

Possible impacts of a marine protected area on the artisanal fisheries on Inhaca Island, Mozambique

With a focus on fishing grounds and transportation



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Abstract

Ponta do Ouro Partial Marine Reserve is a new marine protected area that was approved by the Mocambican government in July 2009. It's a reserve that will extend from Ponta do Ouro close to the South African boarder to the mouth of Maputo River close to Maputo, the capital city. Along with this new reserve come restrictions, that can have impacts on the local communities who are depending on marine recourses for a living. For example it will be prohibited to fish for commercial purpose within this area.

Inhaca is an Island located inside Ponta do Ouro Partial Marine Reserve and inhabitants on the Island are depending on artisanal fisheries as one of the dominating livelihoods. The main purpose with this study was to find out to what extent this new reserve could affect the artisanal fisheries on Inhaca by collecting basic information about their fishery such as fishing grounds and transportation facilities. This was made with the method of semi-structured interviews with 32 fishermen on Inhaca born and raised on the island. The fishing grounds were compiled into a map to see if they are located inside or outside the new restricted area. The result showed that the majority of the fishing grounds were situated within the new restricted zone. The fishermen are however positive to the idea to go further away from Inhaca to fish but the lack of bigger boats and engines prevents them.

The Government of Mozambique is creating marine protected areas to meet its international commitment to conserve biodiversity but also to promote tourism. If this is successful or not is disputed because of the key challenge to balance conservation of biodiversity and local community development. The future outcome of a new marine protected area at Inhaca Island is therefore unknown and hopefully can this report contribute with knowledge needed for an implementation process that includes the local community.

This report will also be handed to the marine manager of the PPMR.

Keywords: Marine Protected Area, Ponta do Ouro Partial Reserve, Maputo, Inhaca Island, fishing trends, Government, tourism

Sammanfattning

Ponta do Ouro Partial Marine Reserve är ett nytt skyddat marint område som blev godkänt av Mozambiques regering i juli 2009. Det är ett reservat som ska sträcka sig från Ponta do Ouro som ligger vid gränsen till Sydafrika och hela vägen upp till Maputo River som ligger i närheten av huvudstaden Maputo. Det nya reservatet kommer med restriktioner som kan påverka den lokala kustnära befolkningen som är beroende av marina resurser för sin försörjning. Det kommer till exempel att vara förbjudet att fiska i kommersiellt syfte inom reservatet.

Inhaca är en ö som ligger innanför det nya reservatet där en stor del av invånarna livnär sig på småskaligt fiske. Syftet med den här rapporten var att undersöka på vilken effekt det nya reservatet kan ha på det småskaliga fisket. Detta gjordes genom att samla fakta om fisket så som fångstplatser och transportmöjligheter. Rapporten bygger på intervjuer med 32 fiskare som är födda och uppvuxna på ön. Fångstplatserna sammanställdes på en karta för att se om de låg innanför eller utanför det nya reservatet. Resultatet visade att majoriteten av fångstplatserna finns inom gränserna för reservatet. Yrkesfiskarna skulle gärna vilja fiska längre ut men på grund av dåligt anpassade båtar och motorer så är det oftast inte möjligt.

Regeringen i Mozambique inför nya skyddade marina områden för att kunna möta internationella avtal som handlar om att bevara biologisk mångfald och för att främja turism. Vare sig det här blir framgångsrikt eller inte är det omtvistat på grund av utmaningen att kunna balansera bevarandet av biologisk mångfald och utvecklingen av lokala samhällen. Det framtida resultatet av det nya skyddade marina området på och runt Inhaca är därför fortfarande osäkert och förhoppningsvis kan den här studien bidra med kunskap. Rapporten kan bidra med information för den implementationsprocess som involverar den lokala befolkningen.

Ämnesord: Skyddat marint område, Ponta do Ouro Partial Marine Reserve, Maputo, Inhaca, fångstplatser, regering, turism

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Abbreviations

MPA	Marine Protected Area
PPMR	Ponta do Ouro Partial Marine Reserve
MITUR	Ministry of Tourism
UEM	University of Eduardo Mondlane
MBS	Marine Biological Station

1. Introduction

1.1 Ponta do Ouro Partial Marine Reserve and Peace Parks Foundation

Ponta do Ouro Partial Marine Reserve (PPMR), Figure 1, is a project founded by the peace parks foundation which is a foundation that envisages to the establishment of a network of protected areas that links ecosystems across national borders. Their mission is to facilitate the establishment of transfrontier conservation areas that can develop human resources by supporting economic sustainable development and conservation of biodiversity and regional peace and stability (<http://www.peaceparks.org/>). The PPMR is therefore involved in a bigger concept making it one of the Mozambican components in the Ponta do Ouro-Kosi Bay Transfrontier Conservation area which also includes reserves in South Africa. (National Directorate of Conservation Areas, 2011). The peace foundation is also supported by Nelson Mandela. (<http://www.peaceparks.org/>)

1.2 Marine protected areas and local communities

At the national level of Mozambique, Marine Protected Areas (MPAs), like the PPMR, is used by the government to conserve biodiversity but also to promote tourism (Motta H, 2008);(MITUR, 2004). The tourism investment has become an important factor for the government's plan to reduce poverty and create new jobs (MITUR, 2004);(República de Mozambique, 2004). The linkage between tourism and conservation areas is also evident because of the fact that establishing and managing conservation areas has been handed to the Ministry of Tourism and their special selected agency group National Directorate of Conservation Areas. The key challenge in Mozambique is to design MPAs that can balance conservation and community development. There is an open agreement among local communities and governmental institutions that marine resources are declining and that something needs to be done to prevent this from continuing. There is however different views on how to achieve this and some local communities do not see MPAs as the only solution. Local communities agree about the fact that tourism can be economically beneficial but also emphasize that it would not provide employment for everyone (Rosendo et al., 2010). There are also different categories of tourism with various economic frameworks which can have major impacts on local community development. An example of this is Zanzibar, a popular destination in Tanzania where tourism has been pushing the local community away rather than including. (Lange and Jiddawi, 2009)

