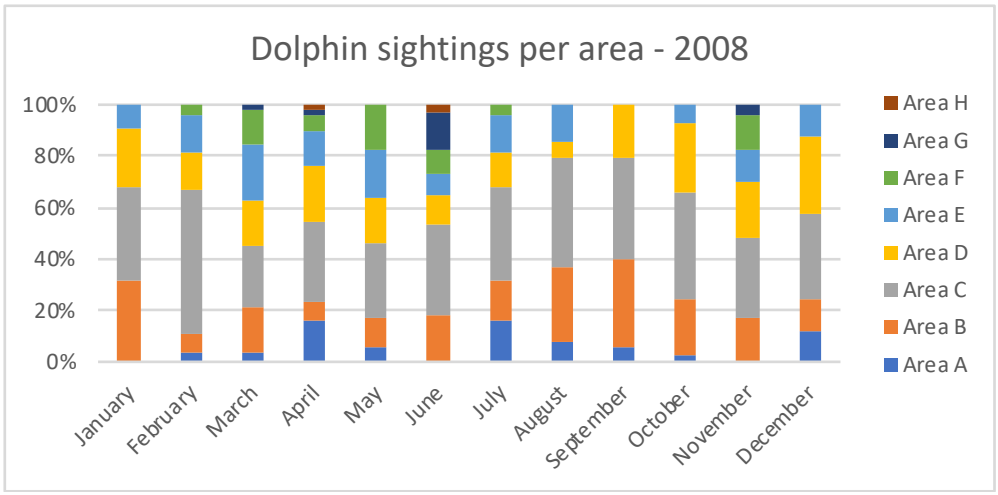


Figure 4.5 – Chart with the percentages of dolphin sightings per area per month (2008).

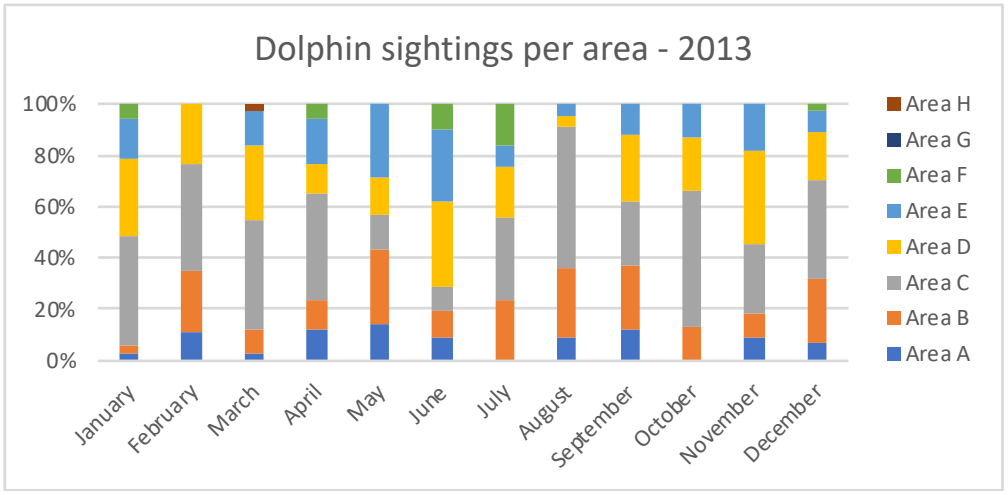


Figure 4.6 – Chart with the percentages of dolphin sightings per area per month (2013).

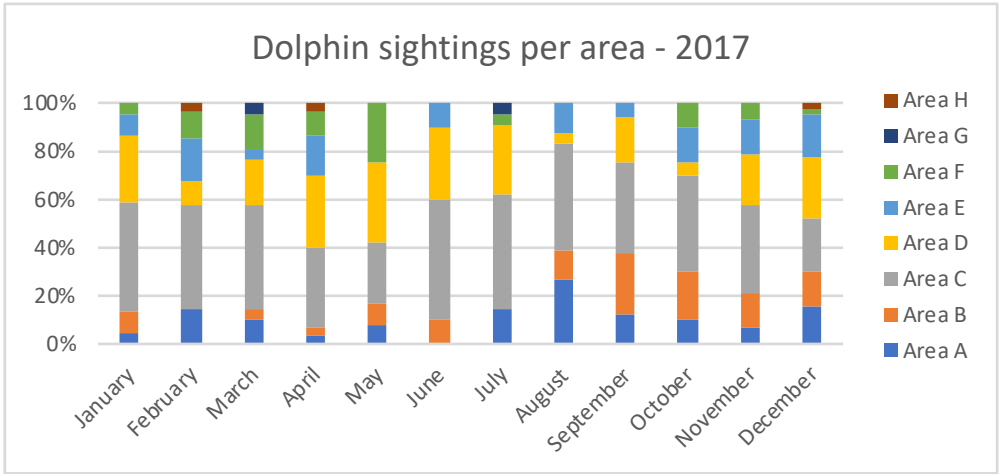


Figure 4.7 – Chart with the percentages of dolphin sightings per area per month (2017).

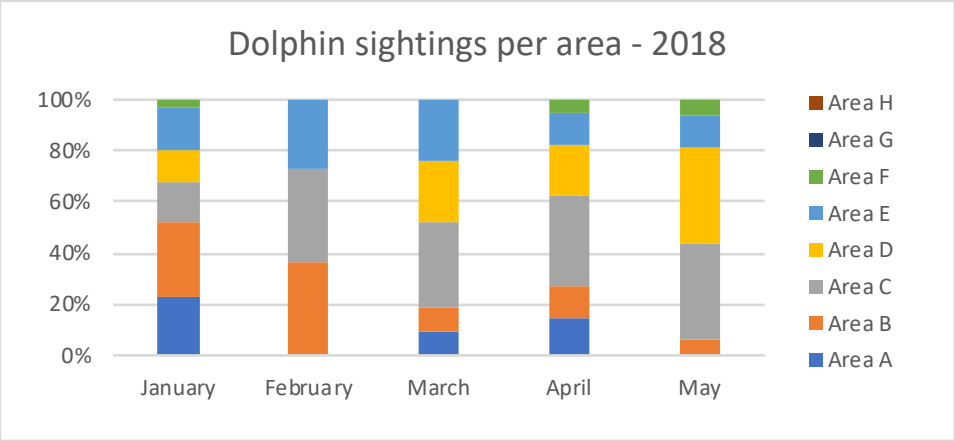


Figure 4.8 – Chart with the percentages of dolphin sightings per area per month (2018).

4.5 Behavioural analysis

4.5.1 Chapter introduction

To determine if CBT trips were interfering with the dolphin's population day-to-day activities a behavioural analysis was conducted. Every dolphin grouped encountered and approached by the dolphin boat was observed and a behavioural state was allocated, based on table 3.4 (Sub-chapter 3.3.4 of the Methodology).

For the purpose of this study only two behavioural states will be presented and discussed, namely "Resting" and "Avoidance".

Avoidance and alterations of the resting patterns have been a popular subject of several studies related to CBT impacts on cetaceans (Constantine, 2001; Constantine et al., 2004; Marega-Imamura et al., 2018; Martinez et al., 2010; Meissner et al., 2015; Steckenreuter et al., 2012b).

4.5.2 Changes to the "Resting" behavioural state

Resting is a behavioural state likely to change once a group of dolphins is approached (Christiansen et al., 2010; Meissner et al., 2015) because the increased noise levels caused by the engines interfere with the animals echolocation (Heiler, Elwen, Kriesell, & Gridley, 2016; Enrico Pirotta, Merchant, Thompson, Barton, & Lusseau, 2015) and consequently the animals need to become more alert (Christiansen et al., 2010; Enrico Pirotta et al., 2015).

The results show variations throughout the months and years with no distinctive pattern. In 2008 there is an increase for the months of November and December that could be justified by the months coinciding with the calving season. Mothers usually nurse their calves while resting and an increase of resting has been associated with the calving seasons (Christiansen et al., 2010; Steckenreuter et al., 2012b).

The years of 2017 and 2018 present an overall increase, with an average of 28% for 2017 and 34% for 2018, compared to the averages of 18% for 2008 and 13% for 2013.

This increase is unexpected as all similar studies reviewed indicated a reduction of resting behaviour related with the increase of boat traffic and CBT activities (Constantine et al., 2004; Marega-Imamura et al., 2018; Pérez-Jorge et al., 2017; Steckenreuter et al., 2012b).

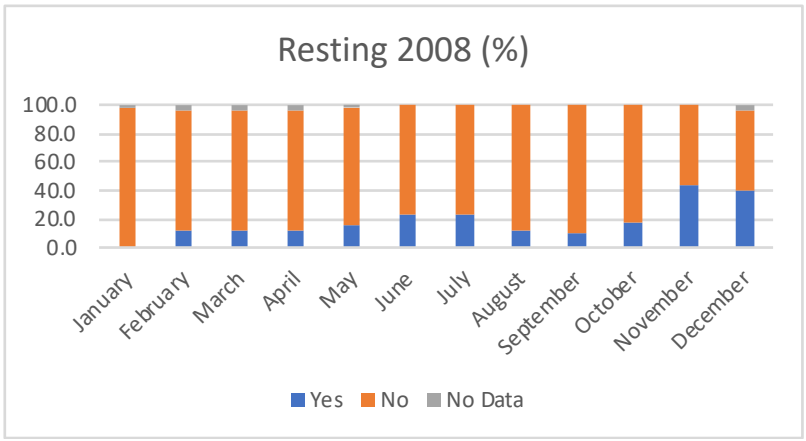


Figure 4.9 – Chart with percentages of sightings per month of dolphin resting when approached by dolphin trip boats (2008).

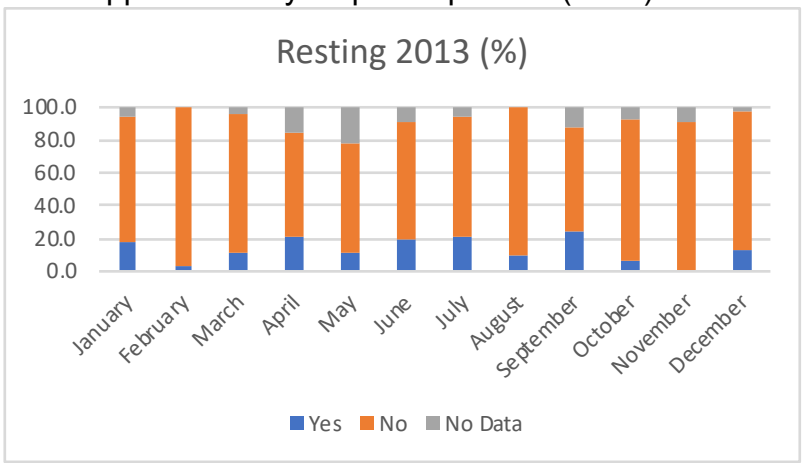


Figure 4.10 – Chart with percentages of sightings per month of dolphin resting when approached by dolphin trip boats (2013).

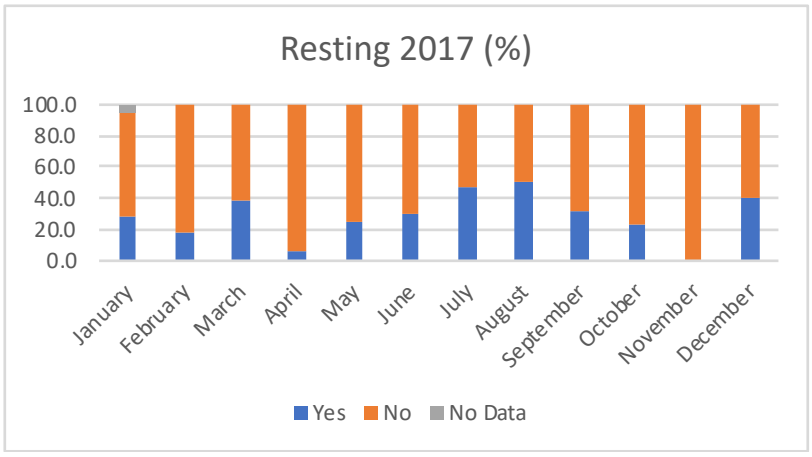


Figure 4.11 – Chart with percentages of sightings per month of dolphin resting when approached by dolphin trip boats (2017).

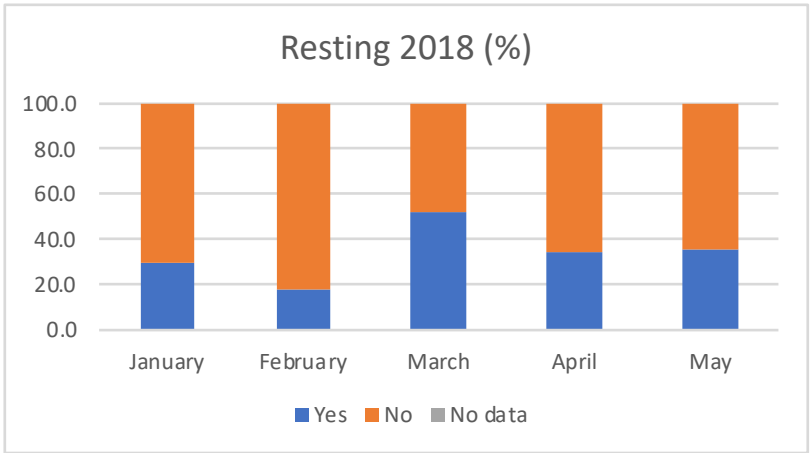


Figure 4.12 – Chart with percentages of sightings per month of dolphin resting when approached by dolphin trip boats (2018).

