Papa Potwe – An assessment of the socio-political relationship between people and whale shark around Mafia Island

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ACKNOWLEDGEMENTS

ABSTRACT

Amongst the many species targeted for aquatic tourism, we find the whale shark, also known as the largest living fish in the ocean. This species is known for migrating over large distances and can be found in several locations around the world near Equator. However, the whale sharks spotted in the Mafia waters, located at Tanzania's west coast, seem to have a more permanent stay around the island. Its permanent stay is believed to create a relationship between the whale shark and the people resident at Mafia. For the fishing communities at this island, the whale shark is believed to provide an advantage as it is a sign for fish which makes it easy for the fishermen to locate their catch. The relationship between fishermen and whale sharks is not some thing new, but are believed to have existed for a long time.

However, a new type of relationship between people and whale sharks at Mafia Island has developed. Mafia has experienced a rapid growth in the tourism, especially after 2010. The purpose for visiting the island seems, for most tourists, to be the opportunity to swim with and experience the whale sharks. In addition, fishermen claim that overfishing and poor regulation other places in Tanzania have led to more fishermen to the Mafia waters. The rapid growth in tourism and the expanding amount of fishermen to the Mafia coast has lead to an increasing number of boats in the whale sharks habitat around Mafia Island. The interaction from such activities might be crucial for the whale sharks vulnerability and future in this area.

This study attempts to investigate people's perceptions of the whale sharks, how the people interact with this species, and whether this interaction can affect the whale sharks vulnerability. This issue was investigated through a case study of the whale sharks presence around Mafia Island. The study was conducted at Mafia Island from October to December 2017. The data collection were carried out by using a mixed method approach, combining both qualitative and quantitative methods, such as desk studied, interviews, a questionnaire and observations. The results were discussed with aspects from the conceptual frameworks of political ecology and vulnerability in order to answer the research question.

The results from this study suggest that the knowledge level about whale sharks is low amongst people in its nearby habitat at Mafia. However, amongst the groups of people working directly with the whale sharks, perceptions and narratives were discovered. Their perceptions and narratives seemed to influence the way they interacted with the sharks. Some

of their interactions were driven by the advantages emerging from the whale sharks presence. The advantages and disadvantages from the whale sharks presence seemed to be structures creating winning and losing actors in the nearby communities at Mafia Island. The result further suggests that the whale shark can be regarded as a vulnerable species due to the social, political and economic system in place.

This study concludes that these social, political and economic factors shape the relationship between people and whale sharks around Mafia. The knowledge level amongst people regarding the whale sharks, their perceptions and narratives, their access to interaction with, and information about, the whale shark, are results of the islands political and economic system. As the level of knowledge amongst the people in the nearby communities regarding this species are low, and systems regulating and controlling the aquatic activities in the whale sharks habitat are lacking, conservation of this species is difficult. This relationship seems to contribute to the whale sharks vulnerability. The whale sharks vulnerability and the multiple stressors from the human interaction with this species seem to create a risk for a future disaster at Mafia, implying that the whale sharks might disappear from the Mafia waters.

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LIST OF ABBREVIATIONS AND ACRONYMS

CCM – Chama Cha Mapinduzi

DFID – Department for International Development

EIU – The Economist Intelligence Unit

HDR – Human Development Report

IUCN – The World Conservation Union

MIMP – Mafia Island Marine Park

MMF – Marine Megafauna Foundation

NGO – Non-Governmental Organization

NORAD – The Norwegian Agency for Development Cooperation

NORHED – Norwegian Program for Capacity in Higher education and Research for Development

PAR – Pressure and Release model

WWF – World Wildlife Fund

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1. INTRODUCTION

In the waters southwest of Mafia Island, located of the coast of mainland Tanzania, we can find the world's biggest fish, the whale shark or *Papa Potwe* as it is called in Kiswahili. This unique species can be found in several locations near the Earth's Equator and host a population of approximately 8760 identified individuals, and 180 of these can be found in the Mafia waters (Rohner & Pierce, 2017). The whale sharks prefer habitats in warm waters, which are usually found in tropical areas (Colman 1997). This preference makes the whale sharks a popular species for aquatic tourism and the options for the tourists seem to be many:

> "Enjoy the experience: Snorkelling tour swimming with whale sharks in Mexico, the biggest fish in the ocean" (Mexico Whale Sharks, 2018).

> "Get up close and personal with the whale sharks in the Maldives" (Marriott International, 2018).

> "Snorkelling with the whale sharks in Donsol Bay, Philippines" (Ultimate Shark Diving, 2018).

> "Whale shark tours at Australia's coral coast" (Australia's Coral Coast, 2018).

Despite the whale sharks size and high profile in the media and tourism, we know very little about it (Potenski, 2008). This interesting creature can move over large distances and usually migrate to different places depending on the availability of food. Outside Mafia Island, however, the sharks seems to be present all year round, which opens up for a unique opportunity to observe and learn more about them (Rohner et al, 2013). The whale sharks almost permanent stay at Mafia Island creates different interactions with people and the nearby communities.

Previous studies conducted in this area, claim that the whale shark gives the community advantages through a growing tourism and benefits the fishers by tracking their catch (Potenski, 2008). These advantages seem to create economic interests for the people involved, such as the government, the tourism and the fisher folk. However, the advantages are not without consequences (Rowat & Engelhardt, 2007). The rapid growth in Mafias tourism industry since 2010 (Sea Sense & MMF, 2015) and an increasing number of fishing boats arriving in Mafia waters, has lead to more frequent interactions with the whale sharks. This has resulted in injuries to the whale sharks, such as cuts and amputations, mostly caused by unfortunate contact with both fishing and tourist boats (Rohner et al, 2013). According to the

IUCN Red List for threatened species, the whale shark was listed as "Endangered" in 2016, most due to human activities (Pierce & Norman, 2016). To which degree these interactions cause direct threats to the whale shark at Mafia is not clear. However, a growing tourist industry based on the whale sharks presence, and the people's perceptions of the whale sharks, might be crucial aspects when it comes to the whale sharks future and its interaction with humans around Mafia.

Despite the whale sharks high profile in the tourism industry, little is still known about their biology and ecology. It is argued that more knowledge is needed in order to understand how we better can conserve and protect their population. This study focuses on the whale sharks located near to Mafia Island, where the sharks seem to be present all year round. Based on previous research and new inquiries, this study investigates the human and whale shark interaction and whether this interaction can affect the whale sharks vulnerability. The study examines the knowledge level, perceptions and narratives held by the people who are directly and indirectly involved with the whale sharks, and the ways in which they interact with this species. In addition, this study investigates the advantages and disadvantages emerging from the whale sharks presence, in order to determine whether this presence creates winning and losing actors in the communities. By combining the conceptual frameworks of *political ecology* and *vulnerability*, this study investigates how the social and political aspects affect people's interaction with the whale shark and thereby affects the whale sharks' vulnerability and the risk for a possible disaster regarding the whale sharks' future presence near Mafia Island.

1.1 BACKGROUND

In order to understand the significance and characteristics of the whale shark at Mafia, a small review of the species biology and ecology is introduced. This is followed by an introduction of the social and political history of the island in order to provide information about the structures shaping today's societies in Mafia Island.

1.1.1 THE WHALE SHARKS BIOLOGY AND ECOLOGY

The whale shark, *Rhincodon typus*, is the Earths largest fish. This large fish can weigh up to 34 tons and grow up to a total length of 20 meters (Chen et al, 1997). The size and length of the whale shark have been much debated, and can vary considerably. However, most observations have stated lengths ranging between 4-12 meters (Graham & Roberts, 2007). In

comparison with other sharks, the whale shark has a larger size, later maturity, slower growth, and is believed to have an extended longevity. Historically, information and knowledge about the whale sharks' biological aspects has been limited. However, whale sharks are believed to reach an age of more than 100 years and are not mature until the age of 30 (Colman, 1997).

The whale sharks' external is characterized by a relatively large mouth, a broad flat head, followed by their first dorsal fin. Their dark skin is covered with a pattern of small light spots. The function of this characteristic pattern is unknown (Colman, 1997). However, the spots are unique for each individual and can be considered as the shark's fingerprints, which is useful in the photo identification of individuals (Rohner et al, 2016).
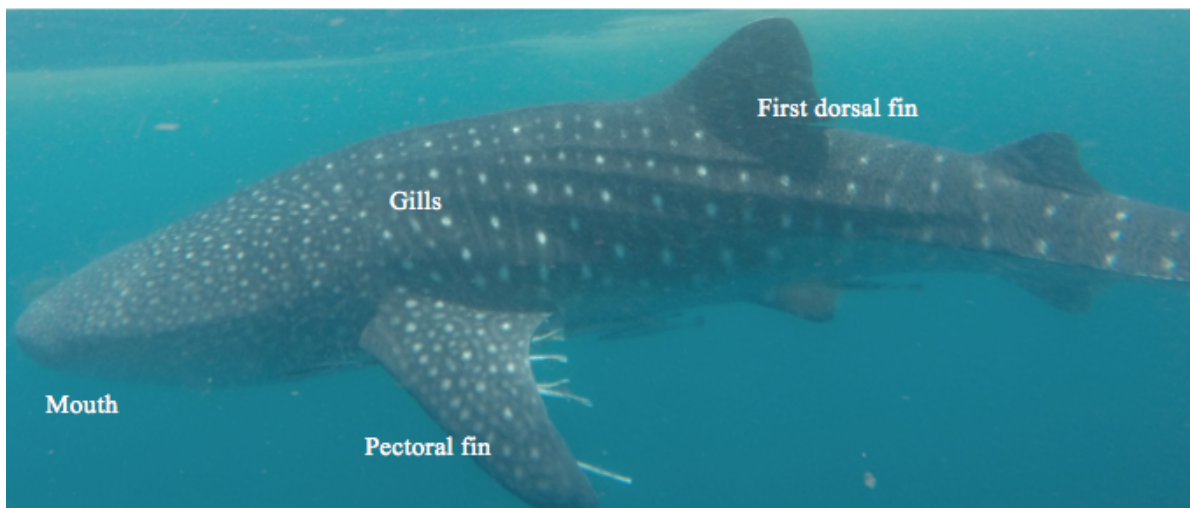
Figure 1: A whale shark off the coast of Mafia. Photo by Sophia Lind

The whale shark can be found in its pelagic habitat, in tropical waters near Equator (see Figure 2), with temperatures ranging between 18-30°C at the surface level. In some locations with this type of warm temperatures, cool nutrient-rich upwellings are brought to the surface. These conditions can be optimal for the production of the nektonic and planktonic prey (Colman, 1997). The whale shark is a filter feeding fish, which feed on a variety of nekton and plankton. Whale sharks feed by opening their mouths in pray-rich waters and suck large amount of water into their mouths (Colman, 1997). The whale shark is known to be mobile and migrate over vast distances. A migration of over 540 km across the equator is recorded. According to geo-positioning tags, whale sharks can have an average movement of 24 to 28 km a day (Pierce & Norman, 2016).

The whale shark's movement can be influenced by a change in local productivity of phytoplankton and zooplankton, changes in wind, water temperatures or other environmental factors. The whale sharks' feeding ecology makes them highly dependent on these conditions (Colman, 1997). The whale sharks can therefore be found in coastal locations around the world. They are known to have a seasonal aggregation in areas such as Australia, Mexico, Philippines, Mozambique, Maldives, the Seychelles and more (Robinson et al, 2013). However, the numbers of whale shark sites are small. In Africa, Mafia Island is argued to be the place where the occurrence of whale sharks is most predictable (Rohner & Pierce, 2017).
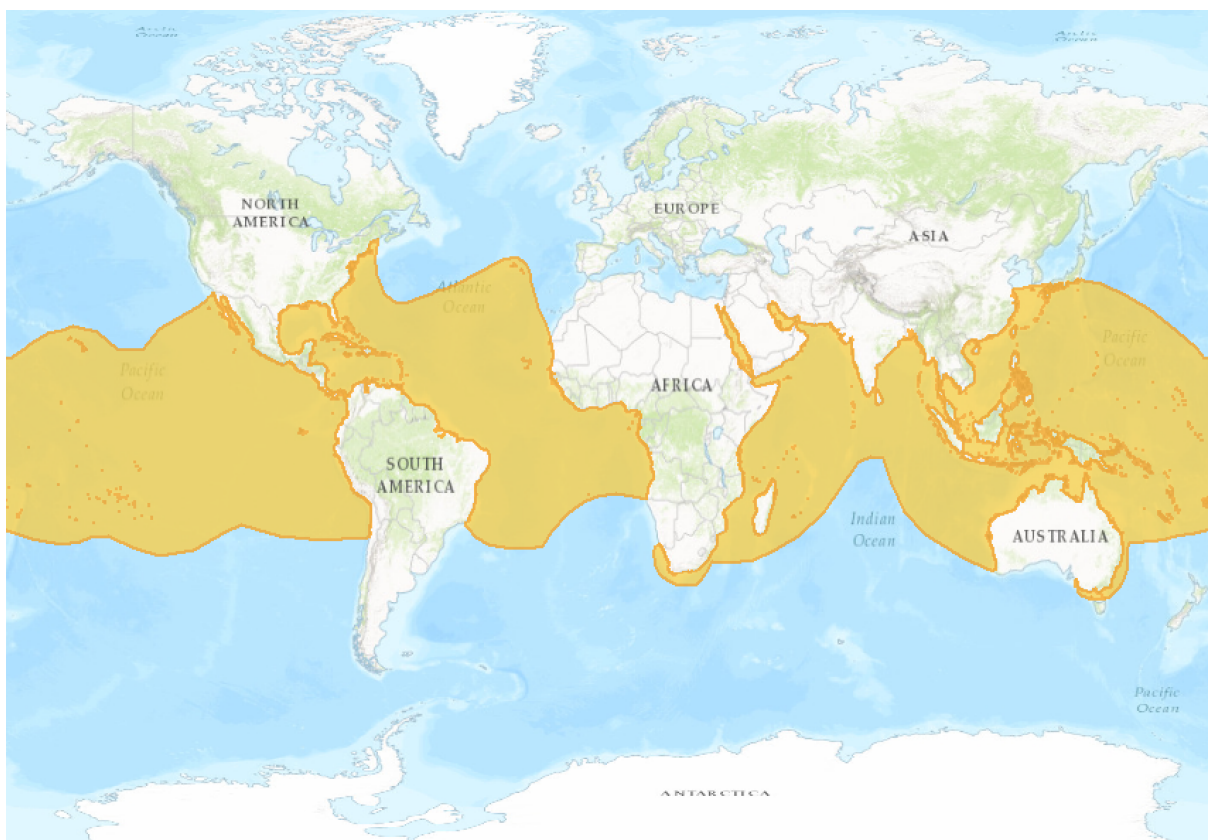
Figure 2: Map of whale sharks distribution worldwide. Source: Pierce & Norman, 2016

In the locations, where the occurrence of whale sharks seems to be predictable, an increase of snorkelling and scuba tourism has developed. The whale sharks presence creates a rare opportunity for a close interaction between whale sharks and humans. This interaction is believed to have an effect on the whale sharks ecology and behaviour (Colman, 1997).

In 1994, the whale shark became listed on the IUCN Red List for threatened species as "Indeterminate". This status implies that the species is "Vulnerable", "Rare" or "Endangered". At that time sufficient information about the whale sharks, in order to place

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the species in the appropriate category, did not exist (Colman, 1997). However, in 2000, more information on the species was collected and the whale sharks were listed as "Vulnerable" on the IUCN Red List. In 2016, more scientific evidence was presented. The evidence showed a 63% decline in the whale sharks population over the last 75 years in the Indo-Pacific Ocean, holding 75% of the world's whale shark population. On a world basis, statistics show that over 50% of the whale shark population has declined, most due to human activities. As a result, the whale shark was listed as "Endangered" on the IUCN Red List in 2016 (Pierce & Norman, 2016).
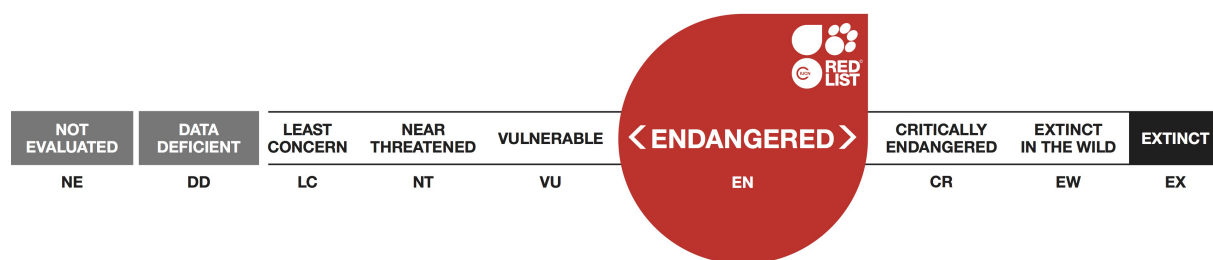
Figure 3: The whale sharks position on the IUCN Red List. Source: Pierce & Norman, 2016

Mafia Island is argued to be one of the most reliable spots to observe whale sharks because they seem to be present throughout the year. The almost permanent presence of the whale shark gives scientists a unique opportunity to conduct long-term research on whale sharks, and makes it possible to follow individual sharks from one year to another (Potenski, 2008).

The whale shark population at Mafia is relatively small. Mafia hosts only 180 identified whale sharks of the global population of approximately 8760 identified individuals. Under a project working on identification of individual whale sharks in 2017, an average of 5.5 sharks was spotted per trip (Rohner & Pierce, 2017). This is an increase in the number of whale sharks spotted per trip, compared to the previous seasons during this project, where 4.8 sharks were spotted in the 2012 season, 4.5 sharks in 2015 and 4.5 sharks in 2016 (Rohner et al, 2013; Rohner et al, 2016; Rohner et al, 2017). According to the research conducted in 2017, the majority of the whale sharks identified at Mafia were males. 88 % of the males were juvenile and ranged between 3-9 meters in length (Rohner & Pierce, 2017).

The whale sharks observed in the Mafia waters can be found on the west side of the island, in Kilindoni Bay, near the town harbour. The whale sharks are often spotted at 0-5 meter's depth (Potenski, 2008) during the period of October to March (Rohner et al, 2013). In this period they feed mostly on sergestid shrimp (*Lucifer hanseni*) which is a pelagic macro-plankton,

typically found near the surface in tropical waters with temperatures up to 30°C. This shrimp is accessible at Mafia Island over a long period and can be the reason for their long stay (Rohner et al, 2013). From February to around mid-March they seem to change pray and dive into deeper waters and are not easily observed until next October (Potenski, 2008).