1.3 Fisheries in Mozambique

There are three types of fisheries in Mozambique; industrial, semi-industrial and artisanal. Industrial fisheries aim is to supply the export market. Semi-industrial fisheries is oriented to both export and local fishing markets. Semi-industrial fisheries have mechanised seines. The seines are connected to cables, which are pulled by a tractor with a winch. Industrial and semi-industrial fisheries accounts for 40 % of the total Mozambican foreign exchange earnings while the artisanal sector supply the domestic market. The artisanal fisheries also play an important role for alternative employment for most costal inhabitants. (Abdul Cawio A. Amade, 1999)

According to the national law, all types of fishing requires a license except from subsistence fishing which is defined as ‘fishing that is practiced with basic artisanal means, with or without a vessel, constitutes a secondary livelihood activity for those who practice it, and does not produce any significant market surpluses (Crona and Rosendo, 2011).

According to the Fishing Administration which is a governmental body working under the Ministry of Fisheries, the industrial and semi-industrial fisheries are easier to control in comparison with the artisanal. Only commercial fishermen require a license, but there are many artisanal fishermen are many and it is hard to distinguish commercial fishing from the subsistence fishing. Fishermen can avoid from paying the license fee by reporting a different purpose of the fishing activities. There are also some general rules regarding mesh sizes, however fishermen in Mozambique in some places are still using illegal nets with mesh sizes that are too small. The fisheries on Inhaca are defined to be artisanal (pers. com with Fishing Administration).

1.4 Management of the Ponta do Ouro Partial Marine Reserve

All information that follows below, which includes the sections 1.4.1, 1.4.2 and 1.4.3, is information extracted from the management plan of the PPMR (National Directorate of Conservation Areas, 2011).

The government of Mozambique proclaimed on 14 July 2009 the PPMR. The reserve has a total surface area of 678 km², and intends to conserve and protect coastal and marine species and their habitats. With a starting point from Ponta do Ouro in the south of Mozambique, the PPMR extends on a straight line 100 meters to the interior, with a seaward extent of 3 nautical miles into the Indian Ocean, all the way up to Inhaca Island, including Baixo Danae (coral and reef area situated in a north east direction from Inhaca, that raise from a depth of 40 to 3

meters). On the west side of Inhaca the PPMR has a seaward extent of one nautical mile. The PPMR has its headquarters in Ponta do Ouro.

The Council of Ministers presented the proclamation of PPMR in terms of the Fisheries Law of 26 September 1990 and the Marine General Fishing Law of 10 December 2003. The laws foresee the establishment of conservation, preservation and management measures for fishery resources. The proclamation of PPMR was also supported by the Environmental Law of 1 October 1997, which establishes the general grounds for the regime of biodiversity protection. It also highlights the importance of activities control within areas of conservation.

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

1.4.1 Fisheries regulation in the management plan

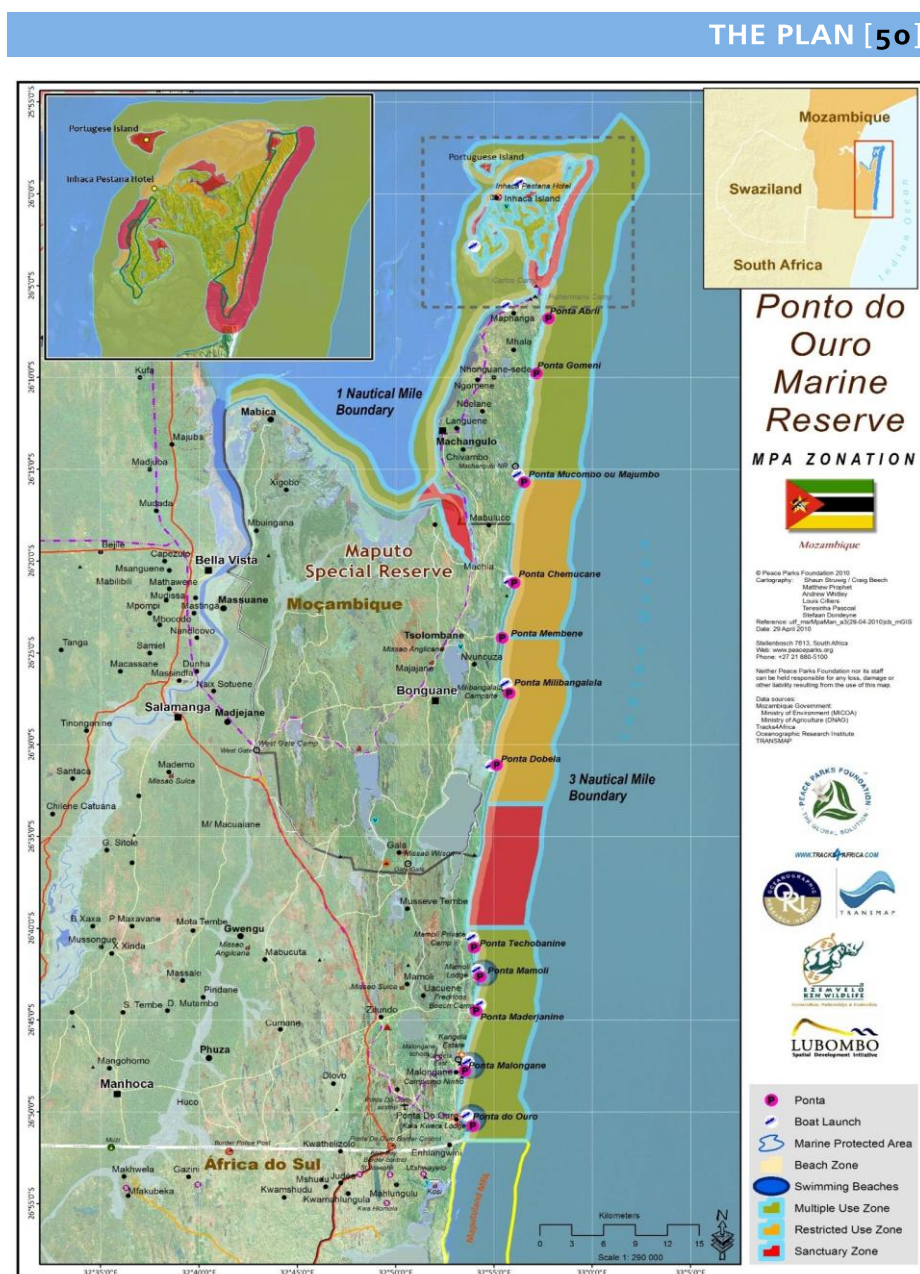
This report will only focus on restrictions in the management plan that will affect the fishery on Inhaca Island. Below is a short description of the content of the management plan, focusing on the restrictions for fisheries.