4.5.3 Dolphin avoidance to CBT boats and swimmers

If when a group of dolphins was approached the animals changed travelling direction, disappeared or spent long intervals underwater their behaviour was marked as “Avoidance” (Table 3.4 on the Sub-chapter 3.3.4 of the Methodology). Previous studies on cetaceans have shown avoidance responses to human disturbance (Lars Bejder, Dawson, & Harraway, 1999; Constantine, 2001; Janik & Thompson, 1996; Mattson, Thomas, & St. Aubin, 2005; Meissner, Martinez, Orams, & Stockin, 2014).

The results indicate that in 2008 when only one operator engaged in CBT activities the levels of avoidance were inexistent. In 2013, avoidance increased to 18% of all dolphin groups encountered. For the years of 2017 and 2018 the levels dropped to 9% and 11%, respectively. Meissner (2014) reported similar

values of avoidance (10%) when analysing the effects of CBT boats to a bottlenose dolphin population in New Zealand.

The variation could be correlated with the number of businesses engaging in CBT activities throughout the years as well as management changes. The selection of these specific years for this study has been justified in sub-chapter 4.2 (Sampling effort).

This indicates that the management plan of the PPMR has been effective in controlling the negative impacts of CBT by reducing number of operators and implementing a code of conduct.

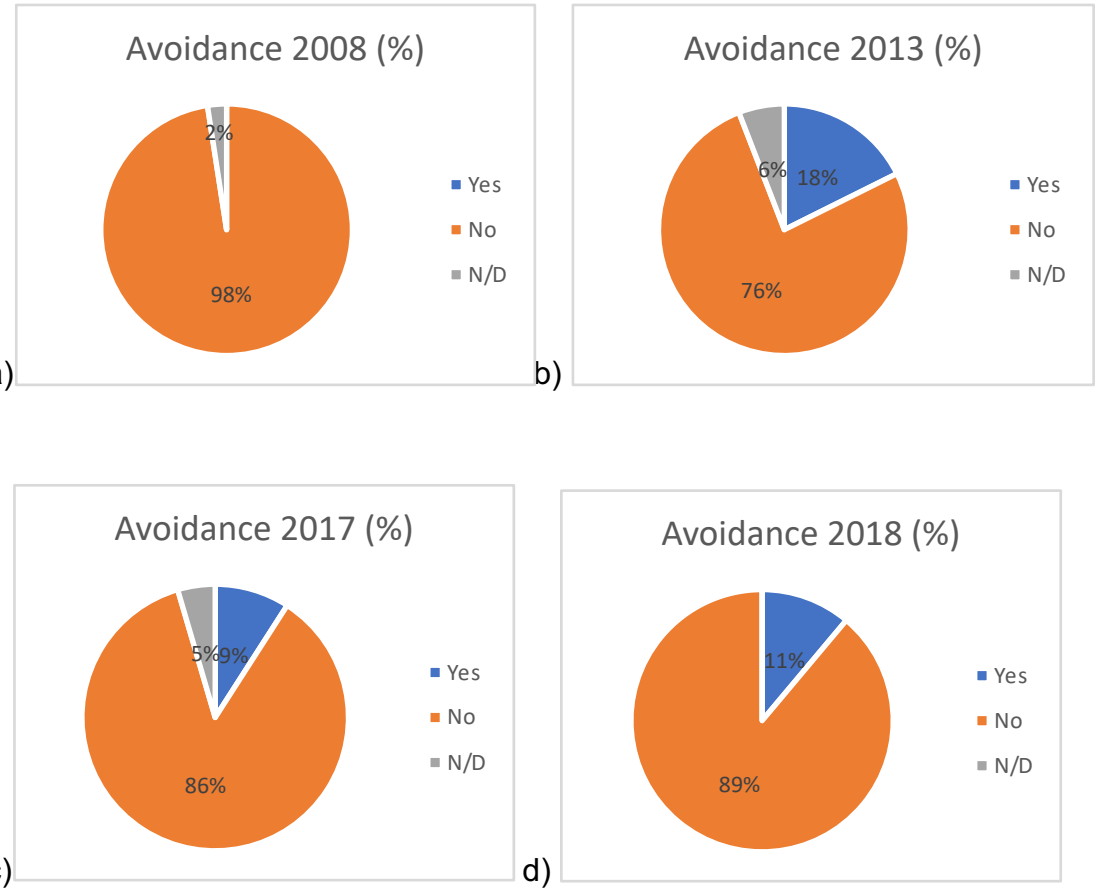


Figure 4.13 – Pizza chart with percentages, per year, of dolphin groups that avoided the CBT boat and/or swimmers a) 2008; b) 2013; c) 2017 & d) 2018.

4.6 Vessel traffic analysis

Increases in tourism usually results in increases in boat traffic, both commercial and recreational. The negative impacts that vessel presence has on dolphins has been widely documented (Constantine et al., 2004; Erich Hoyt, 2001; Marega-Imamura et al., 2018; Meissner et al., 2015, 2014; Pérez-Jorge et al., 2016).

The data presented has been provided by the PPMR offices. Since the reserve was only implemented in July 2009, data is only available from January 2010 to December 2017. The numbers refer to vessels that partake in diving, surfaris and dolphin trips, and that have launched from the Ponta do Ouro launch site (main and busiest launch site in the reserve).

The results present an increase in vessels throughout the years, with “2010” having a total of 2076, “2013” with 3482 and “2017” with 3553 boats. This indicates a significant increase of 68% from 2010 to 2013 and a much smaller increase of only 2% from 2013 to 2017. These numbers suggest that tourism has stabilized.

Considering that the PPMR has imposed limits blocking the establishment operations as well as limiting the number of boats for CBT, and these have been reached. A more in depth study would be necessary to determine if the current operators are running at full capacity or if further increases on vessel numbers can be expected.

The month of December has distinguishably higher values because it represents the peak of summer holiday. The same applies to March and April which represent the Easter holiday, that can fall in either of the months.

Bottlenose dolphins have a calving/breeding season that falls within our spring and summer. For this population the peak of the calving season is in November and December coinciding with very high numbers of vessels (over 500). Calving seasons are usually represented by longer resting periods (mothers nurse while resting) and more cohesive and sized groups (defensive posture) (Christiansen et al., 2010; Pérez-Jorge et al., 2016). The exposure to high numbers of boats can interfere with the population’s survival rates. Studies have highlighted that small populations are particularly vulnerable to human disturbances due to their high site fidelity and coastal distribution (Pérez-Jorge et al., 2016) with some

bottlenose populations already been classified as endangered under the IUCN Red List criteria (IUCN, 2014; Pusineri et al., 2014).

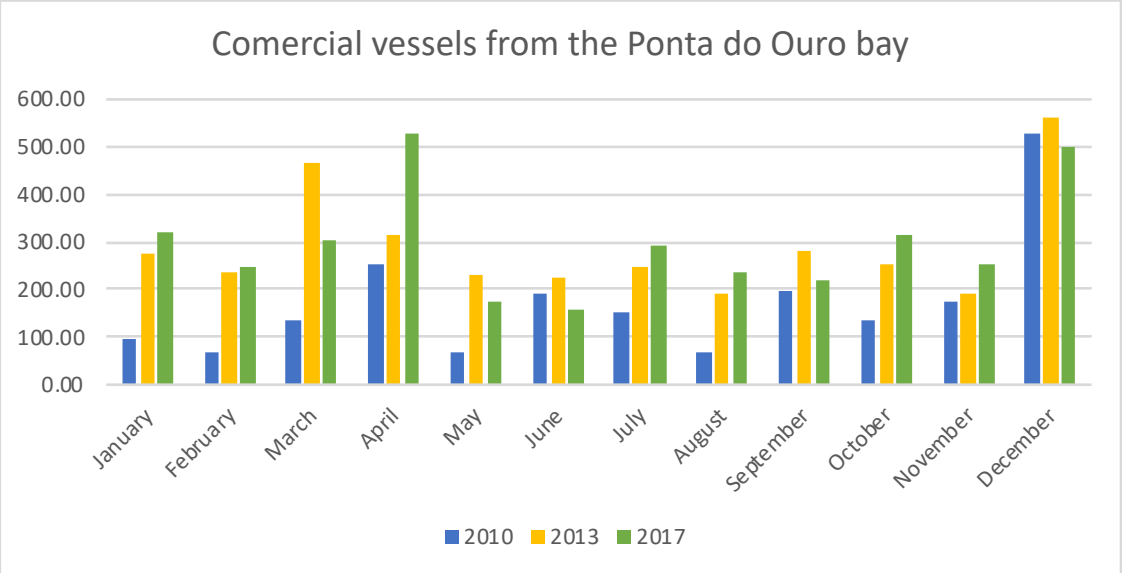


Figure 4.14 – Chart presenting the number of commercial vessels (diving, dolphin trips and ocean surfaris) per month for the years of 2010, 2013 and 2017.

4.7 Summary & Conclusion

A total of 1202 encounters with dolphins were observed in 995 surveys that took place all year long in 2008, 2013 and 2017, as well as from January to May 2018. The survey produced the following results:

- The quality of the dolphin/human interactions (Class swim) has decreased. With class swim “A” showing reductions and classes “B”, “C” and “D” increases.
- The resting levels have increased, unlike most similar research results. It is expected that a population exposed to high levels of human interference would reduce their resting times.
- The numbers for avoidance behaviour indicated an increase followed by a slight reduction in 2017.
- When analysing where most sightings of dolphin groups occurred the areas “C” and “D” were the most representative.
- Commercial vessel traffic has increased in 68% from 2008 to 2013 and has since then stabilized.

From the results I can concur that the increase of tourism and consequently increase of CBT and vessel traffic has had a negative impact to the resident

population of dolphins. Although, the negative impacts were not sufficient to drive the population away it has indeed altered their day-to-day routine and tolerance to humans, which could have long-term implications to the populations health and survival rates.

Many dolphin observations occur in the bay of Ponta do Ouro and Malongane which is worrying as these are considered the busiest launch-sites of the PPMR. Combining this with the fact that their calving season takes place in spring and summer and overlaps with the summer peak holidays is of great concern.

When analysing all the results together I could identify the influence that the implementation of the management plan for the PPMR has had. The swim classification and avoidance levels showed strong changes between 2008 and 2013, time when there was an increase (one to eight companies) of dolphin tours and then presented improvements from 2013 to 2017 and 2018, when the reserve and its plan were implemented and restricted the number of operators as well as regulated authorized ones with a code of conduct.

5. TOURISTS QUESTIONNAIRE SURVEY

5.1 Chapter introduction

The results and analysis of the cetacean based tourists' knowledge, perception and attitudes towards the PPMR and CBT activities that occur within will be presented in this chapter. The results will be discussed comparing the ones from this research with that of other similar research.

5.2 Questionnaire analysis

Questionnaires were conducted from March to July 2018. A total of 117 tourists partaking CBT activities completed the survey. Of these, 4% were from Somente Aqua Dolphin Centre, 16% from Halo Gaia and 80% from DERC.

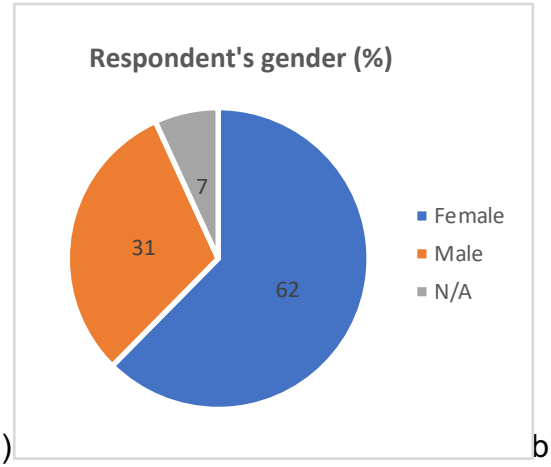
Distributing the questionnaires through the three main operators had the intent of producing results from tourists that participated in dolphin tours that were structured differently (pre-briefing, in-water behaviour, vessel approach type, etc.) therefore, obtaining a wider representation of the group.

Unfortunately, results indicate this was not possible.

5.3 Respondent details

From the total (n=117) respondents 62% were female and 31% were male, similar to many surveys undertaken with CBT participants (Draheim et al., 2010; Filby et al., 2015; Lück, 2015). The majority were visiting from South Africa. As other local research has indicated the main source of tourists for the PPMR is South Africa (Daly et al., 2015; Lucrezi et al., 2017; Lucrezi & Saayman, 2017).

The respondents age had good representation of every group, with exception of minors (under eighteen) and people over 60 years, justifiable by the roughness of the boating experience. Recent studies in the area presented similar results (Daly et al., 2015).

a) 

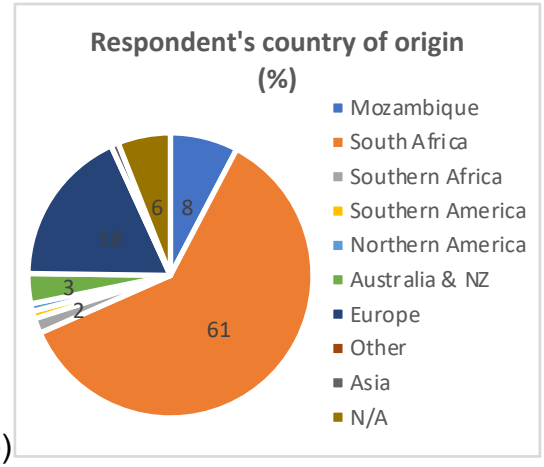
b) 

Figure 5.1 – Chart with percentages of: a) The respondents' gender; b) The countries of origin, (n=117).