The whale sharks are believed to feed most of the time and have been feeding in 73% of the observations at Mafia. During the feeding, the whale shark does not only feed on the sergestid shrimp but are also believed to have other prey sources (Rohner & Pierce, 2017). However, the whale sharks are not alone when feeding on the sergestid shrimp. Small planktivorous fish have also been observed feeding on macro-plankton. As a result, whale sharks are often observed swimming together with a school of smaller fish (Rohner & Pierce, 2017).

The whale sharks feeding habit often result in interactions with the local ring-net fishermen at Mafia Island. The ring-net fishers' target is the small planktivorous fish such as *dagaa*, that swim together with the whale sharks (Rohner & Pierce, 2017). The fishers therefore use the whale shark as a sign for fish. As a result the whale sharks can be entangled into the nets. Most sharks are rescued, but some of them are also damaged by cuts, which in severe cases involve targeted amputations of fins (Rohner et al, 2013).

During the research on whale sharks in 2017, 85% of the individuals registered in the Mafia waters had scars of injuries. The majority of the injuries were small, like abrasions along the dorsal fins. However, large amputations and deep cuts from propellers and knifes were observed (Rohner & Pierce, 2017). The majority of these injuries seem to be accidental, typically from boats with high speed in areas where the sharks are feeding in the surface. However, some injuries show evidence of a more targeted damage where entire fins are amputated with knifes. These types of injuries cause by accidental damage and targeted damage can be threatening to the whale sharks' survival (Rohner & Pierce, 2017).

The interaction with the fishermen is not the only factor threatening to the whale sharks at Mafia Island. Since 2010, the whale shark tourism has been growing fast (Sea Sense & MMF, 2015). Whale shark tourism involves taking a group of tourists out in boats searching for the whale sharks, and to swim with them when the sharks are found. During the 2017 season for whale sharks tours, an average of approximately 4 tourist boats were observed searching every day in Kilindoni Bay. This is an increase of 2.2 boats from the 2012-season (Rohner &

Pierce, 2017). An increase in the interest for such activities results in a higher number of boats cruising in the whale sharks' feeding areas. This rapid growth of tourism has resulted in poor regulation of the whale shark tourism and little understanding for the potential economic benefits that occurs with this development. This activity has raised concern for the whale sharks welfare at Mafia Island (Sea Sense & MMF, 2015).
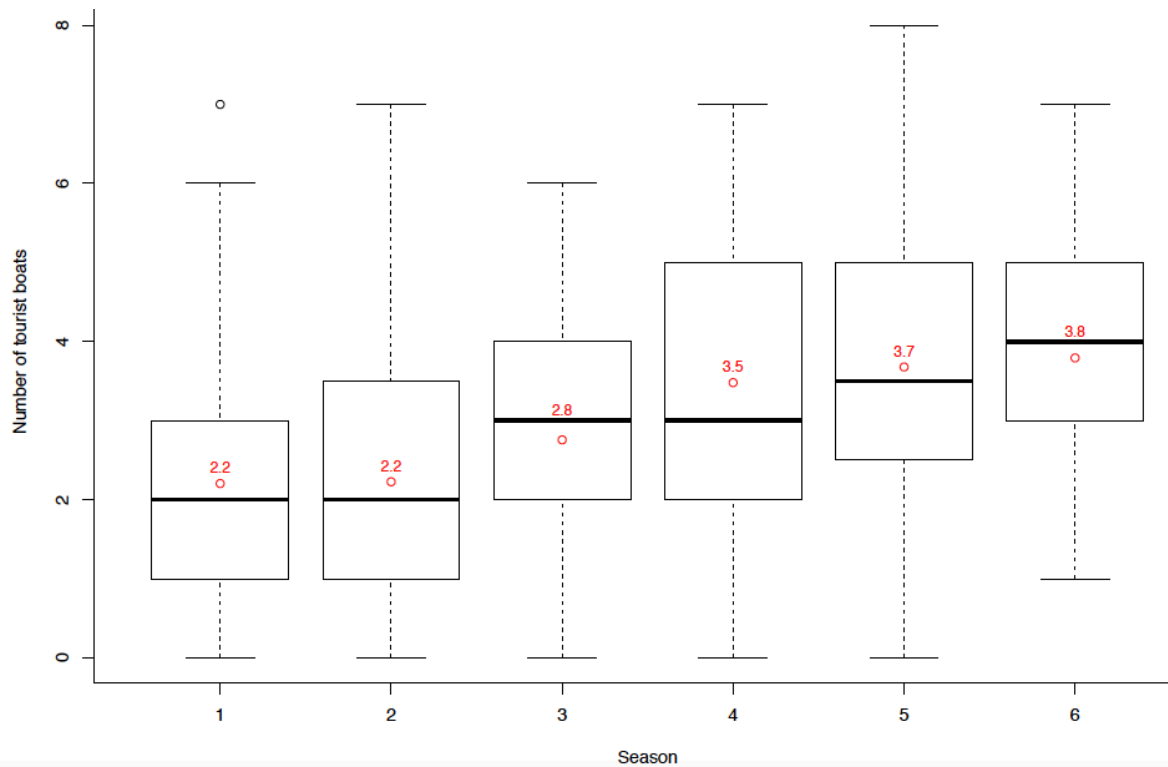
Figure 4: Average number of tourist boats from the 2012 season to the 2017 season. Source: Rohner & Pierce, 2017

However, workshops aiming to raise the awareness on this situation amongst the tourist operators and authorities such as Mafia Island Marine Park (MIMP) and Mafia District Council, have been held (Sea Sense & MMF, 2015). The workshops were conducted by the non-governmental organizations (NGO's) Sea Sense and Marine Megafauna Foundation (MMF) working on conservation of marine species. The workshops' focus was on improving the understanding and knowledge of the whale sharks' behaviour and biology amongst the guides and to implement a Code of Conduct, which is a set of guidelines on how to interact with the whale sharks (see Appendix). Even though this information was given at the workshops, not every participant seemed interested in taking the information into account. Information given one year seemed to be forgotten the next year (Sea Sense & MMF, 2015).

1.1.2 SOCIAL AND POLITICAL BACKGROUND AT MAFIA ISLAND

The District of Mafia is one amongst several districts, which constitute the Coast Region of Tanzania. Mafia Island is governed centrally from the mainland (Goossens et al, 2006), with a local government seat in Kilindoni, Mafias main town (Walley, 2004). The United Republic of Tanzania is governed by a President. Today's ruling political party, Chama Cha Mapinduzi (CCM), has been in power since Tanzania's independence, and still retains the grip on power. The government have stated ambitious plans to improve the public sector and improve the living standards. However, there are still some financial and political limitations in place (EIU, 2018).

From the 1990's and up to 2015, the development in Tanzania, in terms of the economic growth, life expectancy and education has improved (EIU, 2018; HDR, 2016). In the middle of the 1990's Tanzania changed into a multiparty system, where the marked-based economic reform accelerated. This led to a period with more investments and sustained growth, but did also lead to concerns for corruption in the public sector (World Bank, 2018). However, 66 % of the population in Tanzania is still regarded as multidimensional poor, meaning suffering in the three dimensions health, education and living standards, and the income levels in the country remains low (HDR, 2016). Even though there have been some improvements in the human development (HDR, 2016), life in Tanzania is still considered to be difficult, also on Mafia Island (Caplan, 2007).

In 1961, Tanzania became an independent country. After the independence, optimism was reflected amongst people in hope for a better future with more wealth, education and health facilities. On Mafia Island, mainly in the northern part, the main source for wealth was coconut threes, as it had been for a long period. At this time Mafia was partly self-sufficient (Caplan, 2007). At the northern part of the island, people produced enough food for own consumption for half a year, and could rely on purchased food from their income for the rest of the year. At the southern part, were there was less availability for coconut production, people relied more on sales of crops in order to purchase food (Caplan, 2007).

In the middle of the 1970's a change into more structured villages, with village meetings was affecting the whole country (Caplan, 2007; Stapenhurst & Kpundeh, 1999). At the village meetings, governmental officials were visiting. The new structure forced people to move. Some people had been forced to move further away from their fields and others had lost their

land. People were complaining about this, as well as the rising food prices on basic commodities. In addition, the government also changed the way people used to trading (Caplan, 2007).

During the 1980's, an economic crisis affected Tanzania. The crisis was caused by several factors such as drought, a rise in oil prices, exchange relations that became more unequal, and a war with the neighbour country Uganda (Stapenhurst & Kpundeh, 1999). In contrast to the economic situation affecting the main land, people at the northern part of Mafia were doing quite well economically. The crisis resulted in less foreign exchange, which included less import of cooking oil to Tanzania from abroad. This led to a dramatic increase in the price on coconuts, as the coconut oil became the main substitute to the previous imported cooking oil. The men at Mafia now used more time planting coconut trees, due to the demand, and less time on fields producing food. In addition, the rising economy at Mafia even allowed some people to buy their own vehicles and busses (Caplan, 2007). However, the economic benefits in Mafia emerging from the crisis were not distributed equally amongst people. The women in Mafia now had to work more, and as the men spent more time on coconut production than food production and mostly controlled the cash income, less food was available for consumption amongst the women (Caplan, 2007).

In the late 1980s, and early 1990s, an increase in tourism occurred along Tanzania's coast. This was a result of more foreign investors and a policy reform ruling the country, which brought poorer regions into a more international economy (Walley, 2004). In the middle of the 1990s, increasing social differences started to be visible. Especially in Tanzania's capital, Dar es Salaam, evidences of more privatization and cuts in resources for social welfare were emerging (Caplan, 2007). At Mafia, there was clear evidence of a decline in the states financial grants to the education and health systems. Primary schools collapsed due to poor or absent maintenance and the local village clinics lacked sufficient medicines. In addition, the economy in Mafia had declined. The high demand for coconuts was now replaced by the previous import of other types of cooking oil. However, the export of fish resources, especially lobsters was expanding (Caplan, 2007).

In 1995 a marine park was declared by the government, which made the fishing at Mafia more regulated. Local fishermen now needed a license to fish within the boundaries of the park. Mafia Island Marine Park (MIMP) consists of an area that covers 822 km^2 of Mafias

coast (Garpe & Öhman, 2003) (see Figure 5 for the boundaries of the marine park). Since Mafia Island hosts a great number of marine species (Sea Sense, 2012), MIMP was declared and funded by World Wildlife Found (WWF), The Norwegian Agency for Development (NORAD) and Department for International Development (DFID), amongst several organizations (Caplan, 2007). Even though this was a project intended to include local communities and benefit both people and the species at Mafia, the conservation has caused a conflict regarding the regulation of fishing resources. In addition, there were also some reactions to the fact that jobs emerging within the marine parks boundaries, mostly had been occupied by people that were not from Mafia (Benjaminsen & Bryceson, 2012; Caplan, 2007).
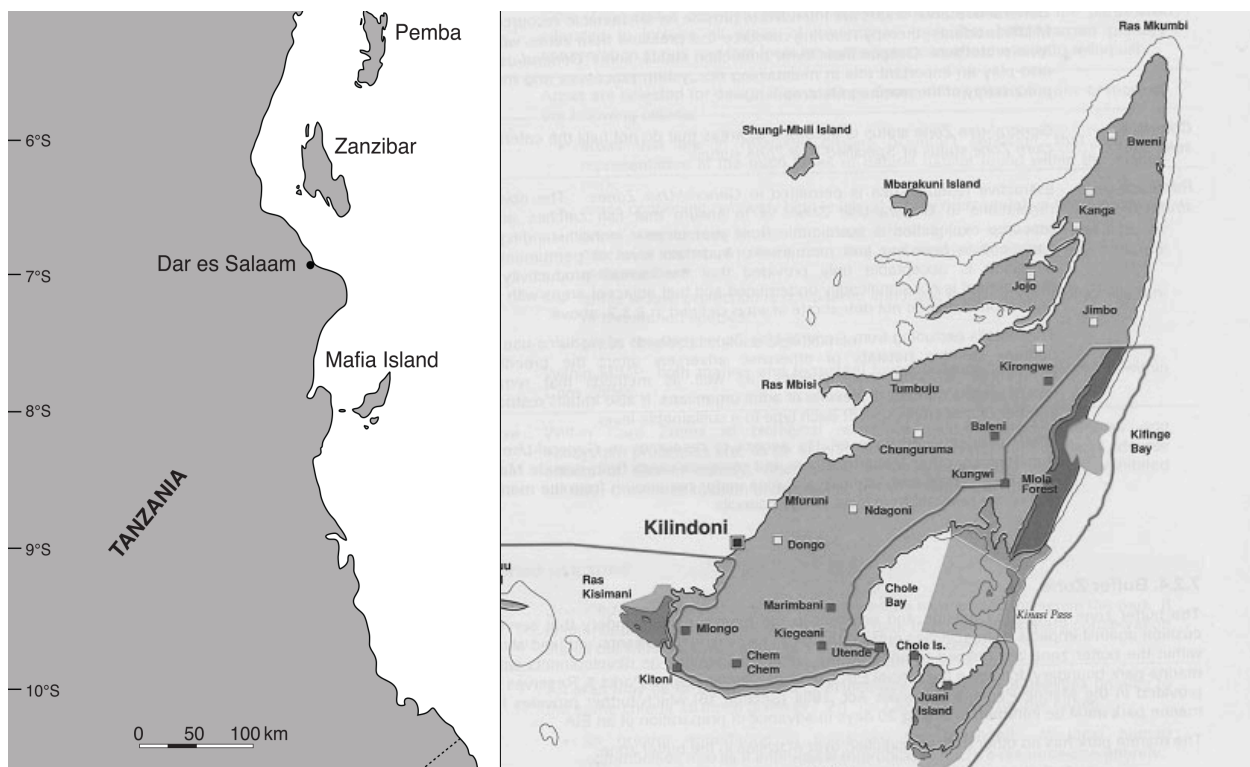
Figure 5: Map over Mafias location at the coast of Tanzania, to the left, and the boundaries of MIMP (the coastal area within the lines) to the right. Source: Rohner et al, 2016, Bryceson et al, 2006

During the early 2000, the tourist sector in Utende village located within the marine park, started to expand. The numbers of hotels had grown from one single hotel, owned by the government, to four hotels, all owned by foreigners, during a short period of time (Caplan, 2007). Even though the hotels offered different jobs, local people were mostly employed in low ranked positions such as house keeping and gardening. Moreover, as the local people still were affected by the economic decrease after the falling coconut prices, people were in need

of cash. This resulted in the locals selling beaches and land near the beaches to foreigners. It was a difficult period for the local people at Mafia for improving their situation. They were affected by the economic decrease, and even though the tourist sector and hotels were developing, few locals were employed due to lack of education (Caplan, 2007).

Today, a large part of Mafia's population is highly dependent on fish resources as their main source for income (Bryceson et al, 2006). The foundations around the island create a rich marine life, which is crucial for the food security and livelihoods of thousands of people living at Mafia (Sea Sense, 2012). Furthermore, there is not only Mafias population that relies on the fish resources. In 2005, the government opened up for the establishment of a large industrial prawn farm in the northern part of the island (Beymer-Farris et al, 2012), an establishment that initially had raised some environmental concerns (Caplan, 2002). The island is now one of the main distributers of fish to Tanzania's capital, Dar es Salaam, and moreover the Mafia waters are an attractive fishing area for immigrant fishers from other parts of Tanzania (Bryceson et al 2006). The trade of large amounts of marine resources takes place every day from the fish market in Mafias main town Kilindoni. Around 75% of the fish at the market in Dar es Salaam is believed to originate from the Mafia waters (Bryceson et al 2006).

To summarize, the social, political and economic situation at Mafia Island has been affected by changes in Tanzania's economic development, conservation and politics. The governments changes in the fishing policies, establishing a marine park, opening up for more tourism and allowing industrial prawn farming on large scale at Mafia, caused a degradation of the environment and the social wellbeing amongst the communities depending on natural resources. These issues have been addressed by several scholars (Benjaminsen & Bryceson, 2012; Bryceson et al, 2006; Beymer-Farris et al, 2012: Walley, 2004).

1.2 HISTORY OF GLOBAL AND LOCAL WHALE SHARK RESEARCH

Even though the whale shark has been studied since the 19th century, there are still gaps in the knowledge regarding its biological and ecological aspects. This unique species was first named and described by Dr. Andrew Smith in 1828. The whale shark was described from a specimen harpooned in Table Bay, located in South Africa (Colman, 1997). During the next 160 years, two scientists, Dr. Eugene Gudger and Dr. Fay Wolfson, dedicated much of their

lives to study the whale shark. Dr. Eugene Gudger spent 40 years studying the whale sharks all over the world, and published 47 papers based on reports about the sharks. Dr. Fay Wolfson published a bibliography on the whale shark, *Rhincodon typus*, up to 1985 (Stevens, 2007).

However, the data collected about the whale shark during this period was very limited. There were actually few observations of whale sharks and their feeding habits, and most observations were done subsequently by studying photographs. Ironically, neither Dr. Gudger nor Dr. Wolfson were able to observe whale sharks in the wild before they died (Stevens, 2007). However, in the following 20 years after 1986, there has been an increase in boat and tourism activity in search for the whale shark, which has provided us with more knowledge and new discoveries. Increasing interest in marine ecotourism has also led to more conservation of this species. However, the knowledge of the whale sharks ecology and biology is still limited (Stevens, 2007).

Recent studies have focused on collecting more information about the whale shark by tagging and photographing them. Between 2007-2008, Matthew D. Potenski tried to improve his understanding of the pattern and behaviour of the whale shark. Whale sharks were marked with small yellow tags and photographed during this period. His study was conducted at Kilindoni Bay in the western waters of Mafia Island, where the impact from ecotourism at this time was relatively low (Potenski, 2008). The research on whale sharks at Mafia in 2012, was succeeded by new research conducted by representatives from the Marine Megafauna Foundation (MMF) and other international collaborators in Tanzania. This research investigated the biology and ecology of the whale sharks, including research on the shark's population structures, feeding habits, injuries and scars, tagging and photo identification of individuals (Rohner et al, 2013). The research in 2012 has been succeeded each year up to the most recent research conducted in October to December 2017. In addition, tissue samples from the whale sharks have also been collected in recent years in order to provide new insights into the sharks biochemistry and genetics (Rohner &Pierce, 2017).