The purpose of the management plan of PPMR is to protect and conserve the values there are within the reserve because of the poor comprehension of marine conservation efforts that occurs today within local communities living along the coast. The PPMR will allow for reasonable opportunities for the local coastal communities to access and use the reserve, since the population along the coastline is very dependent of the marine resources. The plan uses zoning as a management tool to assist the special control of activities within the reserve. It defines permitted activities and prohibitions within specific geographic areas. The area of PPMR is divided into three different kinds of zones, Figure 1:

- Sanctuary zones (marked re in fig 1)
- Restricted use zones (marked yellow)
- Multiple use zones (marked green)

A full description of the specific regulations in these zones when it comes to fishing and harvesting intertidal organisms can be found in table 1. There are also other restrictions linked to tourism activities but they have not been brought up within this report. Since the area of PPMR covers the entire area from Ponta do Ouro to the mouth of the Rio Maputo, and therefore is very large, six management units have been identified according to the cover of the previously mentioned zones, Figure 1. However this report will only treat the area of Inhaca Island, which is one of the six areas in the PPMR. Within the unit of Inhaca Island there are some zones that are sanctuary, some are restricted use zones and the rest is multiple use zones.

Figure 1 Area of the Ponta do Ouro Partial Marine Reserve distributed into different zones. Inhaca Island is far up north, see enlarged frame. The green zone is the multiple use zone, the orange is the restricted use zone and the red zone is the sanctuary zone.



Map 5: PPMR Zonation

Table 1 Zone description concerning fishing regulations

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

1.4.2 Summary of restrictions

As seen in the table 1, the management plan comes with different kind of restrictions regarding fishing and harvesting intertidal organisms. Commercial fishing will be prohibited in all zones, this means that all of the commercial fishing will have to move from the area. Harvesting intertidal organisms will only be permissible for subsistence use or with special permits such as research and education purposes. Bottom fish will be prohibited both when it comes to subsistence and commercial fishing. Impacts on fishermen regarding bottom fish is reported in a parallel report (Enebrand, 2012). Hence, restrictions regarding tourism activities aren't treated in this report, multiple and restricted zones have therefore the same restrictions (table 1).

1.4.3 Financial sustainability and ecotourism

The financial sustainability for the PPMR is described in two main objectives; Rationale and Strategy. Establishing sustainable financing mechanisms via the rationale objective is to underlie the sustainability of the resource and reduce the financial burden of PPMR activities on the Government. The strategy regarding financial sustainability will be based on the “user-pay” principle with the aim of covering part of the operational management costs of the PPMR. The Management welcomes both foreign and domestic investors in unlocking the ecotourism potential but with clear guidelines of development opportunities from the Marine manager. Improving and developing ecotourism opportunities is one of the key components in the business management.

1.5 Implementation of Ponta do Ouro Partial Reserve

The restrictions reported in the management plan will be the only valid restrictions in the area. There will be no other reserves in the area except from the PPMR. According to the facts that commercial fishing will not be allowed in these new zones, artisanal fisheries on Inhaca can be affected. Before making statements in what degree the artisanal fisheries will be affected it is important to have adequate statistic information about the today's current fishing situation on Inhaca. This could be information like fishing effort, income, fishing grounds and equipment.

If the new restriction zones means that fishermen living on Inhaca have to go further away searching for other fishing grounds, their current vessels might not be customized for this. This could be supported by financial recourses from the government, helping the fishermen to invest in safer vessels. The implementation of the management plan is however a long-term

project that has a time perspective of 20 to 25 years. Scientific researches and monitoring is important factors to be performed in parallel with the implementation of the new reserve for support in the decision making (pers. com. with Marine manager of the PPMR).

1.6 Purpose of study

Marine protected areas are controversial and do not necessarily provide advantages for marine resource users. Many local communities are not always positive with outcome of marine protected areas (Rosendo et al., 2010). With the background of the PPMR and the interview with the marine manager the main aim of this report is to collect basic information about the current artisanal fisheries at Inhaca and to analyze how the new protected area can affect the artisanal fisheries. This report contributes with socio-dynamic data about with facts about the artisanal fisheries at Inhaca, and may hopefully be useful to authorities and other stakeholders in their effort to reach a sustainable future implementation of PPMR. In detail the study seeks to explore:

- What are the overall fishing trends among the fishermen on Inhaca focusing on spatial distribution of fisheries grounds and transportation?
- How is the new Ponta do Ouro Partial Marine Reserve going to affect the current artisanal fisheries on Inhaca based on facts from this study?