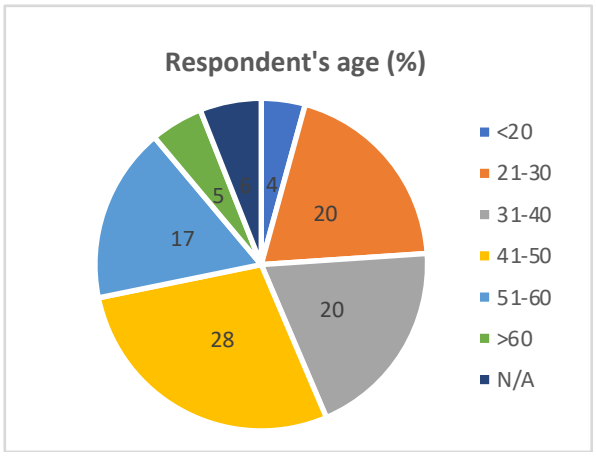


Figure 5.2 - Chart with percentages of the respondents' age (n=117).

5.4 Reason for visiting the reserve

The charts presented in Figures 5.3 a) to e) detail the travelling arrangements necessary to visit the reserve.

Since the survey was intended for only CBT participants it is expected that the majority (53%) would choose "swimming with dolphins" as their main reason for visiting.

The distance travelled indicates that most tourists travel from 300km to more than 1000km to visit the place, with 48% travelling over 1000km. The two most common means of transport are "border transfer" (where tourists drive their car from South Africa to the border and then leave it in a secure parking, concluding their trip with a transfer from a local operator on a 4x4 car, suitable for sand roads) with 35% and "self-driven" with 53%. The preferred accommodation type

was an hotel with 50%, followed by camping with 21% and private housing with 16%. Visits generally last from 3-4 days (32%) to under a week (44%).

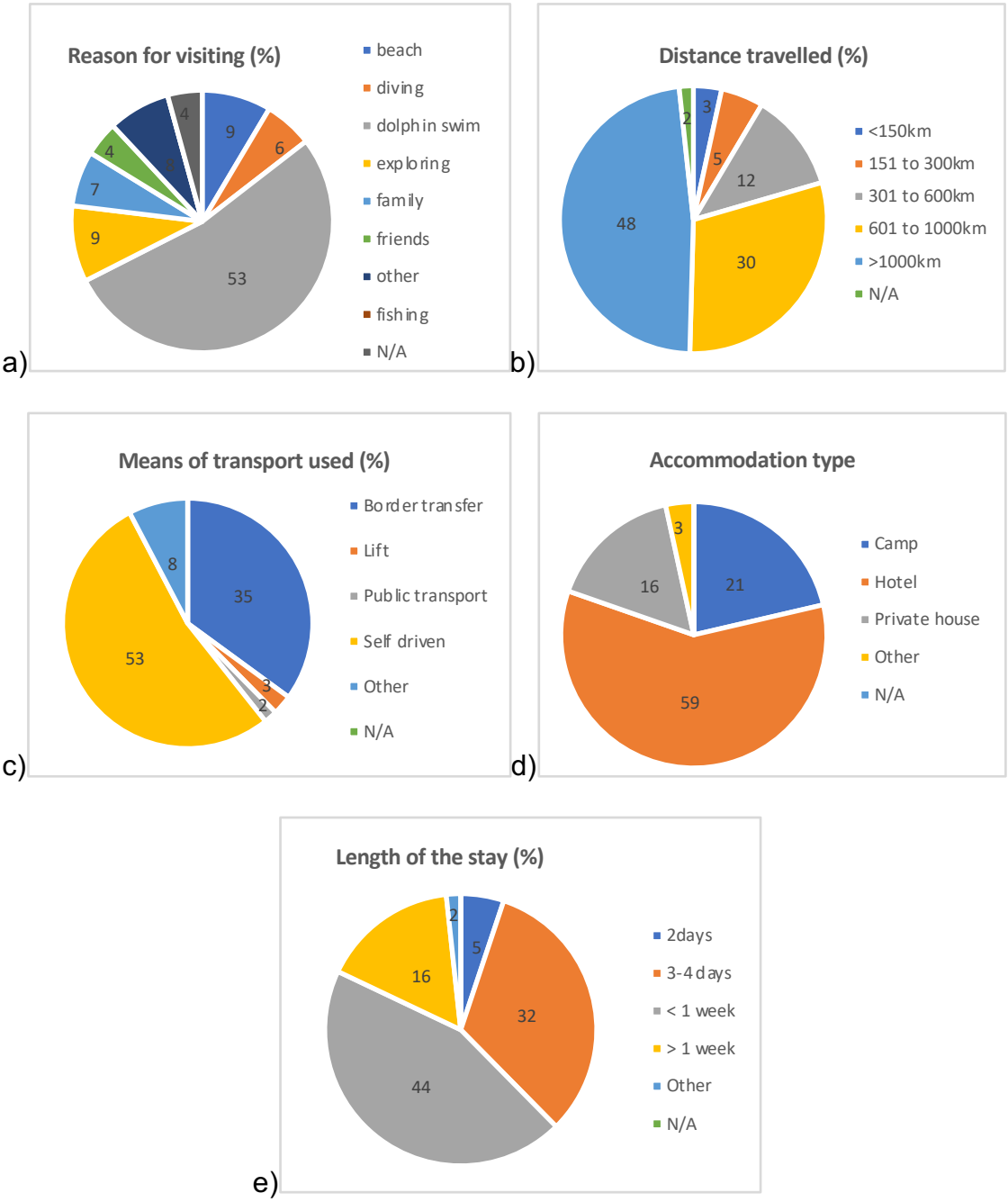
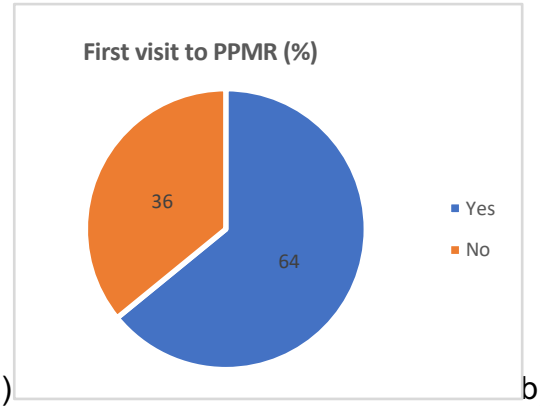


Figure 5.3 - Chart with percentages of a) Reasons for visiting; b) Distance travelled; c) Means of transport to reach the reserve; d) Type of accommodation used; e) Length of the stay (n=117).

The majority of respondents (64%) were visiting the reserve for the first time and most indicated that they would revisit (91%), the reasons varying (Table 5.1).

For the 36% that had already been in the PPMR 32% indicated that they visited less than once a year, followed by once a year with 21% and the remaining three options with 16% each. Lucrezi (2017) obtained similar results when surveying tourist divers in the PPMR, where the majority did more than one dive per year and all within the PPMR.

a)



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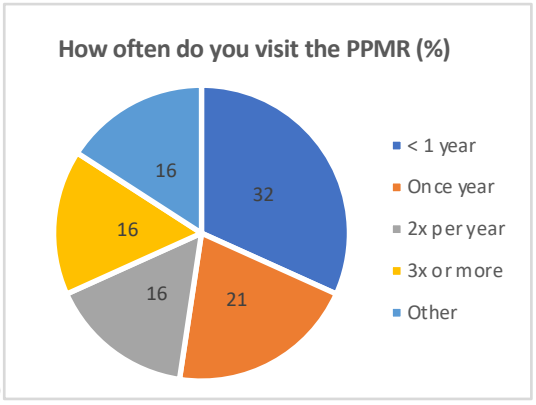

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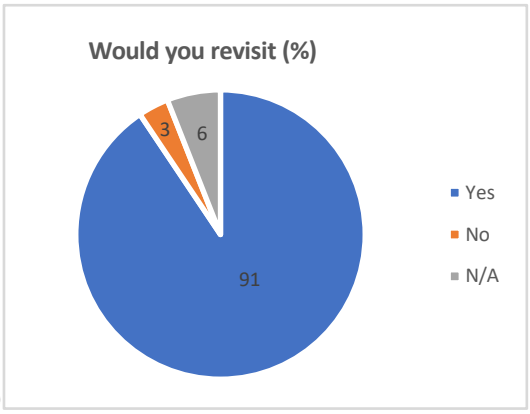


Figure 5.4 - Chart with percentages of a) If this was the first visit to the reserve b) Frequency of visits to the PPMR; c) Whether the respondent would revisit (n=117).

Table 5.1 – Reasons why a respondent would revisit or not the PPMR.

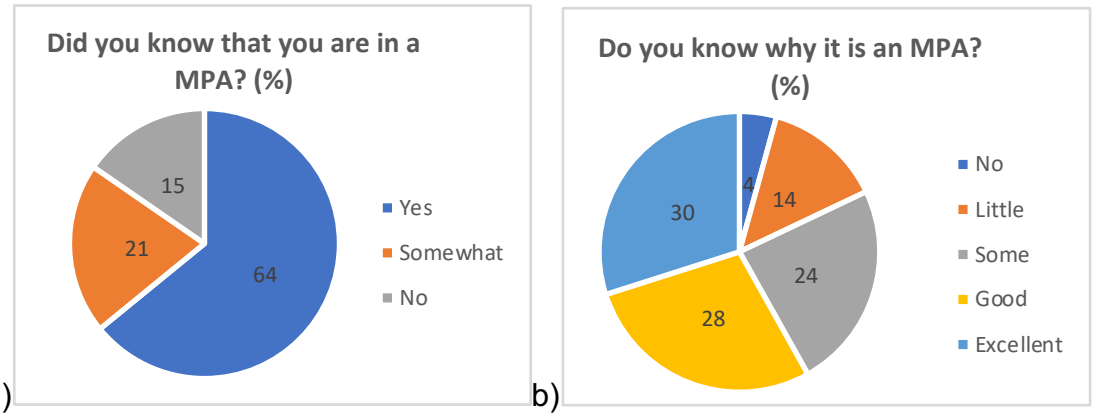
Reason to revisit	n	%
Beauty	21	18
Beaches	15	13
Fun & vibe	14	12
Dolphins	10	9
Diving	2	2
Explore new places	2	2
Not sure	2	2
N/A	51	44
TOTAL	117	100

5.5 Attitudes and perceptions towards marine conservation

The second section of the questionnaire enquired about the tourists' perceptions and attitudes towards marine conservation.

The majority (64%) affirmed that they were aware of the area being a MPA however, the remaining were unsure or had no knowledge of the PPMR representing 36% of the respondents. When asked to rate how well they knew the reasoning behind the MPA's establishment, a combined total of 42% affirmed to have none to only some knowledge. A study in Malta has produced similar data with the majority being aware of the MPA but a smaller proportion actually knowing why it was so (Mifsud & Verret, 2015; Trenouth et al., 2012).

In addition, when asked to give a level of agreement to statements related to the impacts of MPAs on marine activities (Table 5.2) there was a degree of uncertainty, as seen of Figure 5.6. This further shows that the tourists have insufficient knowledge of what an MPA is. Studies analysing the public perceptions of MPAs in other countries have presented similar results (Mifsud & Verret, 2015; Thomassin, White, Stead, & David, 2010; Trenouth et al., 2012).



a) b)

Figure 5.5 - Chart with percentages of a) If they knew that they were on a MPA; b) Whether they knew why the area was a MPA (n=117).

Table 5.2 – Percentages of the respondents' perceptions of a MPA based on a five point Likert scale to 9 statements (N = 117).

	Marine protected areas have an impact on marine activities	5 point Likert scale						
#	statement	Strongly disagree	Somewhat disagree	Mot sure	Somewhat agre	Strongly agree	N/A	TOTAL
1	Protect marine wildlife and habitats	1	3	13	51	28	4	100
2	Provide regulations for marine activities	1	6	15	50	24	4	100
3	Increase awareness of the marine environment	0	5	15	42	34	4	100
4	Imporve boating experience	6	15	27	31	12	9	100
5	Penlize infractioners	7	10	25	28	24	6	100
6	Limit freedom of movement/access	5	9	31	36	14	5	100
7	Represent over regulation	10	20	27	25	9	9	100
8	Difficult to enforce	5	16	32	29	10	8	100
9	Have a low compliance rate	8	21	31	21	9	10	100

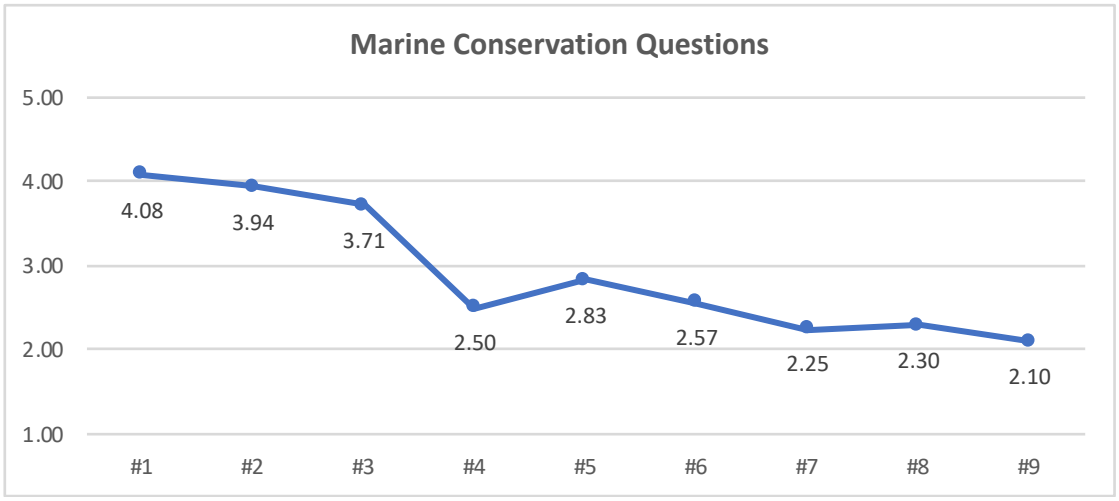


Figure 5.6 – Chart presenting the weight average (from none to excellent knowledge) of each marine conservation statement.