Even though more research on the whale sharks' biology and ecology have been conducted the last years, some gaps are still present. The present status of the whale shark, on a world basis, indicates a remaining population of only approximately 8760 individuals, a number that is relatively low (Rohner & Pierce, 2017). However, concerns raised by the Shark Research

Institute on the declining numbers of whale sharks are reported from the East and South East African coast (Rowat & Engelhardt, 2007). In addition, the whale sharks are, as mentioned, currently listed as "Endangered" on the IUCN Red List, most likely due to anthropogenic activities (Pierce & Norman, 2016). These activities are most likely derived from fishing activities targeting directly and indirectly the whale sharks, but also from the boat traffic caused by both fishers and tourism. As the whale sharks are important for tourism on a world basis, it is clear that more knowledge needs to be achieved in order to conserve this species (Graham & Roberts, 2007).

1.3 RESEARCH QUESTION AND OBJECTIVES

The research question this thesis tends to answer is:

How does the whale sharks' presence at Mafia Island create advantages and disadvantages, with associated winners and losers, and how can these factors, together with people's perceptions and narratives affect the whale sharks' vulnerability and risk of a possible future disaster?

This study follows four objectives with associated sub-research questions in order to answer the main research question.

Objective 1: Study the biological and ecological characteristics of the whale shark, including the whale sharks behaviour amongst people.

- How does the whale shark´s *ecology* and *biology* influence its interaction with humans?

Objective 2: Examine people's perceptions of the whale sharks and possible narratives amongst the people involved. This includes perceptions of local fishers, tourist operators, the tourists and the conservation organizations.

- How do human's perceptions of the whale shark create possible *narratives* that can influence their interaction with this species?

Objective 3: Examine the potential local advantages vs. tourism advantages and disadvantages emerging from the whale sharks' presence at Mafia.

- Does the human interaction with the whale shark lead to any potential advantages and disadvantages for the local communities at Mafia?

- Which actors are perceived as winning and which are perceived as losing from the potential advantages emerging from the whale sharks' presence?

Objective 4: Investigate the whale sharks vulnerability, to see if there is any possible human threat, if protection is needed and whether there are risks of disaster.
- How can the human interaction with the whale shark create or affect the vulnerability of this species and are there risks for a possible disaster?

1.4 JUSTIFICATIONS AND THESIS STRUCTURE

Despite the historical gaps in the research about the whale sharks, recent studies conducted in the Mafia waters have provided valuable insight into the whale sharks' biology and ecology. However, the social and political aspects and effects from this species presence have received little attention. It is likely that the expanding tourism since the early 2000 (Caplan, 2007) and thereafter the rapid growth from 2010, including an increase in the number of hotels and number of people visiting for the purpose of swimming with the whale sharks (Sea Sense & MMF, 2015), has led to positive results for the local economy. Based on previous studies conducted in the Seychelles, tourists visiting for activities involving the whale sharks seem to have a huge willingness to pay. This can create large economic benefits, as well as opportunities for the development of the island's communities (Rowat & Engelhardt, 2007).

However, an increasing number of tourists could also lead to harassment of the whale sharks when feeding, as well as affecting their presence at these locations (Graham & Roberts, 2007). An increase in tourism is also likely to have effects on the nearby communities, especially the fishing communities, which are using the whale sharks as signals for fish in order to locate their catch (Rohner et al, 2013). Even though more research has been conducted on the biological and ecological aspects of the whale sharks at Mafia, few studies have looked into the social effects of the whale sharks' presence after the rapid development in the tourist sector, as well as the effects from the expanding interaction with this species. In this regard, I find it both interesting and appropriate to conduct a study that illuminates these important issues. This study aims to contribute towards filling the gaps in our knowledge regarding the socio-political aspects of the whale sharks' presence around Mafia. By investigating people's perceptions of the whale shark, this study aims to provide answers regarding whether peoples' narratives affect people's interactions with the whale sharks and thereby affect the whale sharks' vulnerability and risks for a possible future disaster.

The structure of this thesis is divided into six chapters. The first chapter introduces the context in this thesis, followed by a brief of the background and historical aspects for the research. Chapter 2 introduces and explains the conceptual frameworks *political ecology* and *vulnerability* and provides a justification for my choices. Chapter 3 outlines the methodology, including the research site, the study strategy, the data collection and the analysis, followed by this study's validity and reliability, limitations and ethical considerations. Chapter 4 outlines the results conducted during the fieldwork at Mafia Island and starts with a presentation of the results from the interviews, followed by the results from the questionnaire and thereafter the results from the observations. Chapter 5 provides insight into the discussion of the results and the conceptual frameworks. The discussion follows the objectives, starting with the whale shark biology and ecology, and thereafter the people's perceptions and narratives, the winners and losers, and finally the whale sharks' vulnerability. The last chapter, Chapter 6, presents the concluding remarks and recommendations for the future.

2. THEORETICAL AND CONCEPTUAL FRAMEWORKS

Previous research on whale sharks has focused purely on biological and ecological aspects. In this relation, this study provides research on the social and political aspects emerging from the whale sharks' presence around Mafia Island. This chapter presents the theoretical and conceptual framework used to address these issues. The frameworks used are first introduced by the two philosophical positions *epistemology* and *ontology*, followed by a presentation of *political ecology* and *vulnerability* as conceptual frameworks. Political ecology is used to investigate the possible narratives on whale sharks, as well as the presence of winners and losers among actors related to the whale sharks' presence, while vulnerability is used to investigate the status and possible threats to the whale sharks around Mafia Island.

2.1 EPISTEMOLOGY AND ONTOLOGY

Epistemology and *ontology* are two elements that are important in the philosophy of knowledge (Bryman, 2016). Taking ontology into consideration first, ontology refers to the study of what we know to be true, what we have in the world or the truth itself. Epistemology on the other hand, refers to how we know these things, how do we know that "things" are true and what it means that something is true. Epistemology asks questions about the sources of our knowledge and what it means (Bryman, 2016).

The conceptual framework and methods used in this study consists of elements from both epistemology and ontology. If we go deeper into the ontology, we can see that it consists of two contradictory positions, *objectivism* and *constructivism*. Objectivism refers to the idea that social phenomena, together with its significance exist independently of social actors. Constructivism on the other hand, implies that social phenomena and their significance depend on social actors (Bryman, 2016). The concepts *narrative* and *winners and losers* used in the conceptual framework *political ecology*, can be related to the ontology position constructivism. As a narrative can be understood as stories or memories, which are held and produced by humans (Robbins, 2012), it relate to the constructivist idea that the existence of social phenomena are dependent on social actors (Robbins, 2012). The same argument can be used about the production of winners and losers. How these winning and losing actors are produced can be affected by our social constructions of reality (Robbins, 2012).

The conceptual framework *vulnerability* is on the other hand more related to the objectivism position in ontology. Vulnerability as a measurement of how vulnerable a species is or communities are, can be considered real, regardless of our social constructions. If the species is exposed to stress resulting in degradation for the species, the reality can be considered as proven. However, the ways this vulnerability are measured and presented by the scientists or by politicians create a social construction of the issue. In other words, vulnerability is not necessarily an objectivist "truth" (Klein & Möhner, 2011). This argument implies that the framework vulnerability also relates to the constructivism position in ontology.

While ontology investigates what knowledge is and what is considered to be true, epistemology look into what we consider as acceptable knowledge (Bryman, 2016). Epistemology consists of three positions; *interpretivism*, *positivism* and *realism*. The interpretivism position implies that the social scientists need to take the subjective understanding of social action. The positivism position refers to the use of methods from natural science to investigate social realities. The realism position refers to the idea that the reality of the world or a situation is accepted as it is (Bryman, 2016). In this study, the epistemology position is based on own experiences in the field, through investigation of the participant's narratives produced by their perceptions and interactions. The positivism position was used when the socially constructed narratives conducted in the field was compared to neutral science perspective on the whale sharks biology and ecology in the reviewed literature. In addition, the realism position is also important to take into consideration, when investigating the perceptions and sources of knowledge creating the socially constructed narratives on the whale sharks around Mafia Island.

2.2 POLITICAL ECOLOGY

This section presents *political ecology* as a conceptual framework used to identify narratives created by people's perceptions and interactions with the whale sharks at Mafia Island. Thos framework is also be used to determine the advantages and disadvantages that emerge from the whale sharks' presence at Mafia Island, in which different actors are perceived as winning or losing. Political ecology was chosen as an appropriate framework because it examines the relations between humans and the environment and how these factors influence and affect each other.

2.2.1 DEFINING POLITICAL ECOLOGY

Political ecology can be understood as a field of research. This field of research is particularly broad, focusing on human-environmental relations (Robbins, 2012). The field combines several aspects from the social, environmental, political and economic disciplines. Political ecology can be considered as a field in rapid development and as relatively recent in the history of social science. Political ecology has emerged during the past 30 years (Blaikie, 1985) as a result of various factors, such as limits in explanations of environmental changes, new insights through critical theory, and as a reminder of the ecology's politics through natural catastrophes and its effects on marginalized communities (Robbins, 2012).

Political ecology is a field attracting scholars from many disciplines. Various scholars have discussed its content during the past years, which has resulted in a wide range of definitions. Going back to the use of political ecology in its early days we discover that these definitions emphasized different elements, compared to the more recent definitions from the 21st century (Robbins, 2012). Blaikie and Bookfield`s (1987) definition emphasizes concerns for ecology and political economy by talking about the constant shifts between society and natural resources, as well as shifts within groups and classes in society. Peet and Watt`s (1996) definition emphasizes the equal path between principles of political economy and ecology rooted in social science. Stott and Sullivan (2000) on the other hand, emphasize how discourses from the politics forces people into activities resulting in environmental degradation (Robbins, 2012). Regardless of how these scholars define political ecology, some common elements occur. They all discuss the connections between ecology and political economy.

My understanding of political ecology is based on a definition by Robbins et al (2014), drawn from several of the elements mentioned above. Robbins et al (2014) define *political ecology* as an approach to investigate environmental issues, which covers issues of ecology, in a political economy that are broadly defined. In other words, political ecology can be regarded as an understanding of nature and society, which are produced together, in a political economy including non-humans and humans. It is an understanding of how nature and society are linked together in what we can call a political economy. Robbins et al define *political economy* as an understanding of our society and environment, which argues that our perceptions and the environment we live in are both constructed by power-relations and the structure of the economy surrounding us (Robbins et al, 2014). From a political-ecological

point of view, this can be used to summarize the context of the human-environmental relationship we are a part of. It encompasses how nature and society produced together work together, affect each other and shape the world we live in.

2.2.2 POLITICAL ECOLOGY AS A CONCEPTUAL FRAMEWORK

Political ecology can be a useful tool in the analysis of human-environmental relations. As political ecology is a field embracing many concepts, some concepts are of more relevance than others in this study. This section presents the concepts used when the findings are discussed in relation to political ecology.

The concept *narrative* is one amongst several concepts raised in this study. A *narrative* can be defined as a story or memory held, and collectively agreed upon amongst people (Robbins, 2012). These narratives or stories typically consist of a chronological order with a beginning, middle part and an end. Narratives are often characterized by a set of actors, which are of different significance. The actors can be expressed through an involvement of archetypes, such as heroes, victims and villains (Adger et al, 2001). Views on the deforestation in Amazonas can be an example of an environmental narrative where the actors play out. Stories about how poor farmers ruthlessly cut down threes, in order to obtain profit and therefore contribute to the deforestation, are considered a narrative. Such narratives are something that can distort and wrongly form our understanding of the world (Robbins, 2012). However, it is important to remember that even though narratives are held by people, people do not necessarily need to believe in what they say, and there narratives do not always result in direct action (Robbins, 2012).

Narratives can also lead to the development of a *counter-narrative.* A counter-narrative can be understood as a group of stories or a combination of other fragments, which together opposes the story of domination (Lindemann-Nelson, 2001). In other words, it is a story that disagrees or challenges a dominating narrative by presenting a different angle. Counter-narratives have also been used to describe the story of "the voices" that have been historically silent, and they challenge the stories from those in power (Delgado, 2000: Glenn, 2012). However, this study uses the term *counter-narratives* only when it comes to identifying opposing views and stories from the narratives in dominance.

Narratives can be shared through different types of *signifying practices*. Signifying practices are the techniques or channels of communication we use when stories are told and presented, such as newspapers, television, scientific reports and much more (Robbins et al, 2014). These channels or techniques of communication are to a certain degree affected by the presence of the socio-political systems in place, and are shaped and (re-)produced by people. As a result, the narrative distributed are socially constructed. It is important to remember that social constructions can make us take stories and concepts for granted, and thereby avoiding critical examination (Robbins, 2012).

Political ecology is considered to be a form of expression, which is characterized by several concepts. One of the characteristics is the discussion of winners and losers. When looking into the narratives we find in political ecology, we discover stories of justice and injustice (Robbins, 2012). Justice and injustice are words or expressions used to explain the status, which some specific actors undergo in the narrative. In occasions where environmental injustice occurs, winners and losers are created. Early studies from the US investigated how environmental bads and risks, such as polluted water and toxic waste had been unevenly distributed, with a higher weight on poor and coloured communities (Schlosberg, 2013). This situation creates an environmental injustice towards these communities, which makes these communities the losing part. The characteristics of political ecology are argued to follow the winners and losers, in order to understand continuous structures of winning and losing (Robbins, 2012). This means that it is not sufficient to say that there are winners and losers emerging from an outcome. The idea is to understand the structures that produce losers in an outcome.

In this study, the production of winners and losers emerging from the whale sharks' presence around Mafia is discussed. The structures from an outcome, such as advantages and disadvantages emerging from the whale sharks, are examined in terms of the production of winners and losers. The production of winners and losers reflects the politics and the political economy we find in the political ecology regarding the whale sharks at Mafia Island. Moreover, an investigation of possible narratives is discussed in relation to people's perceptions of and interaction with the whale sharks. Narratives are used as a concept to illuminate this issue. Together, these concepts are used in explaining some aspects of the political ecology regarding the whale sharks at Mafia Island.

2.3 VULNERABILITY

This section presents *vulnerability* as a conceptual framework used to analyse the whale sharks status and exposure for possible human threats at Mafia Island. Vulnerability is an appropriate framework to use in the examination of components leading to the whale sharks vulnerability and whether a possible future disaster can occur. By using the Pressure and Release (PAR) model, the risk for a possible future disaster is examined through the whale sharks vulnerability and possible stressors from the interactions with people.

2.3.1 DEFINING VULNERABILITY

Vulnerability is a concept used and discussed in many disciplines. The concept can be found in the discussion of impacts on people by natural disasters, global environmental climate change, in the discussion of peoples and communities' adaption and response to change, and in relation to social-ecological systems. Vulnerability can also be a powerful analytical tool. It describes how responsive an object or a system is to harm, the state of powerlessness, how marginal social and physical systems can be, how to increase well-being and how to reduce risk (Adger, 2006).

Blaikie et al (1994) proposed a novel definition of the concept defining *vulnerability* as being people's capacity to anticipate, resist and react to the effects of a natural hazard, which is influenced by the people's characteristics and situation. The scholars argued that the basic idea for their definition relates to the vulnerability of peoples and communities only (Blaikie et al 1994; Wisner et al, 2004). This definition has been a source of inspiration for other scholars later on, who have developed the definition to expand beyond the human systems.

Turner et al (2003) define vulnerability as the degree to which a component in a system, a subsystem or the system itself is likely to experience some kind of harm, as a result of the exposure to stress or a hazard. The system or a subsystem can be a type of environment or an ecosystem, while a component in the system can be a species like the whale shark. In other words, the concept vulnerability describes the status of stress to a component (in this case the whale shark), the components sensitivity and the capacity to adapt (Adger, 2006). The concept vulnerability is not of recent date, but is an analytical tool that has emerged through the research on risks and hazards, resilience and climate impacts (Turner et al, 2003).

2.3.2 VULNERABILITY AS A CONCEPTUAL FRAMEWORK

In this study, vulnerability is understood as a component's status of stress, sensitivity and capacity to adapt, due to exposure to a hazard. This exposure can result in a disaster for the system or the component in question. As vulnerability is a concept emerging from other concepts, more concepts need to be defined.

Adaptive capacity can be defined as a system's capacity or ability to adapt or respond to a change (Turner el al, 2003). A *hazard* can be referred to as a natural event, which can affect alone or in combination, at different places at different times (Wisner et al, 2004). More generally, a hazard can be defined as a thing, a condition or a process threatening a component or a system by being "alive" (Robbins et al, 2014). A *disaster* can represent a mix of human actions and natural hazards. Disasters are not necessarily caused by natural events, such as storms, floods and fires, but can be produced by the economic, political and social environments in place (Wisner et al, 2004).

Direct measurement of vulnerability can be difficult. Vulnerability is a complex issue. It can be considered as phenomena that are dynamic or changing in a continuous state (Adger, 2006). In relation to this, vulnerability can be generated by the economic, political and social processes, which can influence and shape the way hazards affects a group (Wisner et al, 2004). When disaster risks are evaluated, it is important to understand that the social productions of vulnerability are equally important as the natural hazards. It is argued that the risk of a disaster is a combined function of the hazard and the different degrees of vulnerability amongst a number of people being present. This relationship can be illustrated in a formula including the three elements disaster risk (R), as a result of a hazard (H) and vulnerability (V) (Wisner et al, 2004).

$$R = H \times V$$

In this study, the concept *vulnerability* is taken one step further by going into a vulnerability analysis. The vulnerability analysis used in this study is the Pressure and Release model, also known as the PAR model (Wisner et al, 2004). The PAR model is used to illustrate how disasters can develop when hazards are affecting vulnerable people, or as in this case a vulnerable species. The model illustrates how two opposing forces can generate a disaster. On

one side we find the processes that generate vulnerability and on the other side we find the hazardous events. The way the PAR model is presented below, suggests that the hazard is a factor isolated from the other factors creating vulnerability (Wisner et al, 2004).