2. Method

2.1 Study Area

Inhaca belongs to Mozambique and is an island located 32 km east from the capital city Maputo, in southern parts of Mozambique, Figure 2. On the west side of the island lies the entrance of a larger bay called Maputo Bay, while the eastern shores are exposed to strong and current waves of the open Indian Ocean. The Island has an area of approximately 40 km² and is about 12,5 km from its northern point, Ponta Mazondue, to the southeast point, Ponta Torres. (W.Macnae and Kalk, 2001)

The climate at Inhaca is subtropical with a rainy season in October to March. The difference in amplitude between low and high tide varies distinctly depending on neap or spring, leaving widespread intertidal areas exposed during low tide in spring periods. The tide vary with an amplitud of 0.1 to 3.9 m. (Gullström and Dahlberg, 2004)

The island is well known for its marine and terrestrial environments which provides high biological values. Examples of marine ecosystems that could be found at Inhaca are coral reefs, sea grass beds, sandbanks, tidal channels, mud flats, rocky shores and mangroves. This has attracted many biologists to come and visit the island and in 195 a research station was built to facilitate the teaching of biology for students coming from both domestic and foreign universities. The rich marine flora and fauna was also announced by the government in 1965 when they declared parts of the Island to be nature reserves. This was also deemed necessary to be able to control the excessive collecting of valuable species. Tree felling and tilling of land was also declared to only be allowed for the needs of local people. Following the independence Mozambique Republic, the Marine Biological Station (MBS), has been administered since 1980 by the biological faculty at the University of Eduardo Mondlane (UEM). (W.Macnae and Kalk, 2001).

2.1.1 People of Inhaca

The population of Inhaca is estimated to be around 5200 people where the dominating livelihood is fisheries followed by tourism and public sector services. The fisheries includes both women and men where the men do the catching of the fish and the women in a organisation called ladies organisation buy the fish from the fishermen and sell it on to the market in Maputo. Women also collect intertidal invertebrates for selling and eating.

The people of Inhaca speak mostly local languages like Shangana or Ronga and very little Portuguese. When the people are interviewed most of them prefer using the local language. The best Portuguese speaking inhabitants on Inhaca is the ones that works within the tourism, the public sector and people working at the MBS (pers. com. with Arlindo Machel).



Figur 2. Location of Inhaca. Map created in Google Earth.

2.2 Interviews with fishermen on Inhaca Island

The interviews with the fishermen were carried out at Inhaca in May 2012. All the participants in the study were approached while walking around on the beach or in the village. There was no specific choice of respondent other than it had to be a fishermen living on Inhaca Island. The interviews were held with one respondent at a time and the total number of fishermen was 32. None of the fishermen who were asked to participate in the interview declined participation. All fishermen interviewed were men.

All interviews with the fishermen on Inhaca were carried out with help from a local translator and guide, Arlindo Machel. He was born on the island and is well familiar with the environment and the people. The questions in the questionnaire had been elaborated several times and were well understood by the translator. Depending on the respondent's language of preference, interviews were held in the official language Portuguese or in the local language *Shangana*. After each respond the answer was directly translated into English and written down on paper. The translator masters all three languages well.

The study is based on quantitative methodology. The interviews were semi-structured and the questions were held standardized and open-ended. This means that the questions were made in a predefined order and wording, while allowing for explanatory answers and follow-up questions for those answers that were considered important. To be able to equally compare the answers from all the respondents when doing the analysis, the goal was that each respondent would have the same "question-stimuli" and the questions were therefore very specific.

The predefined questioner was written in English with open-ended questions, meaning that there are now pre-defined answers. Space was left for clarifications and follow-up questions.

2.3 Methodological challenges

There are several methodological challenges with these kinds of qualitative interviews studies. First of all there are always possible sources of error in all kind of surveys. Some of the most important ones could be: vague questions, tone of the interviewer, misunderstanding of questions or maybe the respondent is mistaken (Alan Bryman; 2001, p 124). Secondly, working with a translator always poses an extra challenge since questions and answers are modified when they are being translated. Usually the accuracy of information depends to a large degree on the ability and language skills of the translator.

The questions were thoroughly reviewed with the translator in advance to make sure that all questions were clearly understood by the translator before the interviews began. The question

needs to be neutral in formulation; otherwise there is a risk that people answer in a confirming way in order to fulfil expectations. Another thing to be aware of is the problem with sensitive questions. Here was the translator's knowledge of the culture and the people essential in order to approach these questions in a proper way. The interpreter had a major role during the project, which meant that he knew the exact aim of the study and could therefore ask the questions in a right way in order to get the correct data. (Bryman, 2001)

There was no mention about the PPMR before the interview started in case this would affect the answers. In some interviews was the PPMR mentioned in the end of the interview to see if they knew about it and if they had an opinion about it. People working at the local fishery authorities were also asked, to see if they heard about the PPMR and had an opinion about it.

2.4 Questions

The questions are based on the restrictions within the Management plan. A summary of the restrictions which is compiled in chapter section 1.4.2 based on table 1 address that no commercial fishing is allowed in neither of the zones within the PPMR. The questions were formed in a way so that conclusions were left for the questioner to determine together with background information of the PPMR. The questions were formed so that they easily could be answered without greater complexity. Questions that form the basis of this study are:

- Are you from Inhaca?
- How old are you?
- Do you have another job besides fishing? If yes what kind of job?
- Did your ancestors also work as fishermen?
- Do you fish every day?
- Do you have a boat? If yes, what kind of boat?
- Where do you fish? (a more detailed explanation in section 2.3)
- Would you like to fish further away from Inhaca if you had the possibility? If yes, what stops you from fishing further away?