5.6 Attitudes and perceptions of cetacean based tourism

The following sub-chapters present and analyse the results of section three of the questionnaire – CBT activities.

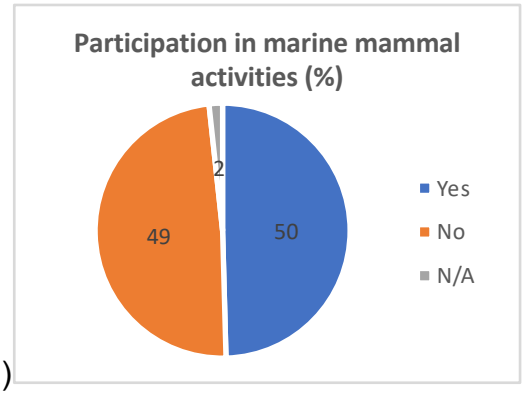
5.6.1 Participation in CBT activities

When enquired about their participation in CBT activities 50% responded that they had previously participated while 49% said no. From the 50% that said yes, the majority had engaged in "swim with wild dolphin" activities, followed by 17% with "wild observation" and the remaining 29% participating in activities with captive animals ("Dolphinarium" and "Swim with captive dolphins").

The following question enquired about activities with other wild marine animals, where 41% indicated that had never done. Whales and whale sharks were the mostly represented groups with 33% combined.

There is a preference for cetacean based activities in the natural environment as it has been presented in other studies with tourists (Draheim et al., 2010; Filby et al., 2015; Ponnampalam, 2011). This indicates that people have become more environmentally aware and proves, once again, that CBT is an effective vehicle for environmental education programmes (Bentz et al., 2016a; Filby et al., 2015; Lück, 2015, 2016).

a)



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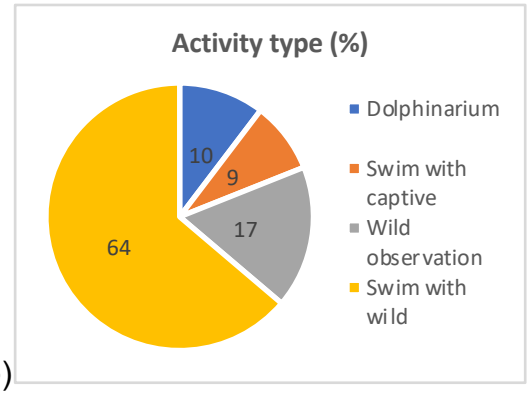

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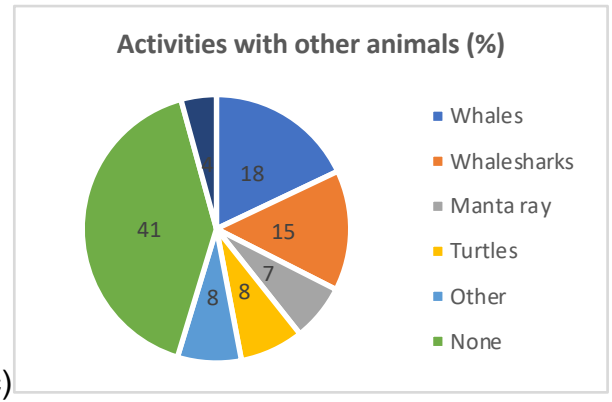

Figure 5.7 - Chart with percentages of a) The participation in marine mammal activities; b) The type of activities; c) Activities with other animals that respondents have participated in; (n=117).

5.6.2 Perceptions about the dolphins, whales and whale sharks' code of conduct

As part of the survey participants were asked if they were aware of the code of conduct to which 50% replied yes. However, 22% assumed to not know about the code and 25% where unsure of what it entailed. Considering that the survey took place after the dolphin trip it is worrying that almost half of the participants

concluded the activity with little or no knowledge of the code. This could indicate that the educational section of the experience is inexistent or inefficient.

When asked to agree with a series of statements related to the code of conduct the respondents showed excellent understanding of the code, strongly agreeing with all statements. This shows that although many participants were unaware that a code was to be followed the majority did agree with the restrictions that it imposes.

The overall acceptance of the code by the tourists can be used as a tool to enforce operators compliance (Filby et al., 2015; Scarpaci et al., 2003).

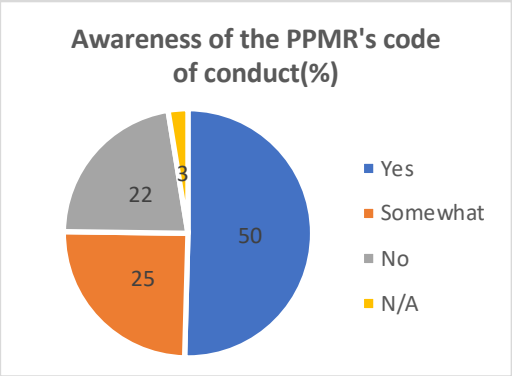

Figure 5.8 – Chart with the percentages of respondents that knew of the existence of the code of conduct for dolphins, whales and whale sharks in the PPMR (n=117).

Table 5.3 – Table with percentages based on a five point Likert scale of the respondents' level of agreement to each statement extracted from the code of conduct (n=117).

	Dolphins, whales and whale sharks code of conduct	5 point Likert scale						
#	Statements	Strongly disagree	Somewhat disagree	Mot sure	Somewhat agree	Strongly agree	N/A	TOTAL
1	Unless authorized, no vessel is to approach witin 300m of animals	4	3	3	15	72	3	100
2	Animals have right of way	3	0	0	2	92	3	100
3	If animals move off they must be left alone	3	0	3	5	87	2	100
4	Keep slow an dsteady speed, without changing course	4	3	4	16	70	3	100
5	Do not approach animals wit jetskis	5	0	7	3	83	2	100
6	If dolphins approach bow, refrain from altering course to approach them	6	3	13	16	58	3	100
7	Always approach fro the side, never from behind or front	4	0	24	11	59	2	100

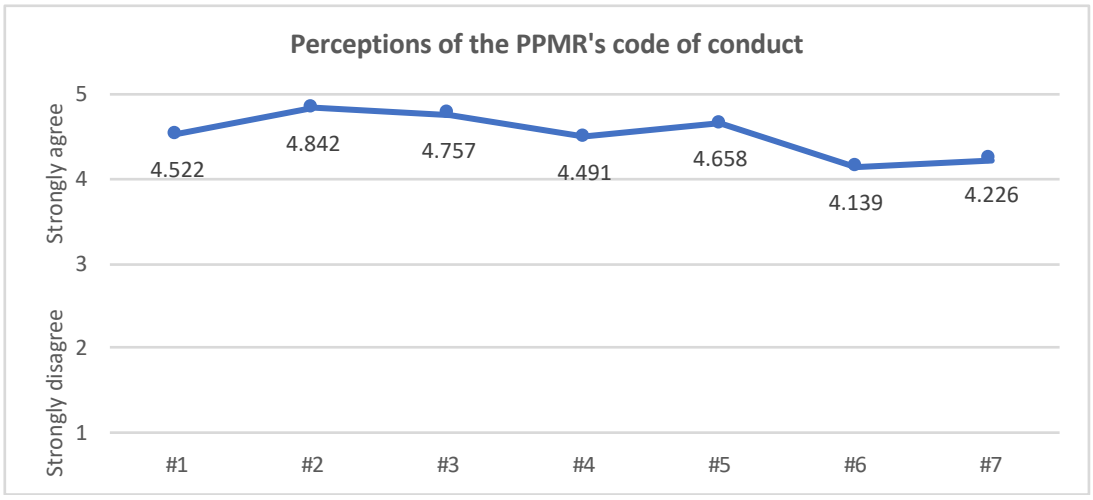

Figure 5.9 – Chart presenting the weight average for each statement related to tourists' perceptions of the PPMR's code of conduct.

5.6.3 Tourists' attitudes and perceptions of their CBT experience

Understanding what is and is not important to the enjoyment of the dolphin trip was analysed through a series of statements (Table 5.4).

There is an overall consensus that the safety of both animals and humans, the educational component and seeing the animals both from the boat and underwater are important to the participants' satisfaction.

Touching the dolphins was the only statement considered not important contrasting with the captive animal business that humans seek to get "the kiss" or swim holding onto the dolphins' fin.

Previous research indicates that participants are happy to comply with regulations once they are explained to them, because they do not want their actions to create disturbance or harm the wildlife (Bentz et al., 2016a; Curtin, 2010; Filby et al., 2015; Wiener, Needham, & Wilkinson, 2009). Statements four and twelve corroborate such findings.

The weather conditions also play an important factor as many studies on outdoor activities suggest (Bentz et al., 2016a; Topelko, 2007).

Respondents have given high importance to interpretation and education as components of the experience similar to findings in studies about tourists satisfaction and education in CBT (Bentz et al., 2016a; Draheim et al., 2010; Filby et al., 2015; Lück, 2015, 2016; Scarpaci et al., 2003).

Table 5.4 – Tourists' opinion on how important is each aspect of the dolphin tour experience, percentages (n=117).

	Opinion of the dolphin experience	5 point Likert scale						
#	Statement	Not at all important	Not very important	Fairly important	Important	Very important	N/A	TOTAL
1	Ensuring that I do not harm dolphins	0	0	1	2	93	4	100
2	Seeing dolphins form the boat	0	3	11	36	44	5	100
3	Seeing dolphins underwater	0	3	9	27	56	4	100
4	Educational brief from crew	0	1	9	25	61	4	100
5	To be able to touch the dolphin	57	23	5	5	4	5	100
6	Breifings about personal safety	1	5	13	25	50	6	100
7	Good weather conditions	1	2	29	36	27	5	100
8	Feeling comfortable in th esnorkelling equipment	0	1	9	46	40	4	100
9	Feeling safe whilst in the water	0	3	5	38	50	4	100
10	Educational material during the presentation	3	9	15	38	29	4	100
11	Opportunitties to learn more information	1	1	17	38	38	5	100
12	Ensuring that I do not harm or have a negative impact on the dolphins	0	0	0	6	90	4	100

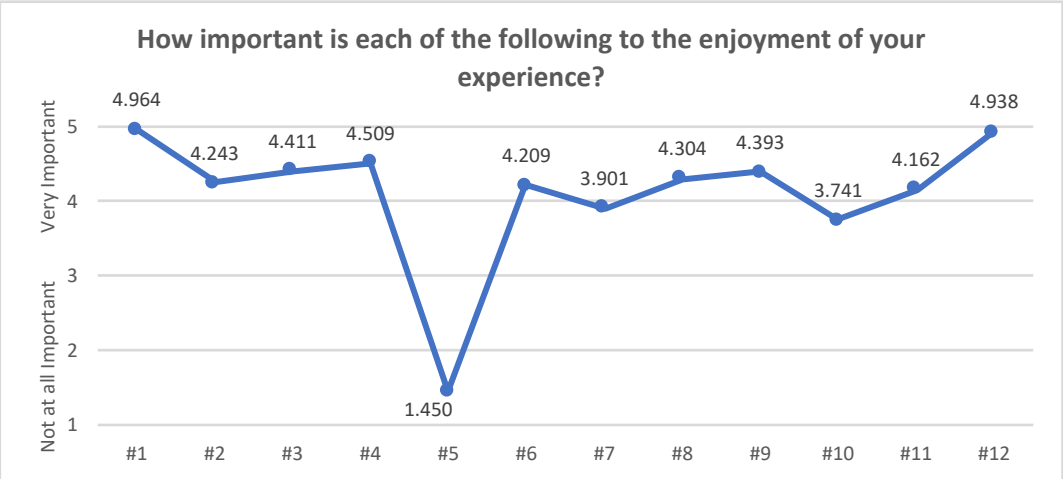

Figure 5.10 – Chart presenting the weight average related to the importance of each statement to the enjoyment of their experience.

The final data presented is based on the level of agreement to statements related to the participants' dolphin experience. This aimed to determine compliance to the code of conduct by the operators as well as the respondents' opinion on the restrictions imposed by it.

The respondents were happy with the crew's compliance with the code with 81% strongly agreeing with it and 73% agreeing that minimal impact procedures were undertaken.

When asked if the animals seemed disturbed 21% were unsure and the statement had a weight average of 2.444, sitting between "somewhat disagree" and "not sure". This could be explained by the respondents' little knowledge of dolphin behaviour which makes the individual unfit to assess it personally.

Time spent observing the animals was considered too short by 26% and sufficient by 51% ("strongly disagree" and "somewhat disagree").

The levels of uncertainty on statements "four", "five" and "seven" combined with the desire to spend more time with the animals could lead to operators breaching the regulations to ensure client satisfaction.

Studies have demonstrated that dolphin tours can be a good vehicle for education (Lück, 2015; Scarpaci et al., 2003) but that often tourists complain about the information provided. It was also shown that if clients expectations are managed prior to the experience (pre tour brief), their levels of satisfaction will increase (Filby et al., 2015).