THE PROGRESSION OF VULNERABILITY

1	2	3		
ROOT CAUSES	DYNAMIC PRESSURES	UNSAFE CONDITIONS	DISASTER	HAZARD

Limited access to
• Power
• Structures
• Resources

Ideologies
• Political systems
• Economic systems

Lack of
• Local institutions
• Training
• Appropriate skills
• Local investments
• Local markets
• Press freedom
• Ethical standards in public life

Macro-forces
• Rapid population change
• Rapid urbanization
• Arms expenditure
• Dept repayment schedules
• Deforestation
• Decline in soil productivity

Physical Environment
• Dangerous locations
• Unprotected buildings and infrastructure

Local economy
• Livelihoods at risk
• Low income levels

Social relations
• Special groups at risk
• Lack of local institutions

Public actions and institutions
• Lack of disaster preparedness
• Prevalence of endemic disease

Risk= Hazard x Vulnerability

R=HxV

Earthquake

Highwinds (cyclone/ hurricane/ typhoon)

Flooding

Volcanic eruption

Landslide

Drought

Virus and pests

Figure 6: Pressure and Release model (PAR): the progression of vulnerability. Source: Wisner et al, 2004

The model illustrates the causes leading to a possible disaster, explained by the social processes that can generate vulnerability and the impact a hazard can have on the objects in question (Wisner et al, 2004). By using the model, vulnerability can be explained by the presence of three overriding components. The first are the *root causes* representing the more general processes in the global economy and within the society. The root causes, such as economic and political processes are considered the most important causes that gave raise to vulnerability, as well as producing it over time. These causes are connected to the state it self and to *how* power is distributed and played out in the society (Wisner et al, 2004).

The next component amongst the components leading to vulnerability are the *dynamic pressures*. Dynamic pressures are a set of activities and processes which in one way render the effects of the root causes into particulary unsafe conditions (Wisner et al, 2004). These pressures can represent the condition a country undergos in terms of migration or a decease,

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but can also be the way rules, laws and controll are playd out by those in power. The dynamic pressures will after such occasions channel the root causes into different types of *unsafe conditions*. Unsafe conditions can be understood as the forms, in which the vulnerability (of a population), in this case a species, are expressed in space and time, connected with a hazard. The word "unsafe" refers to the location of habitation where people or species spend their time during their daily activities (Wisner et al, 2004). In summary, the *root causes*, *dynamic pressures* and *unsafe conditions* explains why vulerability occours.

These three componets were initially designed to explain the vulnerability of people. Throughout the book "At Risk", Wisner et al (2004) have a clear focus on peoples and communities when explaining the PAR model, and they argue that it is the "vulnerability of people" which is crucial to undertand why a disaster occour. They emphasized that the use of the term vulnerability in relation to any factor or aspect related to a disaster, will create a "catch-all" term, which makes vulnerability lose its analytical capasity (Wisner et al, 2004). Even though the model was initially designed for the examination of people's vulnerability and exposure for a disaster, I find the PAR model appropriate to use in the examination of the causes leading to the whale sharks' vulnerability and in examining whether a disaster is possible due to the sharks vulnerability and exposure to hazards, such as the stressors from interactions with people.

In this study, vulnerability is used as a concept to describe the status of whale sharks' at Mafia Island. The different components leading to the whale sharks vulnerability is examined through a vulnerability analysis by using the PAR model. The PAR model is used in the examination of *how* the whale sharks' vulnerability and exposure to a hazard can lead to a possible future disaster for the whale sharks. To which degree the whale sharks are exposed to hazards in terms of stress and harm from tourist and fisher interaction, as well as other human interactions is also discussed.

This study incorporates both *political ecology* and *vulnerability* as conceptual frameworks. These two frameworks can be regarded as slightly different and separate. However, it is important to remember that vulnerability also can be considered as socially produced (Wisner et al, 2004). We can consider vulnerability to be caused by political ecology. Political ecology enlightens the political economy of the management and use of natural resources (Beymer-Farris et al, 2012). The political economy we find in political ecology shows how the human

relationships with nature are rooted in the production of capitalism and creation of unequal power relations. This often illustrates that capitalist economies can lead to reverse and adverse social and environmental states (Beymer-Farris et al, 2012). This study combines political ecology and vulnerability to investigate the perceptions and narratives, advantages and disadvantages creating winning and losing actors, to which degree the whale sharks are vulnerable and which socio-political factors that can be considered as the underlying causes.

3. METHODOLOGY

This study has gathered data of people's knowledge level, perceptions, narratives, interactions with, and the vulnerability of the whale sharks around Mafia Island by using a mixed method approach. This chapter presents the study site for the fieldwork conducted, the study strategy, the data collection and analysis, including the different methods used for the collection of data, followed by the study´s validity and reliability, limitations and ethical considerations.

3.1 STUDY SITE

Mafia Island is located in the Indian Ocean, outside the east coast of Tanzania. The islands location gives a close access to Tanzania's largest city and capital, Dar es Salaam, which is situated only 120 km from the island. The island is located offshore of the Rufiji River, 21 km away from its deltas. Mafia Island itself is approximately 50 km long and 17 km wide (Bryceson et al, 2006). According to the 2012 consensus, the population at Mafia is estimated to around 46.438 inhabitants. The population represent a mix of ethnical groups with different religious backgrounds such as Muslins, Christians and other traditional religions, whereas Swahili is the main language (Heilman & Kaiser, 2002). The island consists of many smaller villages located in coastal and rural areas, including the islands main town Kilindoni (Goossens et al, 2006).

Figure 7: Map locating Mafia Island. Source: Google maps

The majority of the whale shark observations at Mafia have been on the islands west side, outside the boundaries of Mafia Island Marine Mark. The most frequent spot to observe whale

sharks is in the Kilindoni Bay, located southwest of the island. The bay reaches from Ras Kisimani in the south to Ras Mbisi in the northern end of the bay (see Figure 8). Kilindoni Bay is relatively shallow and do not exceed a depth of 30 meters. The seabed consists of sand in most areas, with some areas of damaged reefs, mud and sea grass near the shore. The intertidal zone around the bay can be up to 1 km wide, fringed by a line of mangrove forest with a small opening cleared around the entrance of Kilindoni town (Rohner et al, 2016).

The climate of Mafia is mostly warm, with daytime temperatures ranging between 25°C and 32°C. The humidity is high during most of the year and ranging between 60% and 80% (World Weather Online, 2017). Temperatures on the sea surface lies between 25°C and 31°C with a salinity range from 33.5% to 35.5% (Bryceson et al, 2006). Mafia has two monsoon seasons. From November to the end of February the climate is affected by the northeast monsoon, named *Kaskazi* in Kiswahili. This northeast monsoon brings high temperatures and warm calm winds. During this season, water with high nutrition is brought to Mafias coast, due to productive upwelling water and nutrient water from the Rufiji River Deltas (Rohner et al, 2013). From March to October, the southeast monsoon, *Kusi,* shapes the climate. In this period, temperatures sink and Mafia Island becomes wet with a high amount of rain in the period of April to May. During the southeast monsoon, the east African Coastal Current creates a down welling affecting the Tanzanian coast that brings water with poor nutrient to Mafias waters (Rohner et al, 2013).

The reason for choosing Mafia Island as a study site was the islands unique opportunity to observe and interact with the whale sharks. Due to the whale shark's nearly permanent stay around the island and visibility during *Kaskazi*, foreign and resident people have developed a relationship with them, and can recognize individual sharks from one year to another. The majority of the data was conducted in the main town Kilindoni and partly in eight villages around Kilindoni Bay. However, smaller villages south of Ras Kisimani and north of Ras Mbisi were also visited during the data collection.

3.2 STUDY STRATEGY

The research design used in this study is based on a *case study* design. A case study design involves an intensive and detailed analysis of one case, which can be extended to the study of several cases in terms of comparison. A "case" in a case study can be understood as an object of interest, which unfolds its own rights (Bryman, 2016). This wide definition of "case"

allowed me to use the whale sharks' presence at Mafia Island as the case for my in-depth examination. Semi-structured interviews, a questionnaire and observations were serving as main units in the examination of this case study.

The case study design was chosen because it allowed me to use and combine qualitative and quantitative methods. Research that involves both qualitative and quantitative methods can be described as a *mixed method research* (Bryman, 2016). Mixed methods were chosen because it allows the researcher to triangulate and crosscheck data. This opened up for getting a more profound depth in the study and ability to examine the issue from different angels by combining different methods (Bryman, 2016). The initial plan was to conduct the qualitative part through semi-structured interviews and the quantitative part through observations. However, an opportunity opened up for the conduction of a questionnaire. This was due to extra time and the availability for an assistant helping with translations and participants.

However, the limited amount of time and number of people participating during the fieldwork resulted in a sample group of 50 in the questionnaire. This is a relatively small sample in quantitative terms. The opportunity for performing a quantitative test such as a regression analysis would be limited in this case. A regression analysis has not, due to a small sample, been performed on the quantitative analysis because the results would have been affected by low reliability and a small ability for generalization. This introduces one of the common criticisms of case studies. Case studies are criticized for resulting in findings through the study that cannot be generalized (Bryman, 2016). In this study, the number of participants during the interviews (n=66) and the responses in the questionnaire (n=50) were simply not enough in order to generalize the findings to represent a bigger population, such as the population of Mafia Island. However, the results from the sample provide some insight into the situation.

3.3 DATA COLLECTION AND ANALYSIS

This study was carried out using a mixed method research combing both qualitative and quantitative research. By combining these two research methods, examination of the whale sharks' biology and ecology, vulnerability, people´s perceptions and narratives, advantages and disadvantages, emerging from its presence, were done using different methods. Methods used included desk studies, interviews, a questionnaire and observations. The combination of

using both qualitative and quantitative methods provides strength in the research techniques and provides richer answers to the research questions (Bryman, 2016). This section presents the sampling strategies and the qualitative and quantitative methods used during the data collection in the field, followed by a small section discussing the validity and reliability in the study. The data was collected from the beginning of October until the end of December 2017.

3.3.1 DESK STUDIES

Desk studies were carried out before and during the fieldwork at Mafia Island. The desk studies involved selection and reviewing of literature published on the whale sharks' biology and ecology. A literature review was carried out before the fieldwork in order to gain an understanding of the basic biological aspects regarding the whale sharks. Furthermore, secondary data from reports made by MMF was collected. These reports provided insight into the characteristics of the ecological aspects of the whale sharks at Mafia Island. This information was crucial in order to obtain an overview and an understanding of the situation for the whale sharks around Mafia.

3.3.2 INTERVIEWS

The interviews conducted were *semi-structured*. Semi-structured interviews refer to a technique where the researcher has a series of questions listed in an interview guide. However, the researcher has the opportunity to be flexible (Bryman, 2016). During the interviews, an interview guide was used as a list of checkpoints (see Appendix). Even though the interview guide had questions listed up, not all questions were asked and the questions were not necessarily asked following the listed order. The reason behind this was that not all questions were appropriate at all times and the knowledge level varied amongst the participants. All the interviews were conducted by using a recorder. The recorder gave me the opportunity to avoid missing elements in the statements and to be able to observe the participant behaviour and reaction to the questions (Bryman, 2016).

The collection of participants for the interviews was done based on *purposive sampling*. Purposive sampling is a non-probability form, which does not select participants entirely on a random basis (Bryman, 2016). The interviews targeted people that had some kind of relationship with and possible knowledge of the whale sharks at Mafia Island. The different groups of people selected were fishermen, fish trader women, organizations working with whale sharks, whale shark tour operators and tourists visiting the island.

The interviews with fishermen and fish trader women were carried out in Kiswahili with the help from a translator. A translator was necessary to use because the number of English speaking participants in these two groups was very small. The use of a translator was also helpful in terms of getting participants for the interviews. The translator was a highly respected man in the fisher community and the participants were therefore willing to do the interview. To make sure that different types of fishermen were represented, an equal distribution of daytime and nighttime fishermen were interviewed. The interviews were conducted at the beach near the harbour in Kilindoni, where the trade of fish took place. The interviews lasted from 10 to 20 minutes. 5 interviews with fish trader women and 25 interviews with fishermen were conducted.

The interviews with organizations were carried out on Mafia Island, "face to face" with the participants. The organizations networks were very valuable and helped me getting in touch with other organizations relevant for the study. The interviews took place at different locations, either at offices or at hotels. The interviews lasted from 15 to 30 minutes. 5 interviews with 4 different organizations were conducted.

Guides and boat captains from whale shark tour operators were interviewed. During my first week at Mafia, I volunteered to work as an English-speaking guide for one of the whale shark companies. This was most helpful in terms of creating a network and gaining respect amongst the employees. The interviews were conducted mostly on trips searching for whale sharks. The environment allowed the participant to explain more and illuminate their answers with examples. The time spent on the interviews varied between 10 and 20 minutes, due to some interruption when the interviews were conducted during trips. The total of 11 interviews were carried out.

The interviews with tourists were carried out on trips searching for whale shark or at hotels after the trips. Reaching tourists was a little more difficult due to the fact that many did not want to spend their vacation participating in interviews. However, due to my experience as a whale shark tour guide, the conversation with tourist went on through a "trade of knowledge"; their perceptions against whale shark information. The time spent on each interview varied from 5 to 10 minutes, depending on how much the participants wanted to share. 20 tourist interviews were carried out.

During the fieldwork lasting from October to December 2017, a total of 66 interviews were conducted. The number of interviews was determined by the time available but also by the moment when no new answers would emerge, especially amongst the fishermen. After the interviews had been manually transcribed from the recordings, an analysis was done by using tables and color-coding. Answers were divided after the corresponding objective and placed into tables. Color-coding was used to enlighten the similarities and differences in the answers.

3.3.3 QUESTIONNAIRE

At the end of November I was able to carry out a questionnaire (see Appendix). The questionnaire was made to collect aspects around people´s perceptions (which the semi-structured interviews cold not do), and illuminate the aspects on the general knowledge level of whale sharks amongst people.

The questionnaire was created in Kiswahili with the help from two translators and printed out and distributed amongst the participants. A translated questionnaire was necessary because the English skills varied a lot amongst the participants. The questionnaire was distributed in printed copies because few people in Mafia Island had access to a computer. The use of translators was useful in getting people to respond. When the questionnaire was distributed, the translators sometimes had to read up the questions and corresponding answers due to illiteracy.

The people responding to the questionnaire were partly selected based on *probability sampling*. Probability sampling is a type of selection where the sample is random, which means that everybody in a population should have the possibility to be chosen to participate (Bryman, 2016). In contrast to the purposive selection during the interviews, this selection for the questionnaire encompassed all types of people, also those who did not have a relationship to the whale shark through profession. However, the sampling for the questionnaire contains some elements of purposive sampling as it only applied to people above 18 years, excluding those younger, and was conducted only in areas close to whale shark sites (see Figure 8).

Figure 8: Map over villages at Mafia where the questionnaire was distributed (marked in red)

The total of 50 responses to the questionnaire were collected. The responses to the questionnaire were conducted in five different places along the west coast of Mafia Island, between Ras Kisimani and Ras Mbisi (see Figure 8). The villages were chosen based on their close connections to areas where the whale sharks were observed. 10 responses were conducted in Tumbuju in the north, 10 in Mfuruni, 20 in the main town Kilindoni and 10 in Kisimani in the south. Kisimani is an area consisting of several small villages, and where 5 responses were collected from Kisimani Mafia and 5 from Kitoni (Table 1).

Village	Tumbuju	Mfuruni	Kilindoni	Kisimani Mafia	Kitoni
Responses	10	10	20	5	5

Table 1: Number of responses to the questionnaire

The number of responses to the questionnaire was determined by the time remaining at the end of the data collection period. The responses were manually summarized and coded into

numbers in a document and analysed thereafter through creation of graphs and diagrams in Excel.

3.3.4 OBSERVATIONS

By using observation as a method, I was able to confirm information discovered using other research methods during the data collection. Through observation, including taking notes and photos, I was able to collect information of the whale sharks´ behaviour, its interaction with people, the situation at sea, the competition amongst actors, whether the rules were complied with, and the level of knowledge of whale sharks. This information, together with information gained through semi-structured interviews and the questionnaire, created a wider understanding of the situation.

Observations were conducted through a *participant observer* perspective. This perspective means that the researcher, as an observer, has low interaction with the participant or object observed, while the awareness of being observed is high (Bryman, 2016). The participant observer perspective allowed me to gain a greater understanding of the situation through observation of behaviour, the interaction and the environment, without interrupting the factors with my presence too much. Two different types of observations were conducted; observations of whale sharks on boat trips (1) and observations of people´s perceptions through a project implemented by WWF (2).

The observations from boats were conducted from the beginning of October to mid-December 2017. During these observations, I gained information of the situation at sea. I took notes and photos of the whale sharks´ behaviour, the interactions between whale sharks and people, whether rules were complied with or not, and the interaction between different actors (whale shark tour operators). A total of 14 trips were completed during the data collection period. The observations took place in Kilindoni Bay, between Ras Kisimani and Ras Mbisi (see Figure 9).
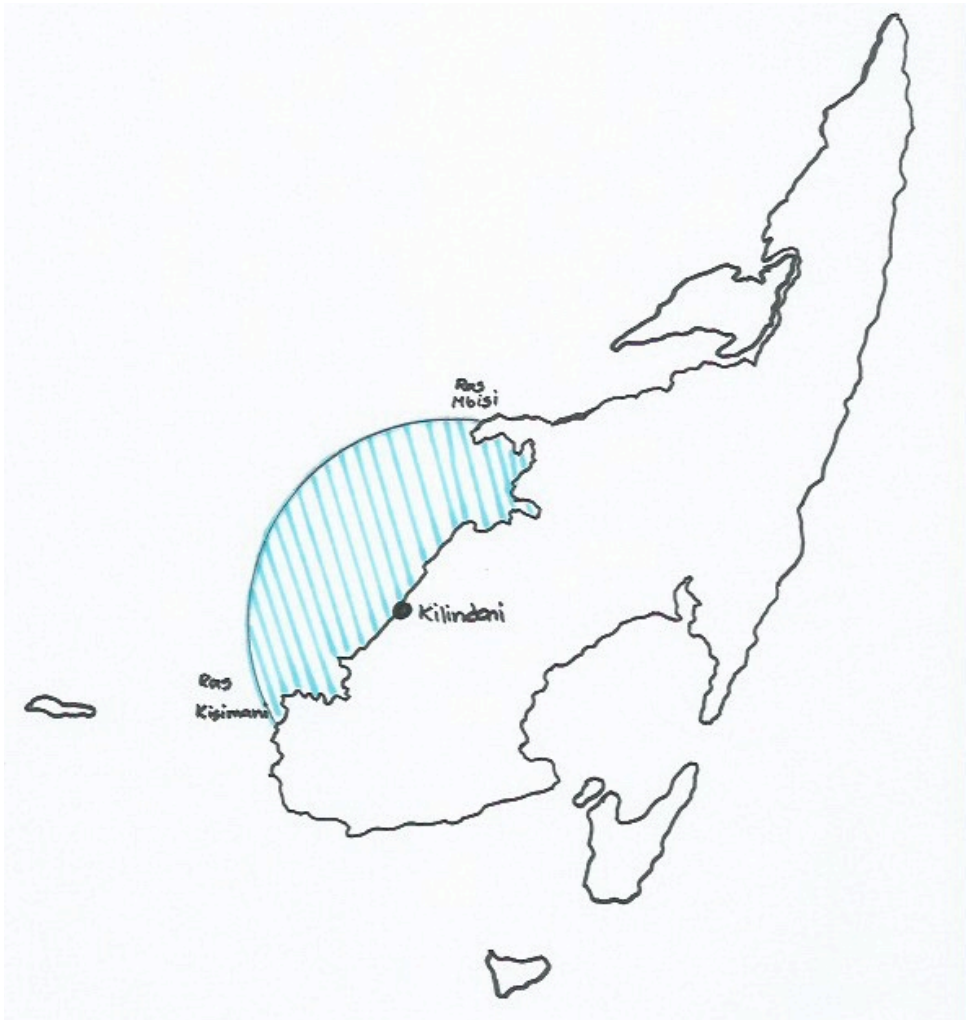
Figure 9: Map illustrating the area where whale sharks were spotted (marked in blue)

The observations through WWF´s project were conducted during three days in November 2017. The project included collecting of children's perceptions of whale sharks (*Papa Potwe*) and mapping the knowledge level of the whale sharks amongst the children by visiting primary schools. During the observations, I was able to collect information of their perceptions and their interest in the topic, as well as gaining an overview of the knowledge situation. Eight primary schools were visited during my observations. These schools were located along Mafia`s west coast, see Figure 10 below.