The first five questions give basic information about the fishermen in order to understand how important the job is for the fisherman and if he has any alternative employment. The last three questions are linked to fishing grounds and transport facilities in order to see if they fish within/outside the PPMR and what possibilities they have of fishing further away. The interview also raised other questions about their fisheries but not all of them have been

compiled in this report. All questions and in the right order as they were asked is found in Appendix 1 and some of the questions have also been brought up in a parallel report (Enebrand, 2012).

2.5 Mapping fishing grounds

In the interviews, the fisherman were handed a map over Inhaca. The fisherman was introduced with compasses and significant places over the island so that he could locate himself. The fisherman then got the chance to point out his fishing grounds with no restriction limits. The name of the sites was also written down directly on the map in the moment when the interview was conducted. A new unmarked map was handed out in every new interview so he couldn't see answers from other fishermen.

Reported fishing grounds in the interviews with the fishermen were written down on a list. A more exact location of the sites was then picked out partly with a GPS Etrex Garmin and partly on a navigational chart. This was done with help from the boatdriver and translator working at the Marine Biological Station, both born and raised on Inhaca and with a good knowledge with the area. The coordinates were later compiled in a map, created in Google Earth.

3. Result

These results are based on the answers from 32 fishermen interviewed on the island. All of the fishermen interviewed are born and raised on Inhaca and most of them have ancestors who also worked as fishermen. Thirteen percent of them had other jobs besides fishing including building houses, building boats, working as a guard at Marine Biological Station or working in tourist camps. Eighty-seven percent work merely with fishing. Most of the fishermen are in the ages of 30-39. Age distribution is illustrated in the Figure 3 below.

According to the question if they had heard about the PPMR all of them said yes. The local authorities were positive to it saying that the fishing today is not sustainable and that it is good with a reserve so that the fish stocks can recover. The fishermen when asked the same question said that they had no opinion about it. They said that they first have to see it implemented to be able to have an opinion about it.

Age distribution

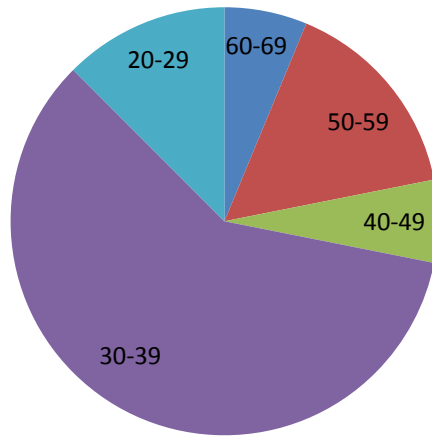


Figure 3. Age distribution among the interviewed fishermen.

3.1 Equipment

Seventy-five percent of the fishermen operate with motorboats, 17 percent with sailingboats and 17 percent without a boat, Figure 4. According to the Maritime Authority the number of boats registered on Inhaca are 51. Based on the responses from the 28 fishermen using boats, the number of crew members lies between 3-10 people depending on size of the vessel.