Table 5.5 – Tourists' attitudes towards their dolphin swim experience, percentages (n=117).

	Dolphins, whales and whale sharks code of conduct	5 point Likert scale						
#	Statements	Strongly disagree	Somewhat disagree	Mot sure	Somewhat agree	Strongly agree	N/A	TOTAL
1	Understanding of dolphins has increased	2	2	3	31	56	6	100
2	Operator follows code of conduct	1	0	2	10	81	6	100
3	Minimal impact procedures are undertaken to reduce human impact to dolphins	5	3	11	15	58	9	100
4	Dolphin swim programs have negative impacts on dolphins	17	14	32	22	9	7	100
5	Animals were unhappy with the human approach	30	21	21	11	9	8	100
6	Animals seemed unphased/curious to human approach	2	5	15	35	32	11	100
7	Number of drops are insufficient	26	26	20	11	8	10	100
8	In water code of conduct is too dtrict	53	21	9	3	6	7	100
9	Not allowed to touch animals in necessary	58	12	3	3	15	8	100
10	Time spent observing animals is too short	25	26	14	21	5	9	100
11	Would choose an observation only over swim with program to minimize impacts on animals	18	20	26	15	15	7	100
12	Would pay the same for observation only, if it's better for the animals	14	15	26	15	23	7	100

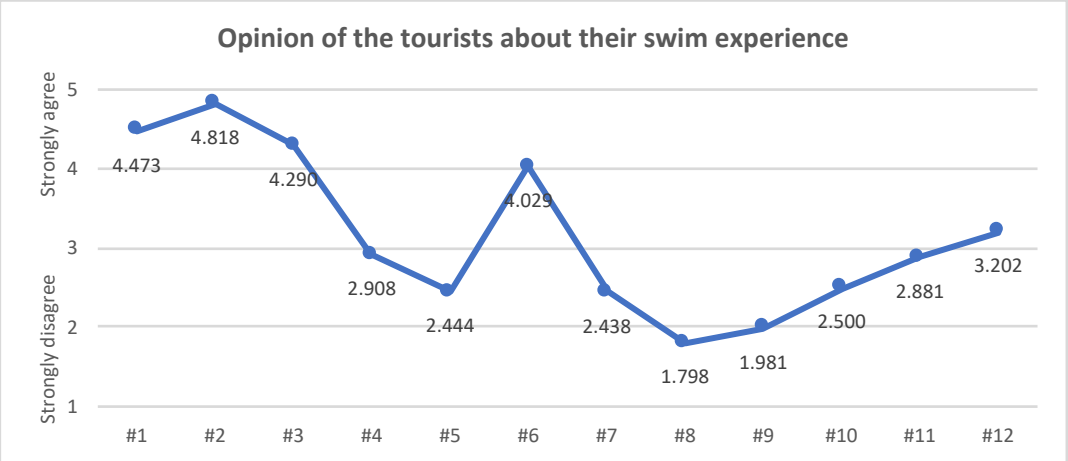

Figure 5.11 – Chart presenting the weight average of each statement related to the tourists' attitudes towards their dolphin swim experience.

5.7 Summary & Conclusion

From a total of 117 questionnaires, the typical respondent was a South African female. Most were first visitors that came to the reserve to interact with dolphins and travelled a distance of over 1000km by private car (self-driven or through a border transfer). The preferred accommodation type was a hotel with 91% happy to revisit the place.

Respondents were mostly aware of the PPMR but a reasonable percentage was unsure of its purpose and impacts to marine activities indicating that the reserve and marine operators aren't successfully disseminating information to the visitors.

When analysing the participants' background on CBT activities a preference towards environmentally friendly activities was noticed. This indicates that people have become more aware of the negative impacts that captive interactions might have on the animals and also proves that CBT activities can be an effective vehicle to environmental and educational programmes.

Although the results showed that 47% has little to no knowledge of the PPMR's code of conduct, it also indicated that the majority strongly agreed with what the code entailed. This combined with what they perceive as important to the enjoyment of their trip implies that respondents would be happy to comply with the code as well as have an interpretation and educational segment as part of the tour.

However, when analysing the participants' opinion about their experience the results suggest that a reasonable percentage is unsure or disagrees with the strictness of the code. And, even if not a majority it might induce the operators to breaking rules in order to "please the clients". This indicates, once again, how important a well-designed pre-brief can be ensure the participants' satisfaction and reduce the pressure of the operators to provide and pleasurable experience.

6 MARINE OPERATORS QUESTIONNAIRE SURVEY

6.1 Chapter introduction

The results and analysis of the marine operator's knowledge, perception and attitudes towards the PPMR and CBT activities that occur within, as well as its management, will be presented in this chapter. The results will be discussed comparing the ones from this research with that of other similar research.

6.2 Questionnaire analysis

A total of 35 questionnaires from 9 marine operator companies were received and entered into the data analysis. There were no questionnaires deemed ineligible. This represented 82% of the total number of the companies (Table 6.1) that work within the PPMR, resulting in a high response rate.

The companies chosen were based on their location and activities, to ensure that all participants worked inside the PPMR boundaries and were involved directly or indirectly with CBT activities, the same methodology was used in other studies (Gaitree & Ian, 2015; Inman, Brooker, Dolman, McCann, & Wilson, 2016).

Table 6.1 – Marine operators list and participation rate.

Marine operator company	Questionnaire participation
The Whaler	X
Scuba Adventures	X
Somente Aqua Dolphin Center	X
Dolphin Encountours Research Centre	X
Oceana	X
Gozo Azul	X
Back 2 Basics	X
Blowing Bubbles	X
Malongane Dive Center	X
Go Fish	-
Mamoli Dive Center	-
TOTAL	9/11 = **82%**

The following chapters will present and discuss the responses from each section of the questionnaire.

6.3 Job description

The job description of the sample population will be analysed in this section. This represents the first segment of the questionnaire and will allow to determine the level of involvement that the participant has with the tourists. Where possible the results will be compared to others from similar studies.

The segment is composed of three categorical close-ended questions that will be analysed separately. The results are presented by means of percentage of responses to each question, similar methods have been used in other studies that involved questionnaires with operators, for results presentation purposes (D. L. Gray et al., 2010; Hamilton, 2012; Lester et al., 2017; Lopez-Espinosa, 2002; Martin et al., 2016).

6.3.1 Job position in the company

Some participants had a combination of positions, for these the position with the most influence and contact with the tourists prevailed such as being the owner/manager involved in decision-making or being the dive master/instructor that has extensive contact and educates the tourists. The majority of the respondents were skippers (31%), followed by owners and managers (23%) and dive masters and instructors (20%) (Figure 1).

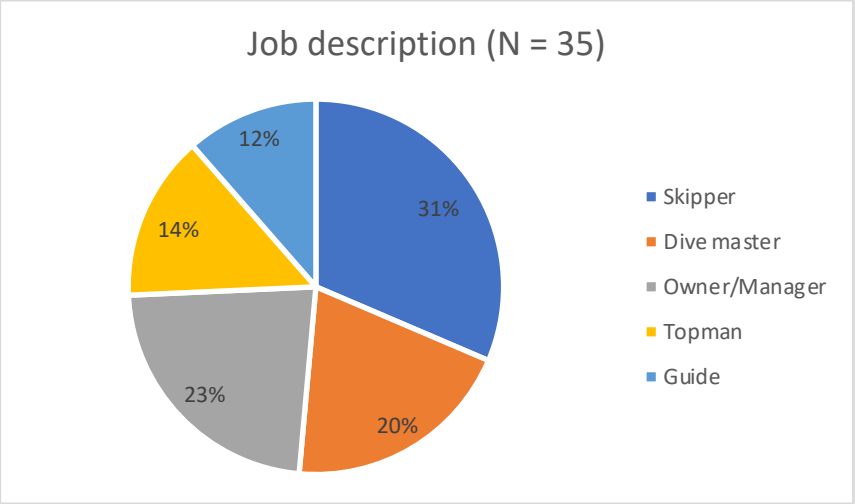

Figure 6.1 – Percentage of participants per job position.

6.3.2 Frequency of times that the respondent takes clients on marine activities

The majority of the participants undertook marine activities with the tourists at a daily basis (60%), while some only participated two to four times per week (26%), with even less at a weekly basis (11%), and only 3% never engaging in marine activities (Figure 6.2). The results indicate a high level of involvement with the tourists which means that the sample has a good representation of the population that is involved with tourists that undertake marine activities. The results also indicate that the sample has good representation for the population that is directly influenced by the management decisions on the PPMR. Many studies have presented data on the frequency of activities and duration of those to ascertain levels of involvement (Hamilton, 2012; Lester et al., 2017; Lopez-Espinosa, 2002; Martin et al., 2016).

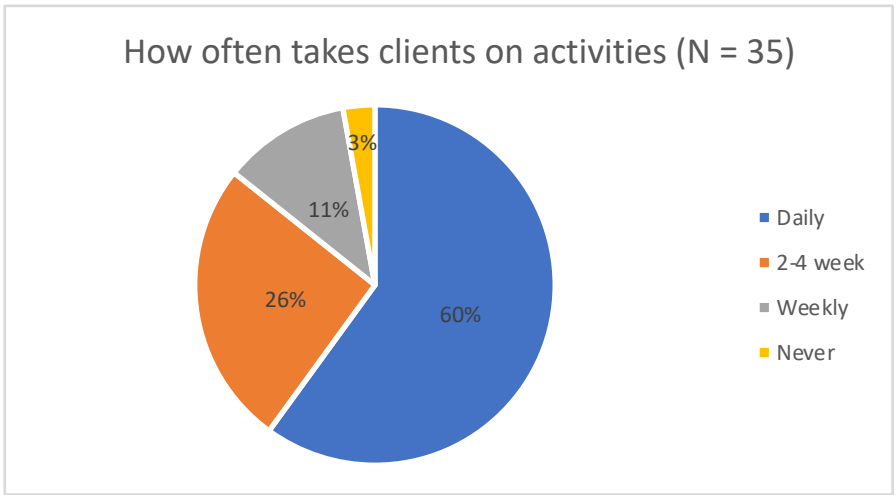

Figure 6.2 – Chart representing the frequency on which marine operators engage in marine activities with their clients (tourists).

6.3.3 Level of communication with the tourists

The number of times an operator communicates with a client/tourist was analysed to determine how much influence can the operators have over the tourists at an educational and awareness level. At the same time this can help determine how influential can the tourist be with relation to operators following guidelines and their levels of compliance.

The majority declared that they speak often with the clients (86%), followed by 11% that speak somewhat and 3% that engage little. There were zero responses

to “never” (Figure 6.3). The results show, once again, a high level of communication between operators and tourists indicating the importance and potential that operators have to optimise the impacts of the experience for the tourists (Ballantyne et al., 2011, 2009; Lück, 2015).

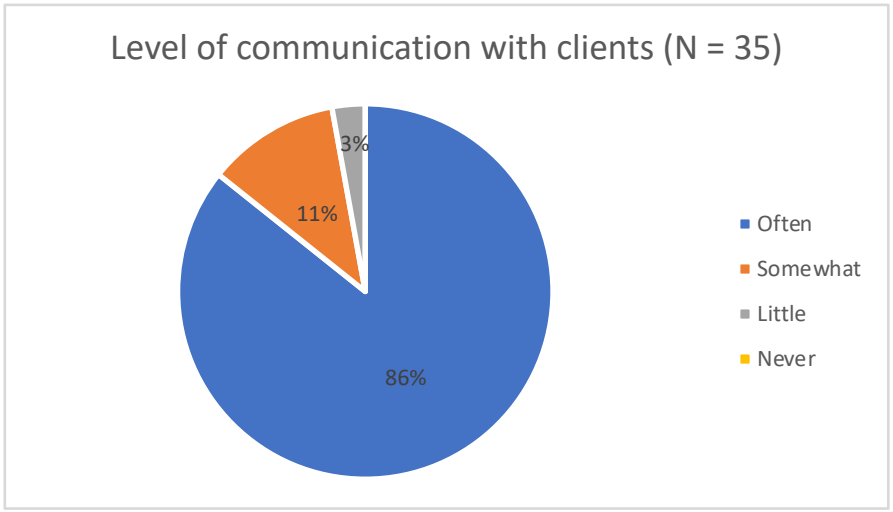

Figure 6.3 – Chart representing the level of communication that marine operators have with their clients (tourists).

6.4 Marine conservation – perception and attitudes

The second segment of the questionnaire is related to marine conservation and has been divided into two parts. The first section analyses the perception and attitudes that operators have towards MPAs. The second section analyses the operator’s perceptions and attitudes towards the CBT industry that occurs within the PPMR boundaries.

6.4.1 Marine Protected Areas

The designation of MPAs is a popular tool to address the protection of marine mammal populations (McDermott et al., 2017).

In order to gain an overall understanding of the awareness and attitudes towards the PPMR, respondents were asked to indicate their level of understanding of the MPA designation.

The majority of the respondents (51%) said that they had a good understanding of why the area had been designated a MPA, followed by 29% with excellent understanding and 20% with some (Figure 6.4).

The results indicate a high level of understanding of the concept of MPA and why this specific area has been designated. Similar results have been presented by a study on the diving industry of PPMR (Lucrezi et al., 2017) and studies on operators and stakeholders perceptions and attitudes of the MPA (D. L. Gray et al., 2010; Hamilton, 2012; Martin et al., 2016).