Figure 10: Map illustrating the location of schools visited at Mafia (marked in green)

The number of observations was determined by the time available and by the access to boat tours during this period. The observations were analysed using tables. The data from the observations conducted on boats were organized into tables according to numbers of spotted whale sharks, injuries on sharks, numbers of tourists and boat traffic. Calculations of the average numbers of trips and whale sharks were done using Excel. Aspects regarding behaviour and interaction were noted and compared. Data from the observations during the project were organized into tables according to the perceptions and knowledge level.

3. 4 VALIDITY AND RELIABILITY

In order to strengthen the validity and reliability of the data collected in this study, several data collection methods were used. *Validity* refers to which degree a measurement actually

reflects the truth of a concept, and *reliability* refers to which degree a measurement used is stable or reliable (Bryman, 2016).

In order to check the degree to which the information collected in the interviews was valid or correct, observations were used to investigate aspects from the participant's statements. In addition, the questionnaire was also used to look into other claims mentioned during the interviews, regarding the general knowledge level and understanding of whale sharks amongst people. To make sure that the conclusion were based on reliable data, the data collected were discussed amongst the participants and other people in Kilindoni in order to try to make sure that I had understood their perceptions correctly.

3. 5 LIMITATIONS

Based on the mixed method approach used in this study, we can argue that this study has a greater strength than purely qualitative or quantitative research approaches alone. In both qualitative and quantitative research we find strengths and weaknesses. The mixed method research used in this study allows the researcher to minimize the weaknesses and emphasize the strengths from both methods used in one study (Bryman, 2016). However, there are some limitations in the study regardless of the strengths the mixed method approach provides.

First, I experienced some language difficulties. During the interviews with the fishermen and the fish trader women, I was forced to use a translator in order to communicate. By using a translator, I risked missing some aspects of the participant's statements, which were first communicated to the translator, who thereafter translated their statements to me. In addition, the translators understanding of the participants' statements might also affect the translated information given to me. However, conducting these interviews without a translator would be difficult, so not using a translator was not an option.

Second, the people that participated in the interviews were selected with help from my translator. With no language skills in Kiswahili and no personal established network on Mafia, I was forced to seek help collecting participants. This means that the people participating were not selected randomly, and a consequence was that some potential participants were excluded. Even though my translator tried to select people from both outside and inside his own network, his connection to the different people might have affected the type of people I met, which probably affects the results.

Moreover, when I conducted the questionnaire, I received help from two different translators. Their reputation on this relatively small island could also affect the type of people willing to participate in the questionnaire. I experienced that it was a little difficult to keep a neutral position amongst the people due to the small size of the island, where everybody seemed to know each other. However, using different translators, which had different networks, I acquired more variation amongst the participants. By doing so, I was able to approach a random sampling strategy in comparison to using only one translator.

Third, not all participants interviewed were willing to answer all the questions. I experienced that when the questions were open the participants tended to misunderstand or did not understand them, or simply would not share information when they felt unsecure of the answer. After such experiences, I rephrased the questions a bit. However, this resulted in that some of the participants got different questions, which affects the results.

Fourth, the sample size used in both the qualitative and quantitative method was relatively small. This implicates that the findings cannot be generalized for the total population as mentioned in section 3.2. Small samples were necessary in order to conduct the study within the limited amount of time, from October to December. However, the size affects the results in this study.

Fifth, during the observations, I might have been exposed to some behaviour that did not appear from a natural origin. During the boat trips, captains and guides might have presented themselves in a "better" way that gave me a certain impression of the situation. The same might have happened while meeting the children participating in the project. This might have affected my results. However, I felt the needed to present myself, and the research I was working on, in order to meet ethical considerations.

Last, I experienced some scepticism amongst people when conducting the interviews, the questionnaire and the observations. Since I was a foreign person walking around asking questions and doing observations, people became sceptical. Especially the fishermen were afraid I was working for the marine park or other authorities that could regulate their fishing activities. To avoid the scepticism, I asked my translator, who was respected in the fishing communities, to explain my student-researcher status and that I had a neutral position. I also

volunteered to work for a whale shark operator and tried to avoid being seen with authorities and representatives for the marine park when I was amongst the fishers. However, their previous scepticism might have affected their responses.

3. 6 ETHICS

Before arriving at Mafia Island, I received permission to conduct research on a regional and district level under the auspices of a NORHED project being implemented by the University of Dar es Salaam and the Norwegian University of Life Science.

Before the conducting of interviews, the questionnaire and the observations began, permission to conduct research at village level was given. I visited village offices together with my translator, where I presented the objectives of my research and its purpose.

Before the research began, *informed consent* was taken in consideration. Informed consent is an important ethical principle in social research, which involve giving the participants as much information about the research as possible in order to decide whether they want to participate or not (Bryman, 2016). Before the interviews, the participants were informed of the use of a recorder. They were also informed that they would be held anonymous in order to ensure that people were comfortable to speak freely. Before the boat trips, captains and guides were given information about my research and my reason for observing. Under the distribution of the questionnaire, the participants were informed of their anonymity and that the research would only be used for academic purposes. Ethical obligations such as appropriate behaviour and dressing were met, and other norms and cultural practices were recognized.

4. RESULTS

This chapter presents the findings collected during fieldwork on Mafia Island from October to December 2017. The data was collected through interviews, a questionnaire and observations. The total number of interviews collected is 66 (n=66), the total numbers of responses to the questionnaire are 50 (n=50) and the total numbers of observations are 14 (n=14). This chapter consists of three parts. First, results from the interviews are presented, including responses from fishermen (n=25), fish trader women (n=5), organizations (n=5), tour guide operators (n=11) and tourists (n=20). Second, results from the questionnaire conducted are presented. Last comes a presentation of the results collected during observations. Observations were collected from boats and through participation in a WWF project.

4.1 RESULTS FROM INTERVIEWS

4.1.1 FISHERMEN'S RESPONSES

The total of 25 fishermen were interviewed. These fishermen represent fishers operating outside Kilindoni Bay. The participants represent both fishermen that work nighttime and daytime.

FISHERMEN'S PERCEPTION OF THE WHALE SHARKS:

When fishermen were asked questions regarding their perceptions on whale sharks, agreements and similarities in answers occurred. 25 participants were familiar with whale sharks and had observed them. However, when I asked the fishermen to tell me what they knew about the whale sharks, some fishermen became a little unsecure and seemed afraid they did not have much information to share. After such occasions I had to ask more direct questions about the sharks external look and behaviour. 17 out of 25 described the whale sharks as "*a creature in different sizes*" ranging from a minimum length on 1,5-2 and a maximum length on 10-12 meters. Only 8 out of 25 fishermen described it as smaller, "*between 4-7 meters*". All 25 fishermen agreed that the whale sharks are known in Kiswahili as "*Potwe*" or *"Papa Potwe"*. However, 7 out of 25 fishermen also knew the whale shark by different names such as "*Seweni*" and "*Josa*". They argued that the names are different due to dialects in different parts of Tanzania. They explained to me that "*People from Zanzibar and north of Tanzania call it Seweni*".

Moreover, 12 out of 25 had the impression that the whale sharks were present at Mafia Island "*throughout the year*". 19 out of 25 fishers explained that the whale shark often "*swim together with other fishes*", such as mackerels, tuna, cobia and smaller fish like sardines. Some of the fishermen even described how the fish "*hide in the shadows*" under the whale shark. 7 out of 25 fishers described the whale shark as a fish "*feeding on planktons*" at the surface. Only 3 out of 25 told stories about whale sharks feeding on fish. They described the whale shark "*feeding on the entrails of fish*" entangled in nets. 5 out of 25 fishermen described the whale shark as a "*friend*" or a "*friend of people*", of which 2 fishermen explained how the whale sharks scare other sharks away so the water becomes "*safe for the fishermen to swim in*". Only 3 out of 25 expressed a more negative description of the whale shark. They argued that the whale shark is "*dangerous, stronger than us, and can beat them with its tail*". These findings indicate that the majority of the fishermen consider the whale sharks friendly or as someone they know due to its permanent stay. Most of the fishermen also described the whale sharks with a lot of enthusiasm. However, only 3 out of 25 fishermen seemed to have a perception of the whale shark more affected by fear.

Under further investigation of the perceptions of whale sharks, the fishermen were asked how they valued the whale sharks importance for the community. 13 out of 25 agreed that the whale shark is important for various reasons. All these 13 fishermen agreed that the whale shark is an "*important sign for fish*", making the fishing easier. Only 5 of these also mentioned the shark's importance for tourism underlining "*the government's opportunity to collect money for the community*". 7 out of the 25 fishermen valued the shark as important in some aspects, but at the same time as something negative in another perspective. They acknowledged its importance as a signs for fish for the day time fishermen, but regarded it also as something negative because it destroys the fishing nets and "*disturb the fish*" during the night time fishing. Only 4 out of 25 fishermen regarded the whale shark as only a useless fish or as a problem. These finding shows that the majority of the fishermen considered the whale shark valuable or important, despite its destruction of nets and disturbance during the night time fishing.

The fishermen expressed different levels of experiences with fishing and relations to the whale sharks. 12 out of 25 fishermen had more than 20 years of experience on the sea and with fishing, and only 6 out of 25 had less than 10 years of experience. These finding reveal that nearly all fishermen interviewed had more than 10 years of experience. Agreement

amongst the fishermen also occurred when they were asked to describe sources of their knowledge. 20 out of 25 fishermen said their knowledge had developed from "*own experience*", and 3 of these also said that the knowledge developed through "*discussion and exchange of ideas*" between other fishermen. 5 out of 25 fishermen said knowledge only developed through discussion with others.

ADVANTAGES AND DISADVANTAGES EMERGING FROM THE WHALE SHARKS PRESENCE:

When the fishermen were asked about advantages and disadvantages in terms of the whale sharks presence, the answers were more equally divided. 12 out of 25 agreed that the whale shark is an advantage. They argued that it is an "*important signal for fish*" and creates an "*opportunity for collecting money*" through tourism. Only 4 out of 25 agreed that the whale shark only causes disadvantages. They argued for its disruption of fishing when it "*follows the lamps on the fishing boats at night and can destroy fishing nets*" if it is trapped during fishing. Moreover, 8 out of 25 fishermen agreed that the presence of the shark is both an advantage and a disadvantage at the same time. In addition, 8 fishermen said they got advantages through "*catch of more fish*" when the shark is around, or that it "*is easier to catch the fish*". This finding shows that the fishermen have some disagreement regarding what they consider as advantages and disadvantages emerging from the whale sharks presence.

THE WHALE SHARKS' VULNERABILITY:

To examine the vulnerability of the whale sharks, fishermen where asked various questions regarding equipment, boat traffic and experiences with changes in the population. The overall impression shows similarities in their responses. All 25 fishermen use "*local wooden fishing boats*" with an engine, together with fishing nets. Only 3 out of 25 said they use additional equipment such as "*long-line, pole and line and GPS*". In addition, 12 out of the 25 fishermen did fishing at nighttime and used additional "*lamps to attract fish*". 7 out of 25 fishermen agreed that the boat traffic has "*increased*" during the years and that there is "*harder competition*" on fish resources. Several of the fishermen expressed their concern regarding too many fishing boats due to overfishing in other places, which had resulted in an increase of visiting fishers from Dar se Salaam, Zanzibar and Pemba to Mafia waters.

Moreover, 23 out of 25 fishermen had experienced whale sharks "*inside the fishing nets*", entangled or trapped. All of these 23 fishermen explained the same methods for releasing the

sharks: 2 people from the boat goes into the water and "*pull the net down in front of the whale shark*" so it can swim over. However, they emphasized very passionately that they "*mean no harm to the shark*" and try to release it as careful as possible. Only 4 out of 25 had experienced collisions between shark and boat. When it comes to the fishermen's impressions of changes in the whale shark populations over the years, some disagreement occurred. When this question were asked, not all fishermen were comfortable to give me a clear answer right away. It seemed like they had not given it much thought. However, after some thinking they all responded. 12 out of 25 agreed that the numbers had increased, 7 out of 25 agreed that the numbers had decreased and 6 out of 25 agreed that the numbers were stable. These findings indicate disagreement amongst the fishermen.

4.1.2 FISH TRADER WOMEN'S RESPONSES

Five of the women trading fish on the beach were interviewed. The overall impression from these responses indicates a low level of knowledge of the whale sharks. 2 of the women seemed afraid to say anything about the whale sharks and I really needed to dig to get some responses. However, agreements occur in their answers. All 5 fish trader women said that they "*had heard about Papa Potwe",* but only 3 out of 5 could describe the whale shark. They described it as a "*big fish*" or a "*cool fish*". 2 out of 5 fish trader women shared the experience of observing the whale shark. All 5 had got the information of whale sharks from fishermen. However, even though the women were married to fishermen, their husbands did not share information of whale sharks. 2 of the women expressed that "*my husband is a fisher but he didn't tell me anything*". Moreover, all 5 fish trader women trade fish that swim together with the whale sharks. This indicates that the women work in an environment that obtains knowledge of the whale sharks. However, the knowledge spread to them is limited.

4.1.3 ORGANIZATIONS' RESPONSES

Participants from 4 different organizations working directly or indirectly with whale sharks, were interviewed. The participants came from Mafia Island Marine Park (MIMP), Marine Megafauna Foundation (MMF), Sea Sense and World Wildlife Fund (WWF). 3 out of 5 participants worked in organizations directly involved in whale shark research, and 2 out of 4 organizations had local offices at Mafia Island. They were involved in different work on, and had different experiences with, the whale sharks. As a result, variations in the participants' answers were noted.

ORGANIZATIONS PERCEPTIONS OF WHALE SHARKS:

When the participants where asked questions regarding their perceptions of whale sharks, 5 out of 5 agreed on the whale sharks' biology when it came to its "*permanent presence in Mafia*", its prey on plankton and feeding habits. Only 3 out of 5 regarded the whale sharks as "*friends of people*". 1 out of 5 participants described the whale shark, as "*a unique species*" without any "*natural enemies in the water*" due to is large size. 2 out of 5 participants mentioned Mafia as a "*unique place*" for whale shark research. The whale sharks' permanent presence gives researchers the opportunity "*to study them and follow individuals year after year*", was used as an argument. These findings indicate that the whale shark is viewed as a unique species with a permanent presence, and as something unique for Mafia Island.

ADVANTAGES AND DISADVANTAGES EMERGING FROM THE WHALE SHARKS PRESENCE:

Under questions regarding who gets advantages and who loses from the presence of the whale shark, 3 out of 5 commented that local people "*know very little*" and thereby "*get less*" from the whale sharks presence. 3 out of 5 participants mentioned the government's advantages. They observed that the government "*collects large amounts of money through a fee*", approximately 10-12 USD per tourist participating in the whale shark tourism. The participants were asked to share thoughts about the interaction between whale sharks and people. According to 4 out of 5 participants, the tourist interaction tends to be "*too close*". Therefore, they argued that it could be "*disturbing*" for the whale sharks. These finding show that the majority of the participants shared the same impression, that local people get less, the government earn more, and that tourist interact too closely with the whale sharks.

THE WHALE SHARKS' VULNERABILITY:

When the participants were asked questions regarding the whale sharks vulnerability, agreement amongst the organizations occurred. All 5 participants strongly agreed that the whale sharks need conservation. The majority of the participants expressed this to me with passion. According to 2 out of 5 participants, fishermen can cause injuries on the sharks when releasing them from nets "*with knifes*" or when using "*spears to avoid them*". However, some argued that conservation is difficult due to the different actors interests. "*We cannot make the whole island a marine park, fishermen need to fish*" and "*there are limited access to money*" are used as arguments.

When it comes to threats, 5 out of 5 participants agreed that the fishermen, together with "*fishing gears and boats*", are a "*human threat*" to the whale sharks. Only 2 out of 5 participants also mentioned "*too close tourist interaction*" as a direct threat. Moreover, 3 out of 5 participants agreed that there are environmental threats to the whale sharks. They mentioned specifically "*plastic bags*", "*pollution*" and "*unpredictable climate changes*". However, 2 out of 5 participants argued that there are no evidences of environmental threats. These findings reveal an agreement amongst the participants regarding human threats, but also a disagreement as to whether environmental threats really exist. When it comes to the whale sharks population estimates in Mafia waters, no study has been conducted so far. However, 4 out of 5 participants believed that the numbers had increased over the years.

4.1.4 TOUR GUIDES RESPONSES

The total of 11 tour guides and boat captains were interviewed. They represented employees from five different companies organizing whale shark tours at Mafia Island.

TOUR GUIDES PERCEPTIONS OF WHALE SHARKS:

The impression from the tour guides responses indicated both agreement and disagreement. When the guides were asked question regarding perceptions, all 11 guides described the whale shark as a "*harmless animal*". 4 out of 11 guides considered the whale shark as a "*friend*". All 11 guides agreed on the whale sharks ecology in terms of prey, permanent stay and feeding habits under *Kaskazi* (the northeast wind season). According to 3 out of 11 guides, the size of the whale sharks lays between 2-12 meters. Moreover, 2 out of 11 guides mentioned that the whale shark reaches an age "*over 100 years*". An interesting finding here is that the majority of the guides agreed on the shark's ecology. However, knowledge about the whale sharks biology seems to be poor. All guides agreed that the whale shark is "*important for the tourism*" in economic terms. 4 out of 11 mentioned the sharks' importance for the "com*munity and people*". They argued for its pride and "*symbolic value for the island",* with great passion in their voices. Only 1 out of 11 guides mentioned the whale sharks importance in the ecosystem.