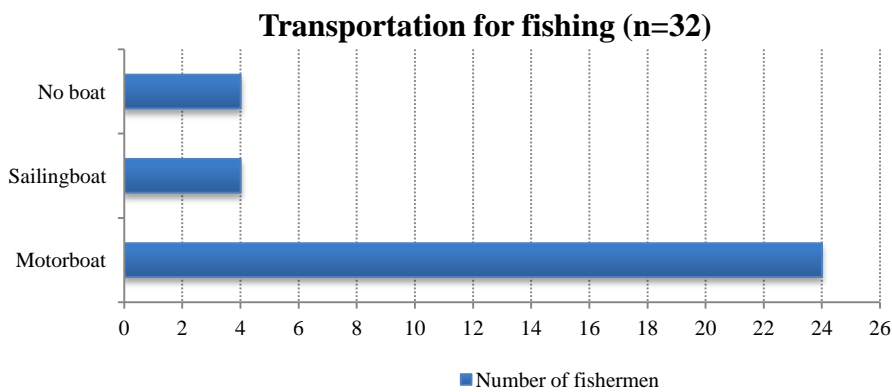


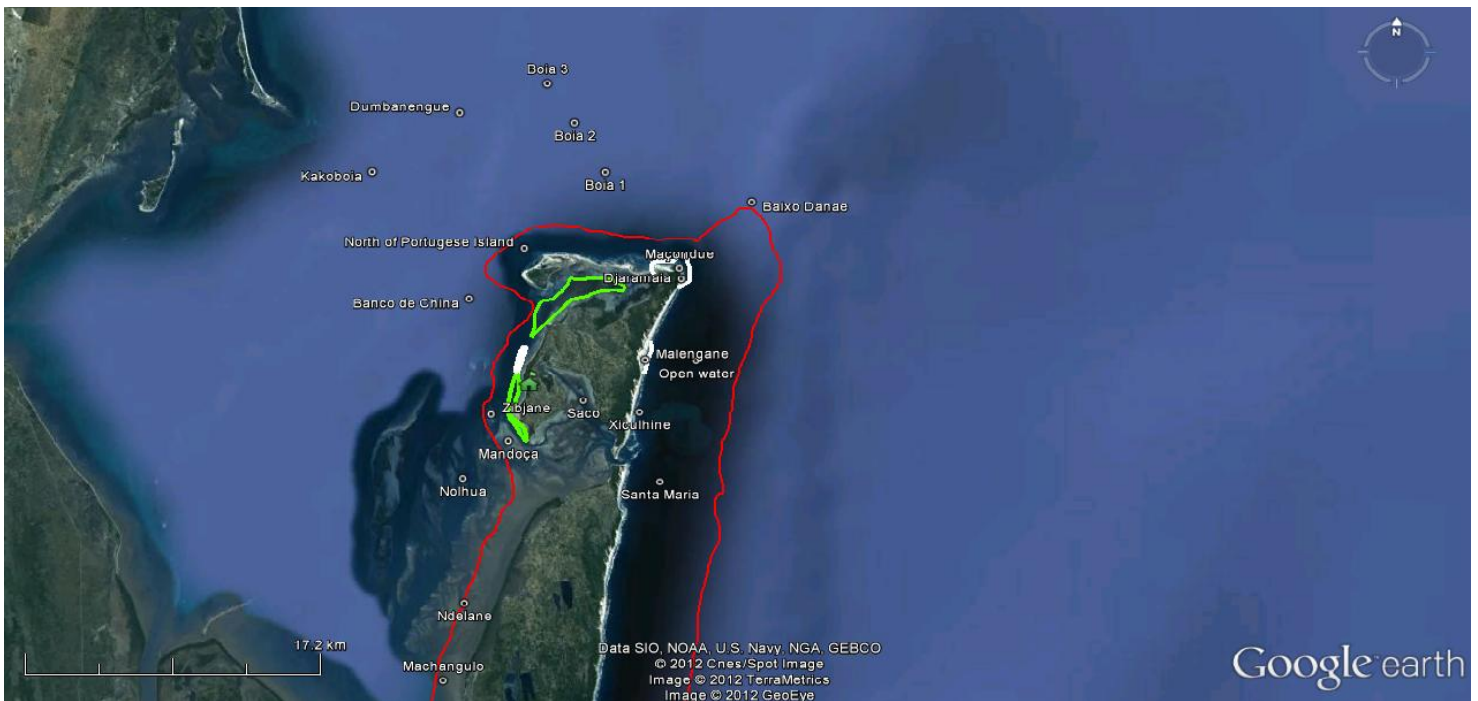
Figure 4. Vessel distribution

3.2 Fishing trends

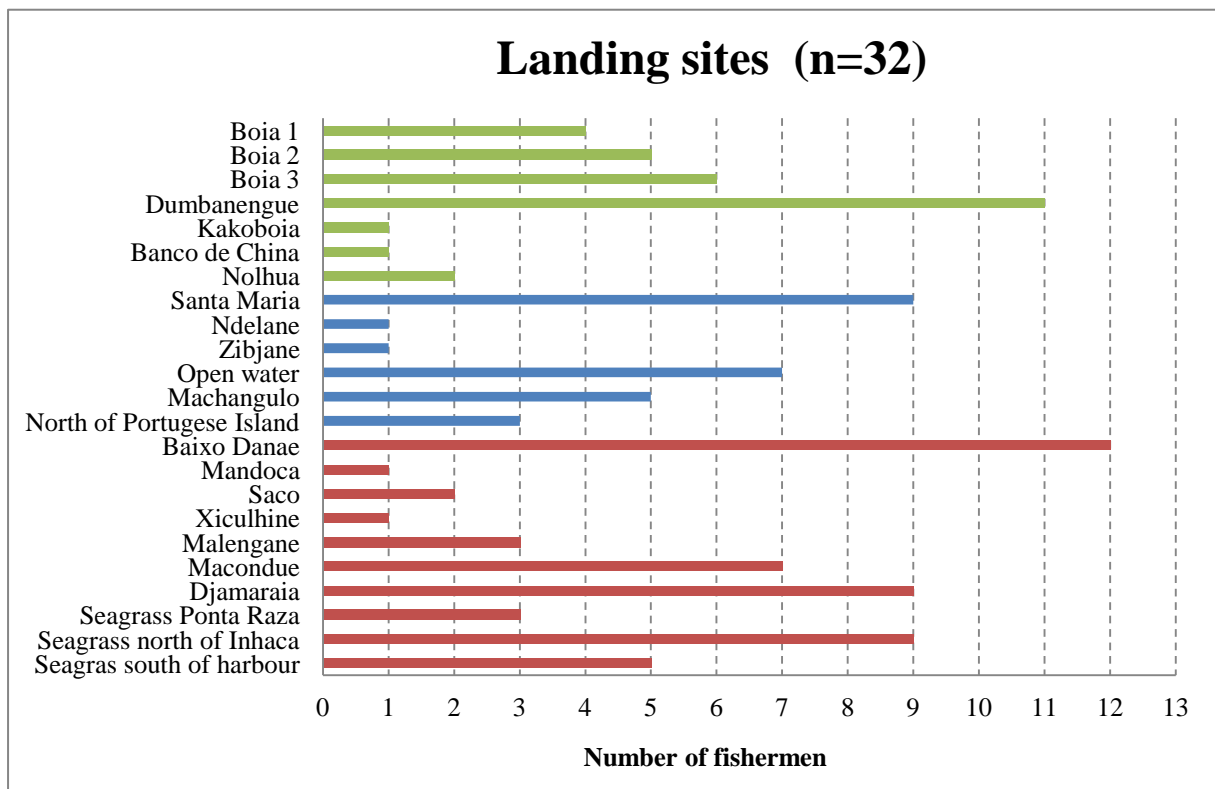
3.2.1 Fishing grounds

Fishing grounds reported in the interviews with the fishermen at Inhaca was compiled in a map, Figure 5. The fishing grounds are located both inside and outside the PPMR. Zibjane, Ndelane, Santa Maria and Open water are situated partly inside and partly outside the PPMR. Baixo Danae point represents the southern part of the fishing ground closest to the PPMR area. The site that is called “Open water” is extending along the whole east coast of Inhaca Island and all the way down to Santa Maria. It begins approximately one kilometer out from the shores with no clear definition of where it ends. This highly depends on the weather and boat size because of the fact that the water is more current on this side.