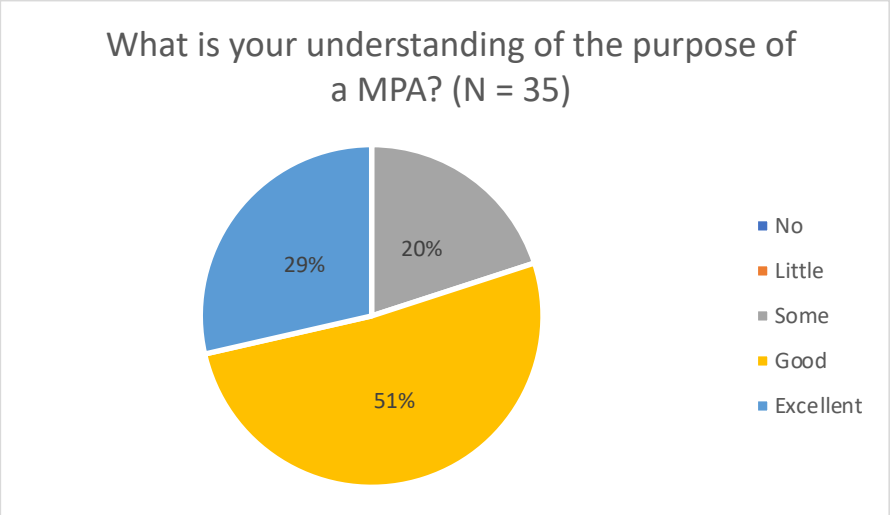

Figure 6.4 – Chart demonstrating the level of understanding of a MPA.

To obtain a better understanding of the operators' perception of the MPA a series of statements were presented in a table and respondents were asked to indicate their degree of agreement based on a five point Likert scale (Table 6.2). Figure 6.5 presents the results according to the weight average (degree of agreement) that each statement obtained.

Over 80% of the respondents demonstrated a good grasp of the concept of an MPA and its obligations, as the results from sentences one to four show. However, when they were asked to express their opinion about sentences five, six and seven the results presented a division of opinions and some uncertainty. The same was seen for the sentence "have a low compliance rate", where around 40% disagreed but 26% were uncertain and 21% agreed. When it came to difficulties on the enforcement and penalties/fines the majority agreed, 66% and 94% respectively, indicating that operators understand the need to comply with regulations. These results are consistent with those produced in similar studies (D. L. Gray et al., 2010; Hamilton, 2012; Martin et al., 2016).

Table 6.2 – Perceptions of MPA - percentages

MPAs have a number of impolicatins to recreational activities.								
	#	Statement	strongly disagree (%)	somewhat disagree (%)	Not sure (%)	somewhat agree (%)	strongly agree (%)	TOTAL %
Please indicate your level of agreement with the following	1	Protect marine wildlife and habitats	0	0	0	0	100	100
	2	Provide regulations for recreational activities	0	3	3	11	83	100
	3	Increase awareness of the marine environemnt	3	0	0	9	89	100
	4	Improve boating experience	0	9	9	40	43	100
	5	Have a bias towards certain acivities	11	14	29	34	11	100
	6	Limit freedom of movement/access	9	9	14	34	34	100
	7	Represet over regulation	6	17	26	23	29	100
	8	How a low compliance rate	20	23	26	20	11	100
	9	Difficult to enforce	17	11	6	46	20	100
	10	Penalize infractioners	3	3	0	31	63	100

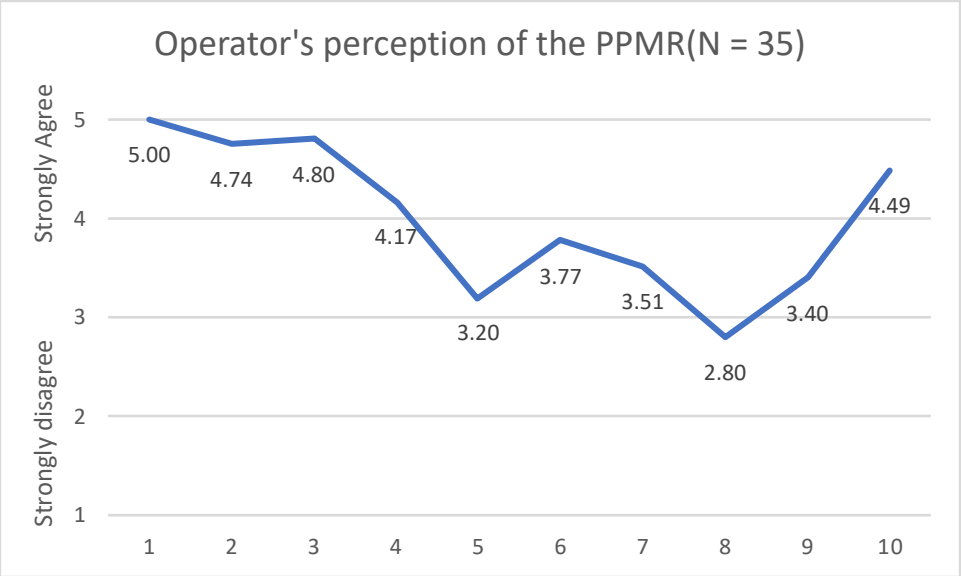

Figure 6.5 – Chart demonstrating the weight average for each statement about MPA perceptions.

6.4.2 PPMR code of conduct for dolphins, whales and whale-sharks - attitudes and perceptions

The following section of the questionnaire has questions and statements related to the "dolphin, whale and whale-shark code of conduct" applied by the PPMR's management plan. Respondents where to express their level of agreement, understanding and compliance to the code.

When enquired if they were aware of the existence of a code of conduct that applied for dolphin, whales and whale-sharks, 86% responded yes and 14% admitted to only somewhat knowing that it existed and to which animals applied. The results indicate that the methods used by the PPMR to inform operators with regards to the code were successful. Studies about codes of conduct have produced similar results, indicating that operators are broadly aware of their existence (Gaitree & Ian, 2015; Inman et al., 2016; Parsons & Woods-Ballard, 2003).

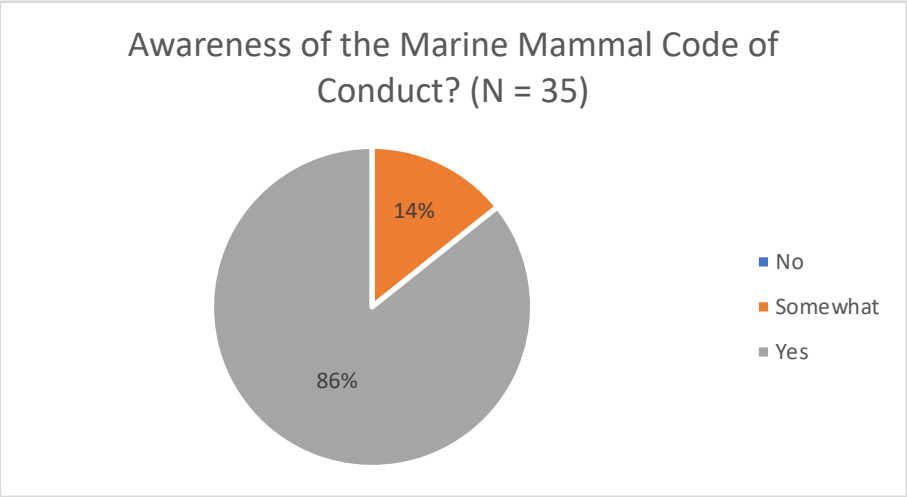

Figure 6.6 – Chart demonstrating CoC awareness rates in percentages.

A series of ten statements were presented on a table for respondents to give their level of agreement, following a five point Likert scale. All statements were extracted from the original PPMR code of conduct to determine if operators know what the code comprises and if they are satisfied with the regulations imposed. The majority (80% and over) “somewhat agreed” or “strongly agreed” with all sentences indicating a high level of understating of the code. The results could be extrapolated into assuming that operators, seen that they agree with the statements, should have high levels of compliance. However, most studies in similar conditions have proven that awareness and understanding of the code does not necessarily result in full compliance by operators (Filby et al., 2015; Gaitree & Ian, 2015; Inman et al., 2016).

Table 6.3 – Perceptions of the code of conduct – percentages.

PPMR Code of conduct for dolphin, whales and whale-sharks								
	question #	Question	strongly disagree (%)	somewhat disagree (%)	Not sure (%)	somewhat agree (%)	strongly agree (%)	TOTAL %
Please indicate your level of agreement with the following	1	Code of conduct rules are to be adhered by both comercial and recreational op.	3	0	3	6	89	100
	2	Unless authorized, no vessel is to approach within 300m	6	9	0	14	71	100
	3	Do not approach animals with jet skis	3	0	0	9	89	100
	4	Animals have right of way	0	0	0	3	97	100
	5	If animals move off they must be left alone	3	0	0	11	86	100
	6	If dolphins approach bow refrain from altering cours to approach them	3	3	14	40	40	100
	7	Always approach from side, never from behind or front	0	6	9	29	57	100
	8	Keep slow and steady speed without changing course	0	3	0	31	66	100
	9	Harrassment and noise pollution from engines can lead to boat strikes	3	6	26	29	37	100
	10	Accidental entanglement and ingestion of fishing gear and marine debris can	0	0	3	0	97	100

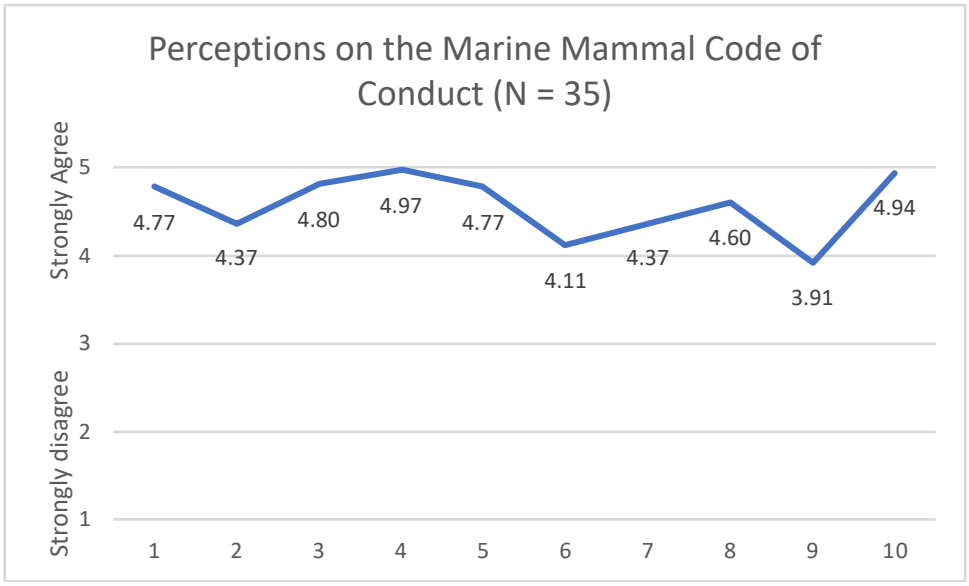

Figure 6.7 – Chart demonstrating the weight average for the perceptions of each statement about the code.

Table 6.4 presents respondents attitudes when enquired how they would act in the event of encountering dolphins but not being authorized to approach (not a "dolphin tour"). The majority indicated that they would explain to the clients that they were not allowed to approach/follow/swim and would also mention the existence of the code. When asked if they would stop and observe 26% said no, 14% said yes, and a total of 57% responded somewhat displaying indecision towards following the code.

When asked if the clients would be allowed to swim, 89% said no, with only a very small sample saying yes and somewhat, 3% and 6% respectively. The

results for the last question were similar. Results show an overall understanding and compliance with the code unlike other studies that addressed compliance of codes (Filby et al., 2015; Gaitree & Ian, 2015; Parsons & Woods-Ballard, 2003; Scarpaci et al., 2003, 2004).

Table 6.4 – Attitudes towards the CoC – percentages.

Question #	question	Yes %	Somewhat %	No %	N/A %	TOTAL
1	Do you explain to the clientshy you can not	100	0	0	0	100
2	Do you make your clients aware of the code of	89	11	0	0	100
3	Do you stop to observe?	26	57	14	3	100
4	Do you allow clients to get in the water?	3	6	89	3	100
5	Do you follow the animals for a period of time?	3	17	77	3	100

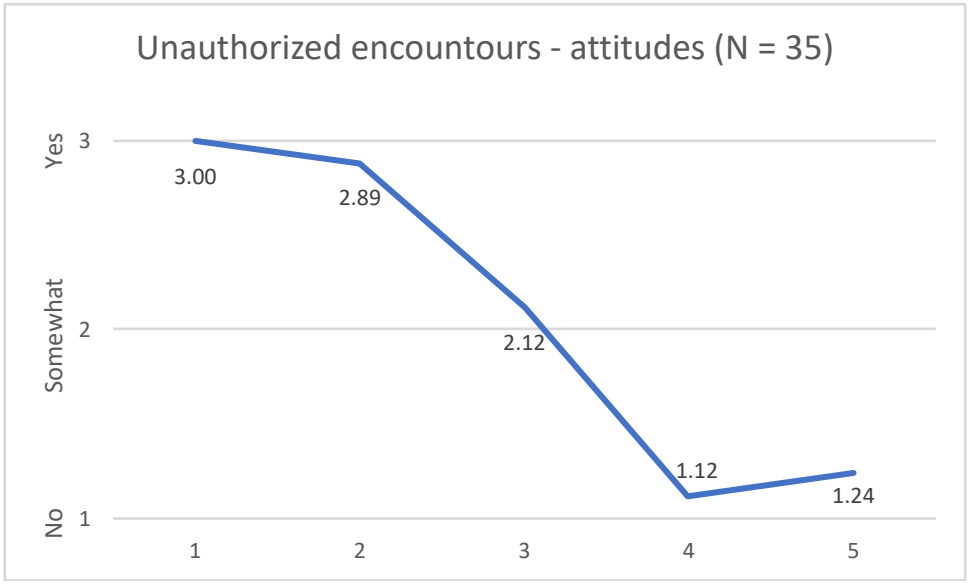

Figure 6.8 – Chart demonstrating the weight average (three point Likert scale), for statements relating to unauthorized approaches.