The degree of experiences with the whale shark varied amongst the guides. 5 out of 11 guides had more than 10 years of experience, while 6 out of 11 guides had 5 years experience or less. The guides were asked how they locate the whale sharks. All 11 guides said they look for the sharks "*fins in surface*", 6 out of 11 also look for "*birds and jumping fish*", 3 out of 11 look

for "*waves and sunny spots*", 2 out of 11 look for "*shadows in the water* " and 3 out of 11 have contact with or look for fishermen. These finding illustrates that the methods of locating sharks vary a lot. When it comes to source of knowledge, 6 out of 11 guides got their knowledge through "*own experiences*" or "*own reading*". 5 out of 11 guides used to work in the fishing industry and got the knowledge through "*my early years as a fisherman*".

ADVANTAGES AND DISADVANTAGES EMERGING FROM THE WHALE SHARKS PRESENCE:

When questions regarding the advantages from the whale sharks presence were asked, all 11 guides responded that they got advantages through the "*income from tourism*". According to 9 out of 11 guides, most tourists travel to Mafia Island to experience the whale sharks. In addition, 5 out of 11 explained how the island gets advantages through "*more income to development*". They specifically mentioned the development of hotels, the service sector and government, and thereby schools, hospitals and roads. An interesting finding is to see that most of the guides showed a high level of agreement in terms of the advantages. However, one participant clearly differs from the rest. 1 out of 11 guides strongly disagree on the money leading to development. According to this participant, the government "*do not follow its responsibilities*" when it comes to "*providing roads, hospitals and public toilets*". 3 out of 11 mentioned advantages for fishermen through "*more catch*" and only 2 out of 11 guides mentioned advantages in terms of "*whale shark conservation*". 8 out of 11 guides agreed that there is "*competition*" between the different operators, and 3 out of 11 explained the situation more as operators "*cooperating with each other*".

THE WHALE SHARKS' VULNERABILITY:

To examine to which degree tourists' interaction leads to vulnerability for the whale sharks, the guides were asked questions about frequency of trips, numbers of people and rules. All 11 guides answered that they had "*one trip each day in the morning*" during the whale shark season. Only 4 out of 11 guides said that they also did trips in the afternoon the same day "*if requested from guests*". 7 out of 11 guides took 10-12 people in their boats, and 4 out of 11 guides said they could host a maximum of 8 people. According to 9 out of 11 guides, the Code of Conduct is followed when interacting with the sharks. However, the interpretation of the codes content varies between the guides. Some argued that the imposed minimum distance you have to keep from the sharks is "*5 meters*" while others mentioned "*20 meters*". These finding shows that the guides were aware of the code and intended to follow it. However, it

seems as the content is misinterpreted. The participants were asked to tell about their experiences with changes in the whale sharks populations. 3 out of 11 guides believed the number of sharks had decreased, 3 out of 11 believed that the numbers were stable and 2 out of 11 believed that the numbers had increased. Many of the participants expressed uncertainty when answering this question and not everyone did answer.

4.1.5 TOURISTS RESPONSES
The 20 tourists who participated in the interviews came from 14 different countries. All 20 participants were visiting Mafia Island for the first time, and 15 of these said that whale sharks were the reason for their destination.

TOURISTS PERCEPTIONS OF WHALE SHARKS:
When the tourists were asked about their perception of the whale sharks, the answers were less similar. 3 out of 20 tourists mistook the whale shark for being a whale. They expected to see bigger animals that "*blow air from their back*" and had "*a big flat tale*". 1 out of 20 tourists thought the whale shark was dangerous, and 4 out of 20 described the shark not as a dangerous animal but as a "*harmless animals*". According to 6 out of 20 tourists, the whale shark is "*the world's biggest fish*" and 4 out of 20 knew that the whale shark is a filter feeder "*feeding on plankton*". 1 out of 20 was convinced that the whale sharks were "*on the food marked in Zanzibar*". These findings show a great diversity in perceptions amongst the tourists.

The tourists represented people with different experiences with the whale sharks. 5 out of 20 tourists had been swimming with the whale sharks before in other locations worldwide. The knowledge of the whale shark was poor amongst the tourists. 11 out of 20 tourists said that they where familiar with the name *whale shark,* stating, *"I have heard about them…"*. However, they all agreed that they knew too little in order to explain more. 3 out of 20 had never heard about the whale sharks until they arrived on the island. One tourist explained "*the guy at the airport told me about them*".

Different numbers of sharks were observed during the tourist's trips. 8 out of 20 tourists experienced 2 sharks or more on their trip(s), 9 out of 20 saw 1 shark and 1 out of 20 did not see any sharks during their trip(s). 2 out of 20 tourists did not go out to look for the whale sharks. 12 out of 20 tourists went on 1 trip and 6 out of 20 went on 2 trips or more. The

tourists were asked about their experiences. According to 12 out of 20 tourists, the experience was described as "*amazing*" and high excitement was expressed. 3 out of 20 described the experience as "*nice*" but they expected more and 1 out of 20 was disappointed, explaining "*it was not what I had imagined*".

The tourists were asked to share thoughts around the behaviour of other tourists, in order to examine the interaction with whale sharks. According to 6 out of 20 tourists, "*too many people*" were observed swimming with the sharks. 2 out of 20 tourists reported that they had seen people touching the whale sharks. These finding reveal that the Code of Conduct is not always followed.

4.2 RESULTS FROM QUESTIONNAIRE

A questionnaire was conducted to map the resident people's level of knowledge about whale sharks and to investigate their perceptions. 50 responses were collected. These responses were collected from villages within the whale shark radius, between Ras Kisimani in the south and Ras Mbisi in the north of Kilindoni Bay.

4.2.1 PARTICIPANTS' BACKGROUNDS AND STATUS

The 50 people participating in the questionnaire were selected to represent a mixed group of people, with differences in age, education and profession, in order to map the overall level of knowledge about whale sharks. The results from the questionnaire represent 23 women and 27 men, an almost equal gender balance. The questionnaire selected adult people above 18 years of age. 21 out of 50 participants were between 18 and 35 years, 26 were between 36-53 years and only 3 of the participants were 54 years or older. People with different academic background participated. 8 out of 50 participants had no formal education, 24 had primary education, 16 had secondary education and only 2 participants had higher level of education such as college and university. People with any types of professions, also professions that did not directly involved the whale sharks were chosen. 7 were engaged in agriculture, 10 where fishermen, 27 participants worked in the service sector and 6 had other professions.
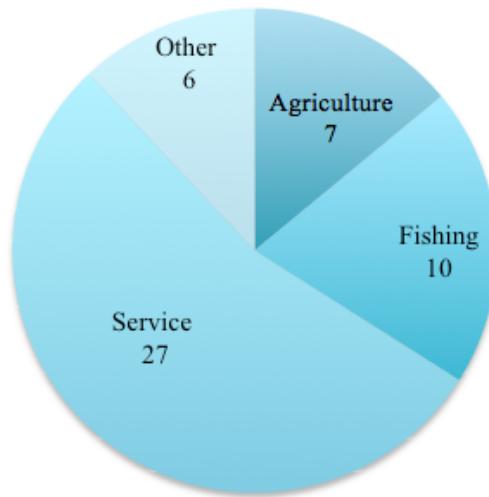
Figure 11: Distribution of people's professions

4.2.2 PARTICIPANTS' PERCEPTIONS OF WHALE SHARKS

The majority of people responding to the questionnaire were familiar with the whale sharks. 44 out of 50 participants responded "yes" to question 5 asking if they knew about the whale shark. Only 6 of the participants were not familiar with it. In order to map the knowledge level, participants were asked to place their level of knowledge within a scale from 0 (no knowledge) to 5 (much knowledge). As a result, 20 out of 50 participants responded level 0, indicating that they did not know anything about the whale shark. 7 participants placed themselves at level 4 while only 3 participants responded level 5. This indicates that the whale shark is known, however, people do not know much about this species.
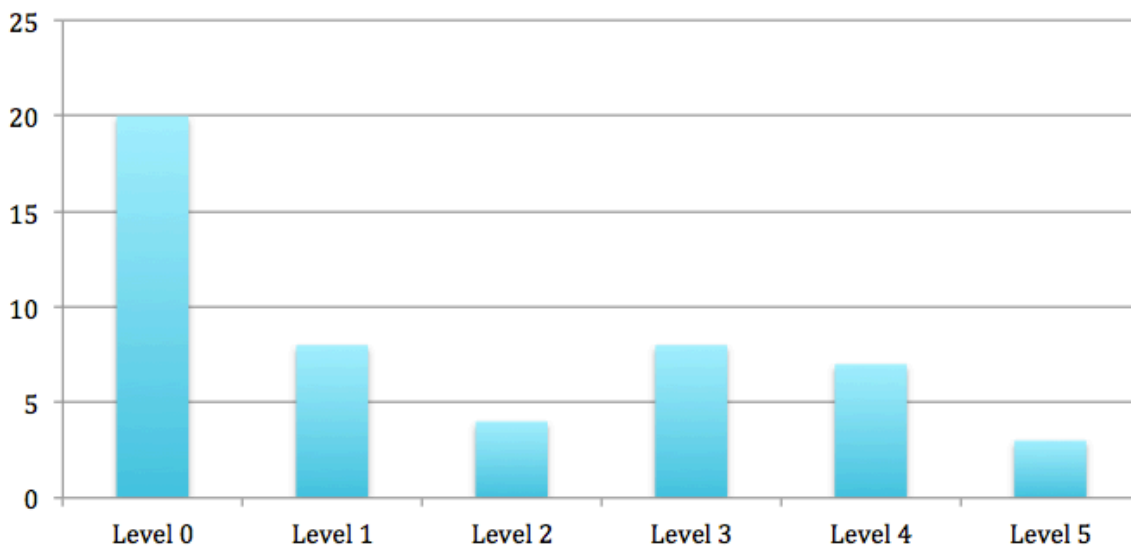
Figure 12: Distribution of people's level of knowledge of whale sharks

People's source of knowledge was also investigated. 15 out of 50 participants responded that they had no information about the whale sharks, 16 responded that they had got the

information from relatives or friends, and only 2 responded that they had got the information from science or published articles. 16 of the participants responded that the knowledge had developed through own experience. This reveals that the knowledge of whale sharks is difficult to achieve, unless you already have the information or know somebody who has. The findings show that the majority of people are interested in more information regarding whale sharks. 48 out of 50 participants responded that they were interested in getting more knowledge, only 2 did not want any more information.

People's perceptions of the wale sharks' importance and value were investigated. Under question 9 the participants were asked to respond whether or not the whale shark is considered important. The majority of the participant (38 out of 50) responded that the whale sharks were important, 12 participants were not sure whether they were important and 0 claimed that it was *not* important. Moreover, *why* the whale shark was considered important was questioned. Again the majority seemed to agree, because 36 out of 50 participants argued that the whale shark is important for tourism. 7 out of 50 did not know why it is important and 5 out of 50 argued that it is an important symbol for the island. Only 2 out of 50 participants agreed that it is important due to its role in the ecosystem.
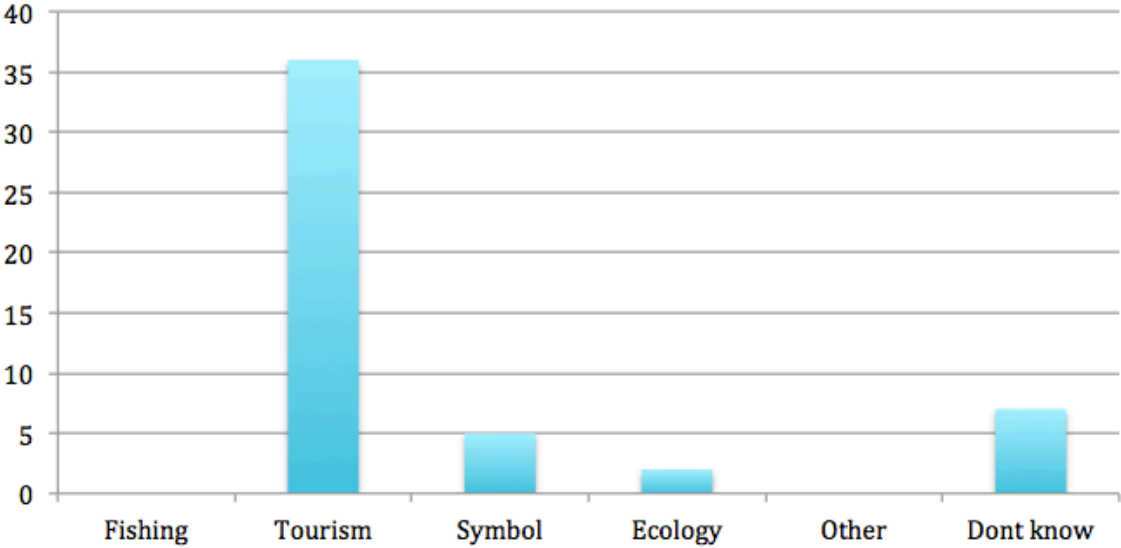
Figure 13: Distribution of whale sharks importance for people

As the findings from question 6 reveals, 20 out of 50 participants meant that they did not know anything about the whale sharks. However, the findings from question 9 show that 38 out of 50 mean that whale sharks are important. This implies that, regardless of people's knowledge of the whale shark, they seem to have the impression that it is important. Another interesting finding regarding question 10, when the participants were asked to select a reason for the whale sharks importance, is that none of the participants considered the whale sharks to be important for fishing. This is interesting regarding the fact that 10 out of 50 participants work as fishermen.

4.3 RESULTS FROM OBSERVATIONS

4.3.1 WHALE SHARK OBSERVATIONS FROM BOATS

During the period of October to December 2017, 14 observations from boats were conducted. The whale sharks were spotted in 12 out of 14 trips. 6 trips were completed in October, 3 trips in November and 5 trips in December. Table 2 presents an overview of the observations collected on the trips 1-14.

Trip	Date	Time	Wind direction	Number of whale sharks	Whale sharks with scars	Number of tourist boats	Number of tourist
1	06.10.2017	08:00-11:00	S/E	2	2	3	19
2	11.10.2017	09:00-13:00	E	0	0	3	21
3	13.10.2017	08:30-12:30	S/E	2	1	3	26
4	22.10.2017	08:30-12:30	S/W	0	0	2	6
5	26.10.2017	07:30-10:50	S/W	1	0	4	28
6	28.10.2017	08:00-11:00	E	3	2	3	15
7	25.11.2017	07:00-11:30	N/E	2	1	7	60
8	29.11.2017	08:00-12:30	N/E	3	2	5	25
9	30.11.2017	08:00-13:00	N/E	14	7	5	30
10	01.12.207	06:30-12:00	N	20	7	5	34
11	05.12.2017	07:00-12:30	N	12	5	4	23
12	06.12.2017	07:00-12:30	N/W	6	5	4	11
13	07.12.2017	07:00-13:00	N/E	24	10	3	7
14	18.12.2017	11:30-12:00	N/E	1	0	3	20

Table 2: Information and conditions during trips

Wind directions are marked with symbol: S = south, E = east, W = west and N = north

The table shows that all trips were done during morning hours. The durations of the trips lie between 0.5 and 6 hours with an average of 3.4 hours. In addition, whale sharks where present under all types of wind directions. However, more sharks where spotted during the N and N/E

wind when more food seemed to be brought to the Mafia waters. The total of 90 whale sharks where counted, which gives an average of 6,4 sharks per trip. Scars and injuries were observed on 42 of the 90 whale sharks counted. The most frequent "scars" on the whale sharks were abrasions and cuts in 1st dorsal fin and amputations, see Figure 14 below. However, identification of individual sharks was not done, so the possibility that the same shark were observed several times could occur.

Figure 14: Illustration of the most frequent scars and injuries. Photo by Sophia Lind

Table 2 shows the number of tourists per trip, swimming with whale sharks. The Code of Conduct suggests that it should be no more than 10 people swimming per whale shark (see Appendix). A brief of the code were given in 7 out of 8 trips with tour operators. However, in trip 3, 5, 7 and 14 the number of people swimming with the whale sharks was considerably higher than the suggested amount. The whale sharks were observed feeding in surface in 8 out of 12 trips when sharks were spotted. Feeding on deeper level or on the seabed was observed in 2 out of 12 trips. Smaller fish swimming together with the whale sharks were observed in 8 out of 12 trips, when sharks were spotted. The pictures below illustrate whale shark feeding and whale sharks accompanied with schools of smaller fish (*Gnathanodon specious*).

Figure 15: Illustration of whale shark feeding in surface, feeding on deeper level and accompanied with smaller fish. Photo by Sophia Lind

The trips consisted of an excursion on medium sized local boats or on fiberglass boats. The boats circled around in Kilindoni Bay, between Ras Kisimani in the south, and Ras Mbisi in the north. The observations were conducted during two types of trips. One type of trip was with the local tour operators taking tourists out for whale sharks safaris. 8 trips were done with local tour operators. 6 trips were done with the scientists conducting photo IDs of the whale sharks.

The whale sharks behaviour when interacting with people, and people's behaviour when interacting with the sharks, were observed during the trips. As mentioned, a brief of the Code of Conduct were given in 7 out of 8 trips with tour operators. However, the code was not always followed. There was no patrol controlling the code, nor a regulation of which boat that should go first if only one shark were spotted amongst several boats. This made the situation difficult for the boat captains and kept the competition for sharks high. As a result, too many people were swimming with the whale sharks, people tended to swim too close to them and captains driving closer to the sharks than recommended in the code. In the majority of the trips observed, the whale sharks tended to change direction, sped up or dived to a deeper level when people were dropped in the water. When larger groups of people were swimming close to the sharks, the sharks' behaviour changed and they became more stressed. The smaller sharks seemed more affected and stressed compared to the bigger ones in most of the cases. These findings reveal that even though there is a Code of Conduct when interacting, there is no one controlling it. This makes the situation difficult for the operators, as stressing the whale sharks can have a negative effect on both the sharks themselves and on the tourist's experiences.