Distribution of fishing grounds among the fishermen is illustrated in Figure 6. The green bars represent fishing grounds located outside the PPMR and stands for 28 percent of the total amount of fishing grounds used. The blue bars are the sites situated both in and outside the PPMR and represent corresponding 24 percent and the red sites located within the PPMR represent 48 percent of all sites used. The sites entirely or partly inside PPMR (red and blue bars) together represent 72 percent of the total number of fishing grounds according to responding fishermen. Sites outside the PPMR can only be reached by boat therefore fishermen without a boat only operates within the PPMR area. Fishermen with boats operate both outside and inside the PPMR. The fishermen are however very dependent on the weather. If the weather is good they fish everyday but when it is cold and windy their small boats can only operate in waters closer to land.



Figur 5. Names of the fishing grounds stated in the interviews. Red line- Ponta do Ouro Partial Reserve, Markpoints- fishing grounds, green areas- seagrass, white areas- rocks and coral, green house- Marine Biological Station.



Figur 6. The most exploited fishing grounds reported in the interviews. Green bars represent sites located outside the PPMR, blue bars are sites located both inside and outside and red bars show sites located inside the PPMR area

Twenty-eight of 32 fishermen report that they would like to fish further away from Inhaca if they had the possibility. The main reasons for fishermen to not fish further away is shown in Figure 7. Four out of 32 fishermen would not like to go further away because they feel satisfied with their current fishing situation or already have the possibility to go operate further away from Inhaca.

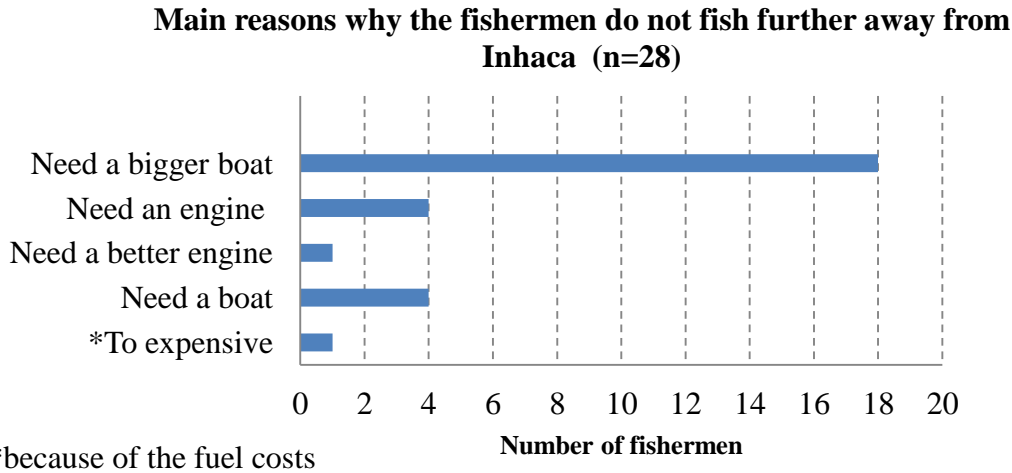


Figure 7. Main reasons for why the fishermen don’t fish further away from Inhaca. This is based on the answers of the 28 fishermen that would go further away from Inhaca and fish if they had the possibility.

4. Discussion

4.1 Fishing grounds

The aim with this study was to find out in what extent the PPMR could affect the artisanal fisheries on Inhaca based on information about their current fishing grounds and transportation possibilities. According to 32 fishermen that were interviewed, 48 % of the total number of fishing grounds that are in use today, are situated within the PPMR and will therefore no longer be in use under the restrictions of the PPMR. There are some fishing grounds that are located both inside and outside the PPMR, which represent 24 % of the total amount of fishing grounds and will partly be lost according to the PPMR restrictions. The remaining part, 28 % of the fishing grounds, lies outside the PPMR and could therefore still be in use.

Restrictions will have great impact on those fishermen who fish without a boat. These fishermen will have no possibility to operate further out than one nautical mile on the west coast and three nautical miles on the east coast, in fact they will be far from being able to that even when the tide is low. Operating outside the PPMR requires a boat for safety.

If 48 % of the fishing grounds among the fishermen will disappear this might lead to a higher pressure on those fishing grounds already used but located outside the PPMR. This statement is based on the fact that the fishermen today have no ability to go further away from Inhaca because of the lack in equipment. Most of the fishermen, 28 out of 32, is however sympathetic to the idea of going further away from Inhaca if they had the equipment. Equipment is expensive and not all of the fishermen could afford such investment like bigger boats or better engines. The remaining four fishermen either said that they don't want to fish further away from Inhaca because they are pleased with their current fishing situation or because they already can.

A specific fishing ground that needs to be of consideration is Baixo Danae, which is one of the sites in the management plan that has been pointed out to be one of the most important rock and coral reefs areas within the PPMR. Baixo Danae is described to rise from 40 to 3 m. According to this study and measurements based on a navigational chart over the area together with the ruler tool in Google Earth, Baixo Danae, in its most shallow areas, 20 m to 3 m, lies outside the three nautical miles that limits the PPMR. If this site is added beyond these nautical miles that defines the extent of the PPMR is uncertain, because it hasn't been further specified in the management plan.

4.2 Impacts on women

In this report it is also important to not forget the women who work within the ladies organization. They sell the fish on to the fish market in Maputo and are very dependent on the fish catches. They would therefore also be affected in a decrease of fishing grounds. The fishing market in Maputo is also dependent on local fish communities nearby such as Inhaca, because it offers a lot of high class fishes such as King mackerel, Rockcod and Emperor Snapper, that can't be found in the water near Maputo. The reason is the lower salinity in the water, caused by the Maputo River that empties close to the capital city. Women will also no longer be able to harvest intertidal species for selling according to the new restrictions and they will therefore lose an important income and food supply.