The final section of the questionnaire explored whether operators are willing to participate in the PPMR's management through education and awareness of tourists as well as marine conservation programs.

Table 6.5 presents seven sentences and the percentages for the level of agreement, according to a five point Likert scale. The weight average for each of the five Likert points was then calculated and presented for each sentence (Figure 6.9).

The majority (over 70%) agreed or somewhat agreed with all the statements. Sentences number two and six showed the highest level of agreement (over 80%). When asked if operators should directly participate in marine conservation events 23% were not sure and inly 51% strongly agreed. These results indicate that operators and their tours are a great tool to be used for the education of environmental sustainability (Ballantyne et al., 2011; Bentz et al., 2016a; Draheim et al., 2010; Guerra & Dawson, 2016; Lück, 2015, 2016).

Table 6.5 – Operators attitudes towards the MPA.

	question #	Question	Strongly disagree %	Somewhat disagree %	Not sure %	Somewhat agree %	Strongly agree %	TOTAL %
Please indicate your level of agreement with the following	1	Operators are an example of behavior to their clients	0	11	3	14	71	100
	2	Operators must reprimend their clients if they do not follow the MPA's regulation	0	0	3	11	86	100
	3	It is the operators obligation to inform and educate their clients about the MPA's regulation	3	3	9	69	17	100
	4	Operators must participate directly on marine consevation events	0	0	23	26	51	100
	5	Operators should report any illegal activities witnessed	3	0	3	11	83	100
	6	Operators should record any illegal activities witnessed	3	0	6	20	71	100
	7	Operators can be citizen scientists	0	11	17	20	51	100

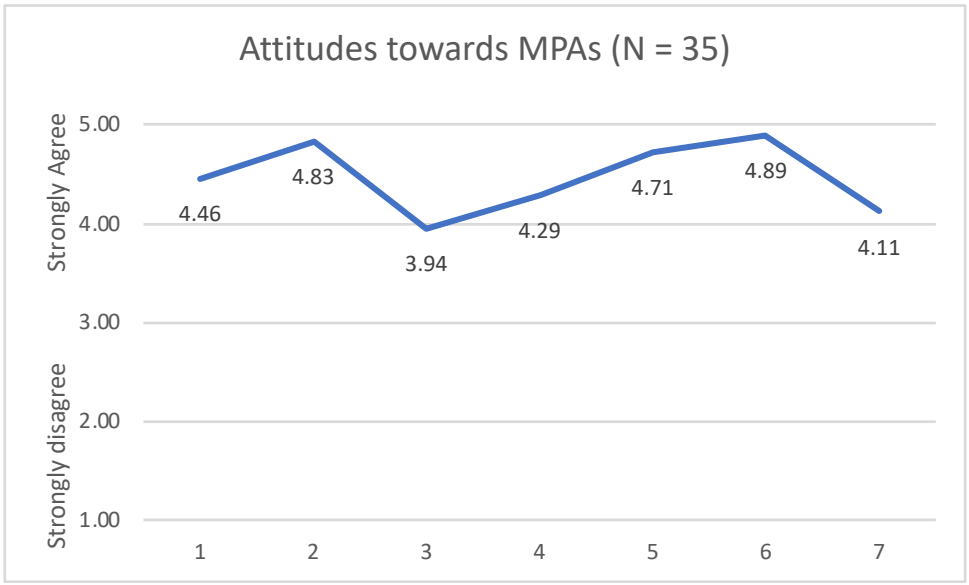

Figure 6.9 – Chart demonstrating the weight average for statements relating to operators' attitudes towards the MPA.

6.5 Summary & Conclusions

A total of 35 questionnaires were analysed, representing 82% of the commercial marine operations within the PPMR. These were mostly represented by “skippers”, “owners and managers of dive centres” and, “dive masters and instructors”.

When analysing how these operators could act as citizen scientists and incorporate education on environmental sustainability in their trips, results indicated that the level of communication they have with their clients as well as the frequency in which they take them on trips are positive.

These outcomes combined with their positive levels of agreement/attitudes towards the PPMR regulations prove that the participation of these stakeholders as citizen scientists and the incorporation of an educational segment in their business could be considered, as previously mentioned by other studies (Ballantyne et al., 2011; Bentz et al., 2016a; Lück, 2015, 2016).

The code of conduct applied to dolphins, whales and whale-sharks is broadly acknowledged and comprehended. It also appears to have successful levels of compliance proving it to be a great tool for the protection of both human and animals (Filby et al., 2015; Inman et al., 2016; Parsons & Woods-Ballard, 2003; Scarpaci et al., 2003, 2004).

There was some uncertainty by the operators on how to behave in the event of encountering dolphins, not being authorized to approach, follow or swim with them, but having clients requesting to do so. Studies have been done to determine how the clients can interfere with the level of compliance of the code of conduct. Some indicated that operators would bend the rules to please their clients (Filby et al., 2015; Scarpaci et al., 2003). However, other studies indicated that the clients’ interest in marine conservation might work as an incentive on the operators to comply with the code (Ballantyne et al., 2011; Bentz et al., 2016a; Draheim et al., 2010; Lück, 2015, 2016).

7 SEMI STRUCTURED INTERVIEWS

7.1 Introduction

This chapter analyses in detail the results of the semi structured interviews administered to compliment the quantitative data obtained through observation and survey techniques.

The chosen method, rationale and interviewees selection have been previously discussed in sub-chapter 3.5.

7.2 Administration of the interviews

Interviews were carried out over a “one week” period and time and location was left at the interviewee’s discretion.

The interviews were carried out in person, lasted between 30 and 50 minutes and the responses were written down during the course of it.

In the beginning of each a brief explanation of the study, aims and overall structure of the interview was given. The respondents had previous access to a set of questions giving them an idea of the topics to be discussed.

To ensure that the respondents were satisfied with their answers and that they had been correctly understood a transcript of the interview was given to the respondent shortly after the interviews. Respondents were encouraged to read through it and make any alterations they deemed appropriate.

7.3 Interview responses and analysis

The following sections analyse the main responses from the participants.

Because the method applied is considered qualitative analytic and is independent of theory and epistemology, a thematic analysis is a flexible tool capable of producing a thorough account of data (Braun & Clarke, 2006; Lucrezi & Saayman, 2017).

The responses were grouped into broader themes that could then be cross analysed between respondents.

All opinions expressed in the following sections are of the interviewees only.

The main topics for discussion during the interviews were:

1. Interviewee’s profile
2. Perceptions and attitudes towards the PPMR
3. Challenges and successes of stakeholder engagement

4. The effectiveness of the PPMR's marine mammal code of conduct

7.3.1 Interviewee's profiles

An initial selection of four interviewees was decided (sub-chapter 3.5.4), however due to time constraints only three interviews were conducted. A basic profile description is presented in table 7.1.

Table 7.1 – Profile of interviewees

Name	Place of birth	Academic background	Previous job position	Current job position
Domingos Manhiça	Manhiça (Central Mozambique)	Technical course	French school teacher	Local chief for the Ponta do Ouro village, since 2016 (public administration)
Vicente Antonio Matsimbe	Katembe (Maputo Province, Southern Mozambqiue)	High school	Human Resources for Kemp	Patrol officer for PPMR, since 2010
Miguel Gonçalves	Maputo (Capital of Mozambique)	Marine Biology graduate	Prawn fishing fleet and quality control (fisheries department)	Manager of both PPMR (2008) and MSR (2017)

7.3.2 Perceptions and attitudes towards the PPMR

The respondents were asked questions related to their involvement with the establishment of the PPMR, implementation of the management plan and how they feel the reserve has affected the area.

There is an overall appreciation for the establishment of the PPMR and work that has been done. The important role that the PPMR has for nature conservation and marine resource management was brought up by all. In specific issues with regards to the exploitation of fish stocks, coastal development on the primary dunes and littering (for more information please read in the literature review chapter 2.6).

However, it was mentioned that the PPMR regulations are unclear and open for interpretation, often leading to illegal actions based on "misunderstandings". A matter that will be further discussed on the following chapter (chapter 7.3.3).

When asked about the government involvement in the management of the PPMR the reserve manager explained with implementation process where many governmental departments worked in an integrative manner to achieve a common goal.

However, once the reserve was official there was much disagreement on which department had the legal power over which marine activity. An example mentioned was the prohibition of marine mammal watching and swimming tours. Before the reserve was established a commercial operator only required a transport license issued by INAMAR to offer this activity. This changed when the management plan was implemented and limited the number of operators allowed to offer the service. This was then resolved and the number of operators offering the tours soon dropped to those of the management plan.

7.3.3 Challenges and successes of stakeholder engagement

When asked about the participation and attitudes of the stakeholders towards the PPMR management many issues where brought up. The following paragraphs expose some of those mentioned.

According to the Local chief the community feels deprived as some lost their income due the implementation of new regulations. The two main reasons for complaining are the recreational jet ski prohibition where many worked “summer jobs” assisting jet ski owners. And the prohibition of artisanal fishing within the sanctuary or any other type of fishing that might produce a financial income.

The PPMR staff have defended that programs to teach alternative sources of income have been put in place with the fishing communities and have proved to be successful.

All respondents agreed that the tourism increase has provided more job opportunities and that there is an overall satisfaction throughout the community. Another comment was the lack of frequent information provided for the community. The Ponta do Ouro village’s population in known for being always changing, a characteristic of a tourism dedicate village and by its proximity to the South African boarder. Therefore, information needs to be dispersed repeatedly and frequently.

Meetings with the stakeholders was another point mentioned by all interviewees. Given the variety of stakeholder groups (artisanal fisherman, temporary job

workers, hotels and restaurants, holiday house owners, marine operators etc), the difference in working schedules and language barriers (native dialects, Portuguese and English) meetings that involve all stakeholders are rare. The stakeholders' groups have dedicated meetings and have the right to request a meeting with the PPMR team every two months. In these meetings their issues and suggestions are voiced and taken into consideration.

The lack of initiative and integration from the Ponta do Ouro community was of concern for two of the respondents. There are no official representatives for each stakeholder group and no meetings or gatherings take place unless when requested by the government/PPMR or when there is an immediate threat to be dealt with.

7.3.4 The effectiveness of the PPMR's marine mammal code of conduct

When asked about the marine mammal code of conduct the main concern was the "Ocean Surfari" tours offered by diving operators. These are defended by the operators as being snorkelling trips but as the name implies they consist of tours that take the clients out looking for animals. Many clients join these trips in the hopes of observing and swimming with dolphins at a more competitive price and only later discover that are not allowed within 200 meters of the dolphins, whale and whale sharks.

This "grey zone" requires adaptation by the management plan and has been awaiting the renewal of said plan.

All respondents considered the code a successful measure to protect both animals and humans during these interactions. There was also a general agreement that there was a successful level of compliance of the code by most marine operators.

According to the reserve manager more information is required in order to develop a more complex and strict code of conduct. In the meantime, the marine mammal operators have joined forces under a voluntary agreement to adopt immediate changes. These deemed necessary changes are to take place during the holiday times when there is an increase in marine mammal tours and boat traffic in general.

7.4 Summary and Conclusion

The information gathered through the interviews helped to achieve a more thorough understanding the current PPMR management process, in specific the participation that stakeholders have and the main challenges with both the management plan and code.

Although there is an overall acceptance for the PPMR some concerns were voiced:

a) Lack of unification and representativeness by the stakeholders;
b) Loss of income;
c) Little and infrequent dissemination of information by the PPMR;
d) Delayed revision of the management plan;
e) Slow and compartmentalized legal process.

The lack of resources (financial and skilled professionals) seems to be responsible for many of the concerns.

Another reason is the language barrier, although the official language of the country is Portuguese there are many that don't speak the language and are limited by local dialects. The proximity to the South African border also brings residents from this country that speak English or have their own dialects. Having a general assembly became time consuming when speeches required translation into two more languages.

There is also a high number of illiterates in the country, in specific in rural areas and away from the big cities, further complicating information dissemination.

8 LIMITATIONS & RECOMMENDATIONS

8.1 Chapter introduction

This chapter will discuss the limitations of this research and chosen research techniques. Concluding with a list of suggested recommendations to improve the management of CBT activities in the PPMR as per the findings of this study.

8.2 Limitations to this research approach

Every precaution was taken to ensure that the results had good representation and were reliable. However, there were limitations associated with the methodology applied. Table 8.1 presents a list of the limitations encountered.

Table 8.1 – Limitations of this research

Limitations encountered
Time and financial constraints meant that the surveys had to take place in a short time frame resulting in a smaller sample than the expected for the CBT tourists, marine operators and government representatives' surveys.
The CBT tourists survey expected to produce an even representation from each authorized CBT operator however, due to different business volume and dedication to the research two operators are underrepresented.
The non-obligational character of the questionnaires allowed for the surveyed to simply refuse to participate. In the case of the marine operators' crew this could be related to those that do not have a positive opinion of the regulations/MPA and therefore, prefer to not express it.
Due to the small and seasonal government representation in the Ponta do Ouro village it was not possible to interview all government sectors desired.
The observation method used for the analysis of the human/dolphin interaction and boat impacts had an opportunistic approach and was conducted previously under a pre-determined methodology. For that reason, the data obtained was then adapted for the aims and objectives of this specific research.