However, the whale sharks behaviour did not seem to change much when few people where interacting with it. During 2 out of 8 trips with tour operators and during all the 6 trips with scientists, a close interaction was observed. During 1 of the trips with the scientists, a fishing hook was removed from the shark's mouth. This close interaction with one person did not seem to stress the whale shark or affect its natural behaviour. When sharks were spotted while feeding, the tourist interaction seemed to interrupt the sharks feeding in 5 out of the 8 observations. People tended to swim fast after the shark in order to get close to take pictures. When the shark was trying to reach the surface to feed, it was forced down again due to groups of people blocking its way. This type of close and stressed interaction seemed to affect the whale sharks' natural behaviour.

To give an impression of the numbers of whale sharks observed during October to December 2017, a small measurement was conducted. The numbers where collected with help from fishermen, tour guides and boat captains, working at sea each day. The total numbers of whale sharks observed each day during the fieldwork in October to December 2017 is presented in Table 3.

OCTOBER	Number of whale sharks	NOVEMBER	Number of whale sharks	DECEMBER	Number of whale sharks
06.10.2017	2	01.11.2017	1	01.12.2017	20
07.10.2017	2	02.11.2017	1	02.12.2017	8
08.10.2017	2	03.11.2017	1	03.12.2017	7
09.10.2017	1	04.11.2017	2	04.12.2017	8
10.10.2017	2	05.11.2017	5	05.12.2017	12
11.10.2017	0	06.11.2017	4	06.12.2017	6
12.10.2017	6	07.11.2017	3	07.12.2017	24
13.10.2017	2	08.11.2017	1	08.12.2017	0
14.10.2017	0	09.11.2017	2	09.12.2017	5
15.10.2017	1	10.11.2017	0	10.12.2017	10
16.10.2017	1	11.11.2017	2	11.12.2017	7
17.10.2017	2	12.11.2017	3	12.12.2017	5
18.10.2017	2	13.11.2017	4	13.12.2017	3
19.10.2017	0	14.11.2017	4	14.12.2017	4
20.10.2017	0	15.11.2017	0	15.12.2017	5
21.10.2017	2	16.11.2017	3	16.12.2017	7
22.10.2017	0	17.11.2017	3	17.12.2017	5
23.10.2017	7	18.11.2017	2	18.12.2017	1
24.10.2017	1	19.11.2017	3	19.12.2017	3
25.10.2017	2	20.11.2017	0	20.12.2017	4
26.10.2017	1	21.11.2017	1		
27.10.2017	0	22.11.2017	3		
28.10.2017	3	23.11.2017	4		
29.10.2017	0	24.11.2017	2		
30.10.2017	0	25.11.2017	2		
31.10.2017	7	26.11.2017	2		
		27.11.2017	1		
		28.11.2017	1		
		29.11.2017	3		
		30.11.2017	14		
Daily average	1,8	**Daily average**	2,6	**Daily average**	7,2

Table 3: Number of whale sharks spotted each day per month

The table shows that the average number of whale sharks spotted in October was 1,8 sharks. In November, an average of 2,6 sharks were spotted, and an increase in December with an average of 7,2 whale sharks spotted on a daily basis.

4.3.2 OBSERVATIONS IN WWF PROJECT

During a week in November 2017, WWF was running a project in which I was invited to participate on the following dates, 08.11, 09.11 and 10.11. The aim of this project was to map the knowledge level of children and investigate their perceptions of *Papa Potwe* (the whale shark). During my observation, 8 different primary schools were visited, where the number of children participating varied from 20 up to 100 students.

The primary schools that were selected were schools along Mafia's west coast. The schools participating during my observations were Jojo, Kirongwe, Dagani, Chungeroma, Tereni, Dongo, Kigombani and Msufini primary school. The schools were chosen on the basis of their possible knowledge of whale sharks, due to that most of these students were children of fishermen. When we arrived at the schools, students were asked to raise their hands if they knew or had heard of the whale sharks. In 2 out of 8 schools, approximately 90% of the children had heard about the whale sharks. In 4 out of 8 schools 50% was familiar with it. In 2 out of 8 of the schools only 5% had heard about the whale shark. One interesting finding is that even though the majority of the students came from fisher families, relatively few students seemed to be familiar with the whale sharks.

The next step in the project was to see what kind of perception the children had of the whale sharks. First, one participant from the WWF held a briefing of the whale sharks' biology and ecology. After this, small notes were distributed amongst the children where they should describe or write what they knew about the whale sharks in a few sentences. These notes were then collected. The results from the notes showed that there was a mixing of dolphins and whale sharks by some of the children, some wrote that it belonged to Mafia, others described it as a friend and some wrote that it needs conservation.

After the notes were collected, the students could ask questions. Some student asked why the tourists had been able to see the whale sharks during a short stay, while the people who lived here did not have the chance to see it, even though it "*belonged to Mafia*". Other students asked for the advantages and disadvantages that came with the whale shark. The discussion brought up disadvantages like destruction of fishing nets for fishers and tourists arriving in inappropriate clothes, as a "culture shocks". This finding reveals that even though the children know little about the whale shark, they are aware of and affected by the consequences of its presence and of the related tourism.

All the children at these primary schools seemed very interested in learning more about the whale sharks. However, the teachers raised concerns regarding the future teaching. They explained that there were no economic resources, a lack of literature and knowledge and less structure in the school system. Even though the teachers wanted to teach more about the whale shark and biology, they did not have the right education. Some environmental clubs existed in some of the schools. However, there were not enough resources to organize them and provide children with necessary knowledge. This finding shows that the curiosity and engagement of learning more about the whale sharks is presents amongst teachers and students. However, the necessary resources to achieve this are not present.

5. DISCUSSION

This chapter presents the results discussed within the conceptual frameworks of *political ecology* and *vulnerability*. The results from the interviews, the questionnaire and the observations are discussed in combination and not separately as they were presented in Chapter 4. This chapter is organized according to the four objectives presented in the introduction of this thesis, and finally addressing the main research question.

5.1 WHALE SHARKS' BIOLOGICAL AND ECOLOGICAL CHARACTERISTICS

The first objective in this study investigated how the whale sharks' biology and ecology might affect its behaviour amongst people. In order to meet the first objective, the whale sharks biology and ecology is discussed in context with the results from the observations.

As reviewed from the literature, the whale shark is a filter feeding species, which feeds on a variety of zooplankton together with other smaller fish species. They are mostly observed feeding at the surface in tropical waters where temperatures range between 18-30°C (Colman, 1997; Rohner et al, 2013). During my observations, the whale sharks were seen feeding most of the time. They were observed feeding in the surface in 8 out of 12 trips and accompanied by schools of smaller fish. This type of behaviour makes the whale shark spend much time near the surface in Kilindoni Bay, which make them relatively easy to see from boats. Since the whale sharks feed on smaller prey sources such as plankton, it does not pose any direct threats to humans. Their feeding habit also creates an interaction with the fishermen, which provide guidance to locate smaller fish species. Its feeding behaviour in tropical waters makes the whale shark an appropriate target for aquatic tourism, as well as its presence is useful in fishing activities.

Previous studies have shown that the wind during the northeast monsoon, *Kaskazi,* brings water with high productivity of plankton to the Mafia coast. This often results in an increasing number of whale sharks visible at the surface while feeding during this period (Rohner et al, 2016). Its feeding behaviour makes the presence of the whale sharks predictable (Colman, 1997), which again results in more reliable conditions for the tourism and the fishing industry. During my boat observations of the whale sharks feeding near the surface, I registered an increase in the numbers of whale sharks from late November to December, as the wind

direction gradually changed to N/E (Table 2 and 3). The conditions during the N/E wind made the whale sharks occupied with their feeding and they did not seem to react to human interaction when smaller groups of people were swimming next to them. As the whale shark is the earth's largest fish (Chen et al, 1997), smaller groups of people did not seem to pose any threeat. In one of the interviews with the conservation organization, one participant explained that the whale sharks do not have any *"natural enemies"* in the water. This can explain why the whale sharks were calm even when people were around. In this regard, the whale sharks' biology and ecology creates an appropriate opportunity for human interactions.

However, when large numbers of people were interacting, the whale shark seemed to change its behaviour. The shark's behaviour became more stressed as several of the boat observations indicate. The smaller whale sharks seemed to be more affected by stress compared to the bigger ones. From reviewing the literature, the bigger whale sharks are typically more mature and older, of which many have been spotted in the Mafia waters several times (Rohner et al, 2016). It is likely that larger sharks might be less affected by stress due to their size and experience with human interaction. To avoid stress, the whale shark tended to change directions or swim to a deeper level to avoid the crowds. In the trips observing the whale sharks feeding, tourist interaction seemed to interrupt the feeding in most of these trips. The interaction on these trips made the whale sharks stop its feeding in the surface and move to a deeper level. This suggests that, the whale sharks' biology and ecology seems to render them vulnerable to human interactions, which can have negative effects and disrupt the sharks' natural behaviour.

In relation to this research objective, the whale sharks' biology and ecology are creating an opportunity for human interaction. This interaction is not necessarily threatening when the sharks are many in numbers and occupied with feeding. Their large size, gentle nature and feeding behaviour make them appropriate for aquatic tourist activities as well as an important resource for fishermen in order to locate other types of fish. However, human interaction that tends to be too close and include too many participants seems to affect the whale sharks' natural behaviour. This can result in possible stressors for the whale sharks.

5.2 PERCEPTIONS AND NARRATIVES OF THE WHALE SHARKS

The second objective in this study examines people's perceptions of and possible narratives about the whale sharks. It looks into which degree these perceptions and narratives influence

their interaction with the whale shark. The perceptions and narratives were collected from people working directly and indirectly with this species. In addition, the perceptions from people settled within the whale shark areas were also examined in order to illustrate the knowledge level about this species. This section discusses the results from the interviews, the questionnaire and the observations in order to investigate the perceptions and narratives emerging of the whale sharks around Mafia Island.

5.2.1 THE FISHERMEN'S PERCEPTIONS AND NARRATIVES

The results from the interviews showed several pieces of evidence of a collective agreement in the fishermen's perceptions about the whale sharks in the Mafia waters. All 25 fishermen, of whom some were fishermen visiting from other parts of Tanzania, were familiar with *Potwe* or *Papa Potwe,* as the whale sharks are named in Kiswahili. The majority of the fishermen had a common understanding of the whale sharks biology and ecology.

An interesting discovery was to see how the majority of the fishermen shared the same perception of the whale sharks size (ranging from minimum 1,5m, up to maximum 12m, and many between 4-7m) and the way in which the sizes was measured. When the fishermen described it, they did not count in meters, but used visual explanations and pointed from one spot to another to determine the size of the shark. The majority of the fishermen had developed this perception based on own observations at sea. What needs to be questioned is to which degree any human perception of objects observed under water is accurate and whether it can be influenced by refraction. Refraction is an effect causing deformation of objects when observed under water, making them appear bigger and closer, due to the light and speed when it hits the water (Kwon & Casebolt, 2006). This means that when the fishermen observe a whale shark in the water, the sharks might appear to be bigger than its actual size. However, their perception is very close to the published science in this field (Potenski, 2008; Rohner et al, 2013; Rohner & Pierce, 2017), which suggests that they are aware of the refraction effect.

Moreover, many of the fishermen shared the perception of the whale sharks permanent stay throughout the year, feeding on plankton and its company of schools with smaller fish. The common understanding of the sharks permanent presence is accurate, according to the science conducted at Mafia, explaining how the whale shark, through changing their source of prey, can have a permanent stay around the island (Potenski, 2008; Rohner et al, 2013; Rohner & Pierce, 2017). The perception of the whale sharks pray source is also in accordance to the

research explaining how the shark mostly feed on pelagic macro-plankton (Rohner et al, 2013). An interesting discovery amongst the fishermen's perceptions is to see that many share the perception that the whale sharks often swim together with schools of smaller fish, and thereby represents an important sign for the fishermen in order to locate the fish for catch. Even though previously conducted science and some of my observations support the assumption that the whale sharks are accompanied with schools of smaller fish (Rohner & Pierce, 2017), it is not always the case. Some of the observations conducted during my fieldwork at Mafia, also show evidence of whale sharks swimming alone, without the company of other fish. Even though the fishermen might be aware of this, they still regarded the whale shark as a sign for fish.

However, this idea or story of the whale sharks presence as an important sign for fish for the fishermen can be regarded as a narrative (Robbins, 2012), dominating amongst the fishermen. In addition, another dominating narrative amongst the fishermen is the story of the whale sharks presence resulting in an economic benefit, which provides the government with an important opportunity to collect money for the community. As 13 out of 25 fishermen regarded the whale shark as highly important based on these two stories, and another 7 fishermen agreed upon its significance, this indicate a high level of common understanding. In these two narratives we can find evidence of the presence of an archetype (Adger et al, 2001). The whale sharks can be regarded as a type of hero in these stories, providing help and advantages to the fishermen.

However, these 7 fishermen also regarded the whale shark to cause some disadvantages during its presence. Another 4 fishermen shared the story of how the whale sharks cause problems for the fishermen as they follow the lamps at night searching for fish and end up inside the nets, resulting in destruction or loss of both net and catch. In this narrative, the archetypes seem to have changed roles. The whale shark is no longer regarded as the hero but rather the villain causing problems for the fishermen, and thereby gives the fishermen the role as the victims. An interesting discovery is to see how these two narratives represent contradictory perceptions. In this regard, the story of the whale shark as a villain causing problems for the fishermen can be regarded as a counter-narrative to the dominating story of the whale shark as an important actor for fishermen and community. This counter-narrative, which is shared amongst a smaller group of fishermen, represents a view in contradiction to the story of dominance (Lindemann-Nelson, 2001).

Several perceptions, views and stories about the whale sharks were discovered during the interviews. Some of the fishermen perceived the whale shark as a "*friend*" or "*friend of people*". They explained that they regarded the shark as a friend due to the whale sharks permanent stay. Some also shared a story about the whale shark scaring other sharks away with their presence, and thereby making the water safe for fishermen to swim in. This story can be considered a narrative, consisting of a beginning and an end (Adger et al, 2001), where the whale sharks presence and action result and end in providing safe conditions for the people. This narrative is positively loaded and describes the whale shark as a type of hero. However, other stories that were shared had a more negative description of the shark. A small number of the fishermen told the story about a large, dangerous creature that are "*stronger*" than people and can "*beat them with its tail*". Again, the whale sharks are regarded as the villains and the fishermen the victims in this narrative. Thereby, these two stories can be considered as two contradictory narratives.

The fishermen's knowledge and stories seems mostly to have been developed through own experience and observations. However, when I asked the fishermen to tell me what they knew about the whale sharks, some expressed a sense of insecurity. I got the impression that some were afraid to share the information, maybe because the information they had were purely based on their own experience and not scientific data. Their insecurity regarding their knowledge might be caused by the lack of academic education within this field, as the teachers participating in the WWF project expressed. However, the insecurity in the provided answers could also be affected by my role as a researcher. As mentioned in Chapter 3, I experienced some scepticism amongst some participants, which can explain why they held some information back and thereby appeared to be insecure.

Many fishermen added that knowledge was developed through sharing and discussion with other fishermen. These sources of information can be regarded as channels where information are produced and reproduced by people on a local level. An interesting discovery is that most of the fishermen shared the same views, which can indicate that they share and build their knowledge on the shared information. These views can therefore be regarded as a social construction, which is shaped and reproduced by humans (Robbins, 2012). The narratives shared in the interviews can be regarded as stories that are kept alive through different channels of communications. These signifying practices keep and reproduce the narratives

through stories or through discussion with others, and can aid their construction of reality (Robbins et al, 2014).

The perceptions and narratives present amongst the fishermen can be argued to influence the way they interact with the whale sharks. Many fishermen regarded the whale shark as a friendly species and as an important sign for fish and a provider of economic advantages. This can be an explaining factor to why they interact with them and why no one has observed any direct catch of whale sharks around Mafia. However, a smaller number of fishermen shared another narrative about the whale sharks being regarded as dangerous or as a problem when it gets in the way of fishing and gets entangled in the nets. This narrative can explain why some sharks bear scars of serious injuries such as amputations of fins and cuts caused by knives (Rohner & Pierce, 2017).

5.2.2 THE FISH TRADER WOMEN'S PERCEPTIONS AND NARRATIVES

In order to present data from both genders I interviewed a small group of fish trader women trading fish at the beach in Kilindoni Bay. However, the group consisted of only five women which makes the data presentation uneven balanced when it comes to gender. Their knowledge about the whale sharks was very limited, resulting in few perceptions. An interesting discovery was that despite the fact that these women trade fish living and swimming in the whale sharks habitat and many of them were married to fishermen interacting with this species, their knowledge about the whale sharks was poor.

All the women interviewed were familiar with the whale sharks name, despite their lack of direct interaction with it. However, only 3 of them had a perception to share. They described a big fish that was "*cool*" or "*nice*" to swim with. This answer is quite similar to the fishermen's perceptions of the whale sharks as "*friendly*" or as a "*friend of people*". The fish trader women's source of knowledge came from the fishermen. Taking this into consideration, it is likely to believe that the women's perception can derive from the fishermen's narrative about the friendly whale shark that scare other sharks away and make the water safe for swimming. This is another example of how information or sources of knowledge is communicated through signifying practices and reproduced by people (Robbins et al, 2014). The memories or views held by these women have developed throughout communication with fishermen.

Even though some of these women had a perception to share, other women were more difficult to interview. When I questioned their awareness of the shark, they immediately responded that they did not know anything. However, after more digging and rephrasing of questions, they admitted that they were familiar with the species name. I got the impression that these women were not so comfortable talking about the whale sharks, probably because their knowledge were limited. Their limited knowledge can be explained by a school system with poor resources (Caplan, 2007), with lack of knowledge of biology and ecology, as the teachers participating in the WWF project explained. However, another reason could be some disturbances from the fishermen surrounding us during these interviews, which might have affected their responses. My impression was that they did not want to tell much in order to avoid saying something wrong when all these fishermen, who apparently knew more about the whale sharks, were around. Their limited responses could also be due to scepticism regarding my role as a researcher. An interesting finding in this regard however is to see how the narratives held by the fishermen affect the perception held by the women.

5.2.3 THE ORGANIZATIONS PERCEPTIONS AND NARRATIVES

The perceptions discovered during these interviews show a common understanding regarding the whale sharks' biology and ecology. Their perceptions of the whale shark as a permanent species throughout the year, its feeding habits and prey on plankton, all correspond to the published science (Potenski, 2008; Rohner et al, 2013; Rohner & Pierce, 2017). The fact that some of the participants interviewed are the authors of the published literature reveals that the source of information held, have developed either through own research and observations or by the research conducted by fellow researchers. These signifying practices, such as articles and scientific papers, are used as channels for communication and distribution of knowledge (Robbins et al, 2014). The participant's usage of the same information sources can explain their shared and common view or understanding of the whale shark around Mafia.