4.3 Inhaca and future tourism

According to the management plan, the ecotourism is promoted to be one of the key projects in the business plan which invites both domestic and foreign investors. Previous studies made on tourism, emphasize that tourism can be a factor pushing the local communities away (Rosendo et al., 2010);(Lange and Jiddawi, 2009). For example the popular destination Zanzibar in Tanzania which is an Island like Inhaca, located within the Indian Ocean close to

the mainland. Zanzibar has different kind of tourism where not all of them favor the development of local inhabitants. Foreign and domestic investors have built large hotel complex which offers all-inclusive packages which leaves tourists little time to meet the local people and the most of the money is spent within the hotel area. This tourism is called the *all-inclusive tourism*. Another form of tourism is the *budget tourism* which can be owned by local Zanzibar's. This tourism is however not of majority and little money is spent compare to the bigger hotels. The bigger hotels also prefer to hire people from the cities because they know how to speak English in order to better meet the European clientele. This is also pushing the local people away because they speak very little English or no English at all, therefore less attractive on the labor market (Lange and Jiddawi, 2009).

This example can be thoughtful when it comes to the plan of developing tourism in an unexploited area like Inhaca. Tourism could come with many economic benefits and help to alleviate poverty, helping local communities to raise the standard of their living, and making them less dependent on unsustainable marine recourse exploitation that is one of the underlying factors for creating the PPMR, in hope to conserve the biodiversity. There is a common believe along governmental bodies and fishermen that the marine recourses are declining and that something needs to be done. Including the local communities in the developing of tourism can therefore be a win-win situation. But this also puts pressure on the country and domestic and foreign investors to agree with this idea. Or else the local people will have to migrate to other areas within the country where an unsustainable marine recourse use still remains. This will also make them poorer and omitted. This makes the tourism a very strong instrument to direct the development in both macro and micro perspectives.

Introduction of ecotourism on Inhaca can take time and might not promise employment for everyone. Fishermen still need to earn a living and to do that they need to invest in things like better boats and engines. If the implementation takes this in account helping some of the fishermen with financially investment this could alleviate the negative consequences for the local community. Another solution like already mentioned is to involve and make the local people more attractive in the development of ecotourism. For example support locals to speak improved Portuguese or English. Very few people speak English and many of the locals today could improve their Portuguese.

Inhaca is known for its marine and terrestrial nature and many biologists come to explore the Island (W. Macnae and Kalk, 2001). There is no doubt that Inhaca is an attractive place to have tourism with its long sandy beaches, coral reefs and close distance to Maputo, the capital city, which just recently rebuilt the airport (www.skyscrapercity.com). A new road has also been promised by the government to stretch from Ponta do Ouro to Maputo (EPDA, 2011). This will open up for people from South Africa to come because Ponta do Ouro lies close to the border of South Africa, and is already a very popular destination for South Africans. This improvement of infrastructure could also open up for a new tourist flow from South Africa to Inhaca Island. This could be one more reason for helping them to improve their English.

4.4 Source of error

It is important to point out that all these sites were identified with help from different people and because of that fact, answers can differ from each other.

The report didn't include the women in interviews and because of that it is hard to draw good statistical conclusions of the impacts on them. It would be beneficial, in order to draw better conclusions about what impacts the PPMR would have on the artisanal fisheries at Inhaca, if the women also were interviewed.

5. Concluding remarks

- According to this study fishermen will lose 48 percent of their current fishing grounds and also partly the fishing grounds that are situated both inside and outside the PPMR, which stands for 24 percent of the total number of fishing grounds. 28 percent of the fishing grounds is located outside the PPMR and could still be in use.
- Twenty-eight out of 32 fishermen said they would like to fish further away from Inhaca if they had the possibility. Four out of 32 fishermen said they don't want to fish further away from Inhaca because they already can or that they are pleased with their current fishing grounds.
- Restrictions will have great impact on those fishermen who fish without a boat.
- If 48% of the fishing grounds among the fishermen will disappear this might lead to higher pressure on those fishing grounds located outside the PPMR.
- The PPMR will indirectly affect the women working in the ladies organization which also are depending on fish catches.
- Woman can no longer be able to harvest intertidal species for selling.
- Tourism can make the locals less dependent on unsustainable marine resource exploitation, which is one of the underlying factors for creating PPMR.
- There is a common belief among governmental bodies and fishermen that marine resources are declining and that something needs to be done.
- Including locals in the developing of tourism can be a win-win situation.
- Introduction of ecotourism on Inhaca can take time and might not promise employment for everyone. Fishermen still need to earn a living and to do that they need to invest in things like better boats and engines.

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Appendix

Interview questions in the order they were asked.

How old are you

How long have you been a fishermen

Do you have another job besides fishing? If yes what kind of job

Are you from Inhaca

Were your ancestors also fishermen

Do you have children that fish

Do you fish everyday

How many hours per day do you fish

Do you fish with a boat

What kind of boat

Do you have your own boat

How many crew members do you have on the boat/without boat

What kind of equipment do you use

What kind of equipment do you use the most

What kind of net/line and how do you use it

In what kind of environment* do you fish

What kind of fish do you fish the most

In which location do you fish the most (MAP)

How deep is it where you fish

Where is the best places to catch big fishes near Inhaca

In places with very strong currents, do find less, more or similar number of fishes than in water with less current

What kind of fish do you earn the most money from

Are there any rules that stop you from fishing something you want?

How much money do make per boat/week

Would you fish further away from Inhaca if you had the possibility

Do your fishing change over season

Do you fish differently depending on neap or spring

Have you ever heard about someone that has been attacked by a shark near Inhaca.

*Seagrass, mangroves, pelagial, rocks, reeves...