Furthermore, the results produced only represent the attitudes and perceptions of the respondents and those under observation at the time of the collection of data as must be viewed as such.

Regardless of these limitations all possible measures were considered to maximise the response rates of the surveys and to overcome the effects of said limitations (see Chapter three).
Likewise, participants cooperation was high and the results obtained can be considered as authentic and reliable.

8.3 Suggested recommendations for the management of CBT

After a critical analysis of the results produced by this study a series of recommendations have been devised to improve future management practice of CBT and promote marine mammal conservation. These are case-specific to the PPMR's bottlenose dolphin population but can be adapted to national levels.
The recommendations were divided into four main groups (Table 8.1) and also presented in a diagram to demonstrate the application of each point with an hierarchy perspective (Figure 8.1). Figure 8.2 is a diagram explaining the CBT operators approach and manoeuvres guidelines.

Table 8.2 – List of recommendations to the management of CBT in the PPMR.

Category	Recommendation
Code of conduct	Divide into two codes of conduct one for authorized operators and one for recreational boaters and other marine operators with simpler, clear realistic regulations and feasible in the field (Machernis, Powell, Engleby, & Spradlin, 2018; Martin et al., 2016; Parsons & Woods-Ballard, 2003; Scarpaci et al., 2003, 2004; Steckenreuter et al., 2012a; Sullivan & Torres, 2018);
	Specify types of boat and swimmer approach and indicate which are allowed and not (Constantine, 2001; Marega-Imamura et al., 2018; Martinez et al., 2010);
	Include allowed speed (20knots) and a gradually reduction of it from 50 meters of animals (Guerra & Dawson, 2016; Machernis et al., 2018; Steckenreuter et al., 2012a);
	No approach within 50 meters in the presence of calves (1/3 of adult's body length) (Allen, S; Smith, H; Waples, K;Harcourt, 2004; Steckenreuter et al., 2012a).

CBT operators and tours	Include educational and awareness component to tour (Bentz et al., 2016a; Buultjens, Ratnayake, & Gnanapala, 2016; Filby et al., 2015; Lück, 2015, 2016; Machernis et al., 2018; Scarpaci et al., 2003);
	Incorporate other activities to reduce focus and pressure off the dolphins (reef snorkelling, birds etc);
	Formal training of the boat crew on boat and swimmer approach, dolphin behaviour, data collection, guiding skills etc (Buultjens et al., 2016; Filby et al., 2015; Gaitree & Ian, 2015; Nicholls, Townend, Bradbury, Ramsbottom, & Day, 2013; Parsons, 2012).
PPMR management of CBT	Accreditation of operators based on compliance to guidelines and security measures for costumers (Gaitree & Ian, 2015; Parsons, 2012)
	Increase education efforts of the recreational boating community with pamphlets and signage (Bentz et al., 2016a; Buultjens et al., 2016; Draheim et al., 2010; Filby et al., 2015; Gaitree & Ian, 2015; Hassan et al., 2017; Inman et al., 2016; Sullivan & Torres, 2018; Trave et al., 2017);
	Creation of a phone app with open access to all to inform of the zoning, regulations and report infractions (Martin et al., 2016);
	Forum and workshops for regular communication with the stakeholders to discuss awareness, regulations, policy and monitoring and the use of citizen scientists (Buultjens et al., 2016; Hassan et al., 2017; Inman et al., 2016; Parsons, 2012; Sullivan & Torres, 2018; Trave et al., 2017);
	Precautionary approach (due to current lack of information) through “time-area closures”, only CBT vessels should be authorized to cruise within 500m of the beach to reduce boat traffic on common dolphin grounds (Allen, S; Smith, H; Waples, K;Harcourt, 2004; Machernis et al., 2018; Parsons & Woods-Ballard, 2003; Pérez-Jorge et al., 2016; Trave et al., 2017);
	Precautionary approach (due to current lack of information) through “trip/visitor limits”, no tours allowed after 4pm on peak season (Allen, S; Smith, H; Waples, K;Harcourt, 2004; Gaitree & Ian, 2015; Hassan et al., 2017; Machernis et al., 2018; Trave et al., 2017).
Monitoring	Long-term monitoring of the dolphin’s population demography, distribution and behavioural changes is necessary to provide

	reliable information and ensure successful management or adapt when required (Inman et al., 2016; Machernis et al., 2018; Meissner et al., 2015; Pérez-Jorge et al., 2016; E. Pirotta et al., 2015; Steckenreuter et al., 2012a; Trave et al., 2017);
	Operators and tourists' compliance with regulations requires monitoring (Hassan et al., 2017; Scarpaci et al., 2003; Steckenreuter et al., 2012a; Trave et al., 2017);
	The carrying capacity of CBT and visitation levels must be ascertained (Guerra & Dawson, 2016; Parsons & Woods-Ballard, 2003; Trave et al., 2017).

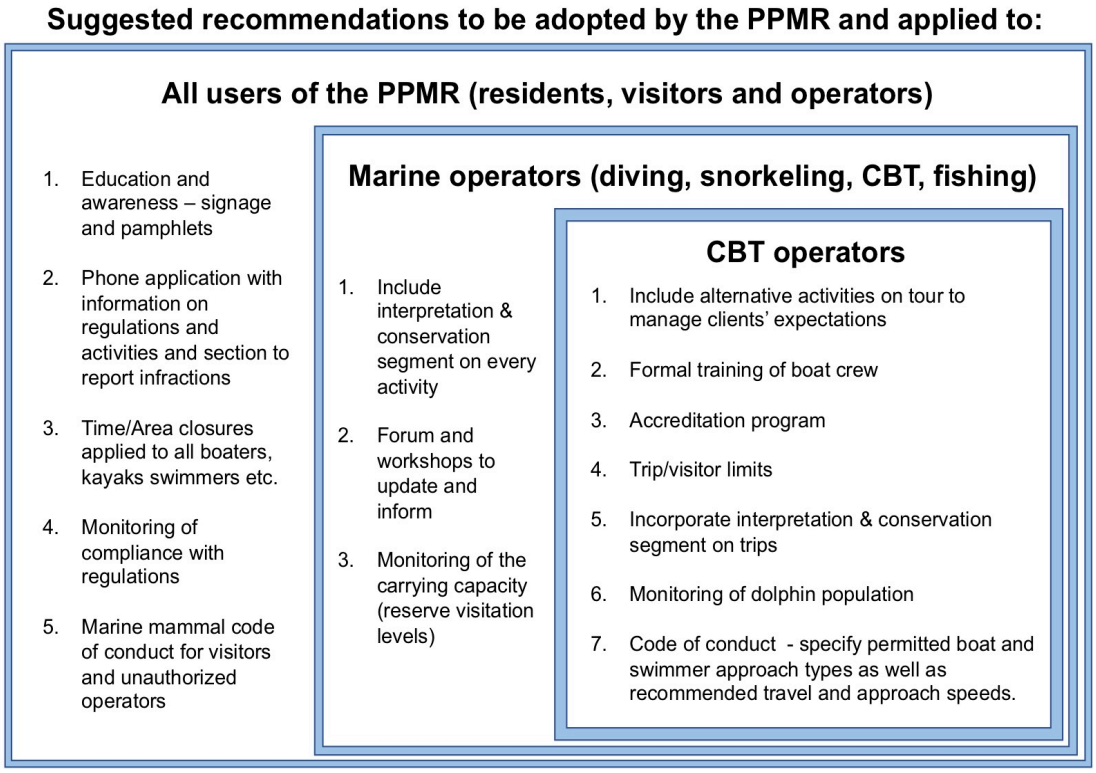

Figure 8.1 – Diagram indicating to which group the recommendations apply to.

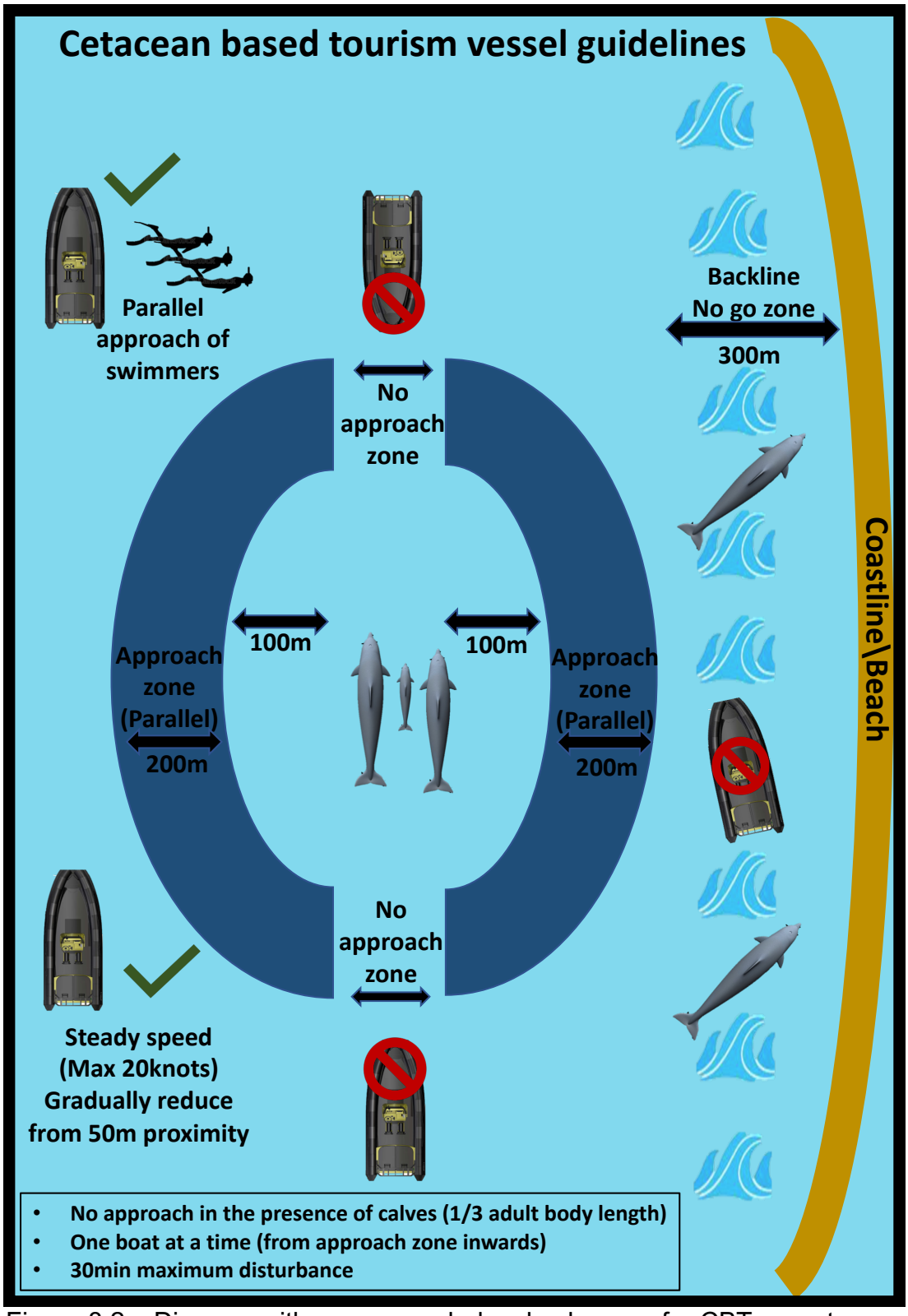

Figure 8.2 – Diagram with recommended code changes for CBT operators.

9 CONCLUSION

This study aimed to determine the impacts that CBT activities have on a resident population of bottlenose dolphins in the PPMR in order to provide recommendations for the present management plan and support the devising of the guidelines at national level.

It applied a mixed methods approach with:

1. Observations of the interaction between dolphins and humans/vessels;
2. Close-ended questionnaire surveys with the CBT tourists and commercial marine operators;
3. Interviews with local government representatives to complement the knowledge gained from the data obtained through the previous methods.

The results confirm that the adherence to the PPMR code of conduct and permit conditions is effective in minimizing the effects of CBT. However, changes found in this study are biologically meaningful for the population. Both human and vessel interactions are disrupting the population's behavioural budget and may alter long-term survival and reproduction at the individual and population level (Lars Bejder et al., 2006; Machernis et al., 2018; Martinez et al., 2010; Orams, 2004).

CBT can have socioeconomic benefits and aid conservation (Parsons, 2012). However, there needs to be a shift from ownership falling exclusively on the operators to ownership being shared between operators and tourists because the last have proved that, if properly educated, can be used to increase the operators compliance with regulations (Ballantyne et al., 2011; Bentz et al., 2016a; Draheim et al., 2010; Filby et al., 2015; Lück, 2015).

This research provided sufficient evidence to support the management recommendations suggested in table 8.1. If these mitigation measures are successfully implemented the PPMR could have a thriving sustainable CBT industry, providing a significant boost to the local economy (Buultjens et al., 2016).

Parsons (2012) believes that it is possible for the operators to minimize their impacts, possibly enough so that there are no lasting negative effects. Nevertheless, it is necessary to enact legislation specifically for the protection of cetaceans and the management of the CBT industry (Parsons & Woods-Ballard, 2003).

It is also important to ensure that these regulations are designed in a manner that can be comprehended by all boaters, are realistic in the field and easily enforceable (Martin et al., 2016; Scarpaci et al., 2004).

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