Moreover, some of the participants shared the perception of the whale shark as a "*friend*" or "*friend of people*". This perception is similar to the fishermen's narrative about the friendly whale shark. This is an interesting discovery, illustrating how a local narrative amongst the fishermen is repeated on a national and global level amongst the participants from the organizations. In addition, some of the participants perceived Mafia Island as a unique place for whale shark research, due to the opportunity to follow individuals year after year. This

perception is likely to explain the participant's interaction with the whale shark at Mafia for several years (Potenski, 2008; Rohner et al, 2013; Rohner & Pierce, 2017).

All the participants shared the perception of the whale shark as a species in need for conservation. This perception was expressed with great passion emphasizing its significance. This concern corresponds with the fact that the whale sharks is listed as "Endangered" on the IUCN Red List (Pierce & Norman, 2016). This perception seems to influence the way in which some of the participants were interacting with the sharks. As noted through the observations at sea, the scientists conducting research of the whale shark acted very carefully around the whale sharks in order to avoid disrupting them too much. The knowledge of and concerns for the whale sharks present status, resulted in a careful and considerate interaction.

Some of the participants explained the whale sharks need for conservation as a result of interaction with humans, such as the fishermen. Some shared a story about fishermen causing injuries to the whale sharks with knives and pulled out spears in order to avoid them. This story can be regarded as a narrative presenting the fishermen as the villains and the whale sharks as the victims (Adger et al, 2001). Such narratives regarded the fishermen in a negative way. However, the sources of this story were not clear. All the participants perceived the tourist interaction to be threatening to the shark, due to their close contact. This perception can be supported by the observation from boat trips, where large groups of people were observed interacting close to the whale sharks.

However, it is important to remember that the participant's perception can include elements of social constructions. As mentioned, the perceptions held of the whale sharks' ecology and biology can be created by humans through the scientific publications about these topics. This refers to the *constructivist* idea, which implies that the meanings of social phenomena are dependent on social actors (Bryman, 2016). Even though science is conducted and measured in the field using tools and numbers, it is presented and published through channels of human perceptions. By doing so, the science presented will to a certain degree be influenced by the understandings held by the people conducting and presenting the science.

5.2.4 THE TOUR GUIDES PERCEPTIONS AND NARRATIVES

All the guides interviewed shared the same perception of the whale shark as a "*harmless animal*". They also had a common understanding of the whale sharks' prey, permanent stay

and feeding habits during the *Kaskazi*, which correspond to the published science (Potenski, 2008; Rohner et al, 2013; Rohner & Pierce, 2017). These perceptions seem to dominate amongst the guides and are also common amongst the fishermen and participants from the different organizations. An interesting discovery is that the tour guides knowledge did not only derive from their own experience in the industry, but did also derive from published literature or their own experiences in early years as a fisherman. This can explain why the perceptions are similar amongst the different groups of participants. Their knowledge is based on their common experience and channels of communication.

A smaller number of the guides shared the perception that the size of the whale sharks was ranging from 2 to 12 meters. Their perception of whale sharks being 12 metes of length seems to be higher than the length suggested in the published literature, which normally suggests a length of up to 9 meters (Rohner & Pierce, 2017). The tour guides perceptions of the whale sharks might have been affected by the refraction, making the sharks look larger than they actually are (Kwon & Casebolt, 2006). Moreover, some guides shared an understanding that the whale sharks could reach an age of more than a 100 years. Even though there is limited research within this field, previous research supports the perception of the whale sharks having a slow maturity and reaching more than 100 years of age (Colman, 1997).

The perception of the whale shark as an important species for the tourism in economic terms was common amongst all the 11 guides. However, 4 guides also perceived the shark as important for the people and the community in terms of symbolic value for the island. They argued for the sharks' intrinsic value to the people. This is an interesting discovery regarding the fact that people in general seemed to have a relatively low knowledge level regarding the whale sharks. In addition, most people seemed to regard the whale shark as most important for tourism, whereas very few seemed to regard the shark as a symbolic value for the island, as the questionnaire reveals.

Some of the guides perceived the whale shark as a "*friend*". This perception is quite similar to the fishermen's narrative about the "friendly" whale shark. This is an example of how a narrative can be the source of perceptions, as well as an example of how the perceptions can be affected by the same social constructions (Robbins, 2012). Moreover, the way in which the tour guides locate the whale sharks at sea show evidences of more common perceptions. All the guides explained how they look for the sharks by searching for their fins in the surface.

This suggests a dominating view regarding in which spots it is most likely to observe them. This perception can be supported by the science arguing that the whale sharks are observed feeding most of the time (Rohner & Pierce, 2017). However, *feeding* does not necessarily mean feeding at *surface level* but can also mean feeding at deeper levels, as some of the observations discovered.

In addition, many guides also looked for birds and jumping fish at the surface in order to locate the whale sharks. This perception has some features in common with the narrative held by the fishermen regarding the whale shark being a sign for where to locate the fish. The tour guides perception can be based upon this narrative. Some guides explained that they often had contact with the fishermen when the whale sharks were to be located. If this is the case, it can illustrate how a narrative can lead to a social construction of the tour guides understanding (Robbins, 2012). However, many of their perceptions also seemed to be based on own observations at sea.

The tour guide perceptions seemed to influence the way they interacted with the whale sharks. As many of the tour guides regarded the whale shark as harmless and friendly, close and frequent interaction seemed to appear in the observations. In addition, the fact that all tour guides regarded the whale shark to be important for tourism in economic terms, can be a triggering factor to the large amount of people participating in organised tours swimming with the whale sharks. Even though the Code of Conduct suggests a number of maximum 10 people per shark, some of the observations indicate that this recommendation is not always complied to. Both the interviews and the observations show evidence of poor compliance and understanding of the Code of Conduct. The balance between the economic incomes they depend on, the overall level of knowledge and the lack of control and sanctions for not complying to the code, represent a complex issue regarding the interaction with the whale sharks. This issue is further discussed in section 5.4 about the sharks' vulnerability.

5.2.5 THE TOURISTS PERCEPTIONS AND NARRATIVES

The over all impression from the tourists' perceptions shows a limited level of knowledge. Even though some tourists had observed whale sharks previously, other tourist were not aware of the whale sharks existence until they arrived at the island, and the majority had few elements to add in their descriptions. The limitation in the tourists' knowledge might be a

consequence of the gaps in the science about the whale sharks biological and ecological aspects (Colman, 1997). However, some perceptions were common.

A small number of tourists mistook the whale shark for being a whale, which is some how understandable regarding its name. They shared a perception of a big animal with flat tale and air blowing from its back. This perception seems to have developed through the tourists understanding or view of what a whale is, which in this case is not representative for the whale shark. However, an interesting discovery is to se how their perception of the whale shark is distorted because of their understanding of the similar species, the whale. Their perception of the whale shark can be regarded as socially constructed (Robbins, 2012). Many tourists shared the perceptions of the whale sharks being the world's biggest fish, a harmless animal and a filter feeder, which prey on planktons. These perceptions seem to match with the published research (Potenski, 2008; Rohner et al, 2013; Rohner & Pierce, 2017).

One tourist stood out by perceiving the whale shark as dangerous. It is likely to believe that this view is affected by the perception people often tend to have of sharks in general. Another tourist shared a different perception implying that the whale shark was to be found on the food marked in Zanzibar. The source of the latter was not clear. However, these two perceptions were not collectively agreed upon amongst the majority of the tourists and can therefor be regarded as perceptions differing from the ones in dominance. The majority of the tourists regarded the whale sharks as an amazing species after observing it. The latter can be regarded as the perception dominating amongst the tourists.

The perceptions held by the tourists' seems to influence on how they interact with the whale sharks. The fact that many perceived the shark as an amazing species to observe might be the reason for why some tourist took several trips. In addition, their low knowledge level is likely to be the reason for their undesirable behaviour when interacting with the sharks. Some tourists explained that they observed people touching the sharks and interacting closely in big groups. In addition, the observations also indicate that the number of tourists' interacting is more than the number suggested in the Code of Conduct. The limited knowledge amongst the tourists and the increase in the tourism industry every year (Rohner & Pierce, 2017), might be factors threatening the species and the future relationship between people and whale sharks at Mafia Island.

5.2.6 THE NEARBY COMMUNITIES KNOWLEDGE LEVEL AND PERCEPTIONS

The questionnaire revealed that even though most people were aware of the whale sharks existence, their level of knowledge was low. This may correspond with a low level of education and a lack of knowledge about these topics amongst the participants, of whom the majority had completed only primary school. In addition, most participants worked in other professions not connected to whale sharks such as in services, farming and others, which causes a more distant relationship to the whale sharks.

As discovered in the questionnaire, I found that knowledge about whale sharks is difficult to receive unless you know someone obtaining this knowledge, and even then it seems difficult to get. Communicating knowledge represents a type of signifying practice, where the information given can be affected by human influence (Robbins et al 2014). It is likely to believe that information, which has been distributed by few channels only such as through stories and through discussions, will lead to a high degree of similar and common perceptions and views regarding the whale sharks. Despite a low level of knowledge about whale sharks, almost all participants expressed an interest for receiving more information about this species.

An interesting discovery is to se that the majority of the participants perceived the whale shark as important. Despite their low level of knowledge of this species, they seem to regard the whale shark as a species of significance. The majority shared the perception that the whale sharks were important for tourism, whereas very few regarded the shark as an important symbol for the island. An interesting discovery is that even though 10 of the participants did fishing as a profession, none of them regarded the whale shark as important for the fishing industry. This stands in contrast to the fishermen perception collected during the interviews.

It seems as if the majority of the participants in this questionnaire shared the narrative held by the fishermen and the tour guides, regarding the sharks' presence as an important economic contributor for tourism and thereby for the community. Even though this narrative illustrates the whale sharks' importance for the community, not every participant seemed to know why the shark was of significance. This is likely to be due to the lack of knowledge, but it can also be because they simply do not support this opinion. However, if these participants held a deviant perception to the dominating narrative, it was not expressed in the questionnaire.

The observations conducted during the project held by WWF, discovered a low level of knowledge about the whale sharks, amongst the children. Even though the majority of these primary school students were children of fishermen, less than half of them seemed to be aware of its existence. This corresponds to the country's history regarding the education systems (Caplan, 2007) as well as the concern for future teaching raised by the teachers at the schools. Without economic resources and necessary knowledge, the distribution of this knowledge is difficult. The findings implies that even though you know people with the knowledge about the whale shark, passing on this knowledge to others seems challenging. An interesting discovery is to se how these children's situation is similar to the fish trader women's situation. Both groups are surrounded by fishermen obtaining this knowledge. However, their awareness and knowledge seems to be limited.

Many of the children that were aware of the whale shark shared the perception that it belonged to Mafia. An interesting discovery is that the children perceived the whale shark more as something connected to Mafia, as a part of it, while the adults regard it as important for tourism and the economy. However, when the sharks advantages and disadvantages was brought into the discussion, the children did not emphasize possible economic advantages. They rather discussed how the tourism brings foreigners to the island, providing them the opportunity to experience and swim with the sharks, an opportunity most of the local people don't get. In addition, they dress inappropriately according to the local costumes. In this regard, the children can be regarded as influenced by the consequences from the whale sharks presence, despite their limited knowledge.

Some children also shared the perception that the whale shark is in need for conservation. An interesting discovery is their awareness of conservation, despite their limited knowledge about this species. However, the children's situation is complex. Without awareness and resources put into the development of knowledge about whale sharks in the schools, future conservation on a local level will be difficult, as these children represent the next generation of possible marine conservationists.

5.3 WINNERS AND LOSERS FROM THE WHALE SHARKS' PRESENCE

The third objective in this study investigates the potential local advantages vs. tourism advantages and disadvantages emerging from the whale sharks presence at Mafia, and further more whether such advantages and disadvantages can lead to the production of winning and

losing actors. Through examining the interviews, the questionnaire and the observations, this section discusses the advantages and disadvantages emerging from the whale sharks presence and whether these structures lead to the production of winners and losers.

5.3.1 DISCOVERING THE ADVANTAGES

Throughout the interviews with the fishermen, I discovered that the majority perceived them selves as getting advantages from the whale sharks presence. They argued for the sharks' importance in signalling the location of fish, making fishing easier and as a contributor to more catch. As the whale sharks often were spotted accompanied with smaller fish, and even feeding on the same plankton as fish targeted by fishers (Rohner & Pierce, 2017), they seem to be a specie of significance to the fishermen. Together with the fishermen's knowledge of and experience with this species, the whale sharks presence can be regarded as an advantage for the fishermen.

Some of the fishermen, as the majority of the participants in the questionnaire (representing people who did not necessarily have a relationship to the whale sharks), also considered advantages such as contributions to the tourism and the supply of money. Some of the participants from the organizations agreed and argued for the government's economic advantage through the fee of 10-12 USD per person, earned from the whale shark tourism. In addition, all the tour guides interviewed perceived them selves as getting direct advantages through the income from the whale shark tourism. Around half of them agreed that the income also gave advantages to the community through the development of hotels, the service sector and governmental institutions such as schools, hospitals and roads. A small number of tour guides also mentioned that the money collected could contribute to the conservation of the whale shark.

From the reviewed literature, I discovered that the whale shark tourism has been increasing over the last seasons (Rohner & Pierce, 2017). In addition, the observation conducted at sea indicated a relatively large number of tourists participating on whale sharks tours, evenly distributed during the months October to December 2017. With a fee of 10-12 USD per tourist collected during the season and an increasing number of tourists, it is likely to believe that this industry represents a profitable advantage for the government. By taking this into consideration and the advantages such as signals for fish and increase in catch, the advantages seems to be structures creating a win-win situation for the government, the fishermen and the

tour guides. The whale sharks presence and use as a resource seems to create advantages for different groups.

5.3.2 DISCOVERING THE DISADVANTAGES

The whale sharks presence did not only appear to create advantages. Disadvantages were also discovered. Some fishermen argued that the whale shark created disadvantages in terms of disturbance of the fishing and destruction of nets when it was entangled. As the whale sharks often are spotted together with other fish targeted by fishermen and sharing the same source of prey (Rohner & Pierce, 2017), it is likely to imagine how this huge species can create difficulties for fishermen. In addition, as the fishermen release the shark by pulling the net down, the catch captured by the net also escapes, as explained in the interviews. In this regard, the whale sharks presence is causing a disadvantage for the fishermen.

During the interviews with participants from the organizations, some participants raised concerns regarding the local community's poor knowledge about the whale sharks and there limited opportunity to take advantages of the sharks' presence. As the questionnaire revealed, the knowledge level regarding whale sharks was low amongst the participants, representing the population settled in the whale shark area. The limited knowledge does not necessarily create a direct disadvantage for the community, but can rather be regarded as a type of injustice. The injustice can be regarded as a result of structures such as the limited access to knowledge and the published research about the whale sharks. Without a certain level of knowledge about the whale sharks, advantages from its presence are difficult to achieve.

A more direct disadvantage emerging from the whale sharks presence can be the different cultures the tourism brings to the island, as discussed during observations in the WWF project. Some of the children reacted on the inappropriate dressing amongst some tourist or the "culture shocks", which were regarded as a lack of respect for the Mafian culture, where many originate from Muslim backgrounds (Heilman & Kaiser, 2002). In addition, the tourists' appearance seemed to illuminate some social and economic differences as the children questioned why all the foreign tourist got the chance to observe the whale sharks, an opportunity very few of the resident people at Mafia were offered. In this regard, the cultural effects, such as "culture shocks" and a raising awareness of social differences, resulting from the whale shark tourism, can be regarded as a disadvantage.

Another interesting discovery regarding advantages and disadvantages is that not all participants regarded the whale sharks' presence to contribute to the community. Especially one of the tour guides interviewed, strongly disagreed that the tourism brought advantages to the community through the government. He argued that the government did not take its responsibility in providing roads, hospitals and other public goods. The participants' perception on these issues could be based on the promised improvement in the public sector stated by the government (EIU, 2018), which the participant did not feel had been accomplished. If this is the case, it does not represent a direct disadvantage from the whale sharks presence, but is rather an example of injustice. Taking into account that parts of the income collected from the whale shark tourism initially were designated to community development, and is not accomplished, the local communities can be regarded as victims of injustice. In summary, the disadvantaged emerging from the whale sharks presence seems to be unevenly distributed, with a higher weight on the local community (Scholsberg, 2013).

5.3.3 WHO ARE THE WINNERS AND WHO ARE THE LOSERS?

In this regard, the advantages and disadvantages emerging from the whale sharks presence seem to result in a production of both winning and losing actors. The advantages and disadvantages do not create winning and losing actors directly (Robbins, 2012). It is rather the structures of advantages and disadvantages leading to injustice that creates these types of actors. As the fishermen, the tour guides and the government have access to necessary knowledge about the whale sharks, it gives them the opportunity to achieve advantages from the whale sharks presence, and can therefore be regarded as the winning actors.

Moreover, as the local communities (including people who do not necessarily have a relationship with the whale sharks) have little knowledge of, and limited access to, information about the whale sharks, advantages from the sharks presence seems difficult to achieve. In addition, they seem to be affected by the disadvantages drawn from the whale shark tourism and might not receive what is promised in terms of public improvement from the government. Taking this into consideration, the local communities are the victims of injustice caused by an uneven distribution of disadvantages. The local communities can therefore be considered as the losing actors from the whale sharks presence. The factors creating disadvantages and injustice to the local communities can be regarded as the structures producing losing actors (Robbins, 2012).

5.4 THE WHALE SHARKS' VULNERABILITY

The fourth and last objective in this study investigates the whale sharks vulnerability, in order to determine possible human treats and risks for a future disaster regarding the whale sharks presence in the Mafia waters. This section discusses the results from the interviews, the questionnaire and the observations with vulnerability. A vulnerability analysis preformed using the Pressure and Release (PAR) model is presented, in order to determine the factors leading to the whale sharks vulnerability. These factors are combined with the possible stressors from human interaction in order to determine the risks for a possible disaster at Mafia Island.

The vulnerability analysis, preformed using the PAR model, is first presented by a discussion of "the progression of vulnerability", including the three components (root causes, dynamic pressure and unsafe conditions) leading to the sharks' vulnerability. This is followed by a discussion of the hazard affecting the whale shark, which in turn is followed by a discussion of the risks for a possible disaster. The PAR model illustrates how a disaster can develop when a hazard affects a vulnerable group (Wisner et al, 2004). The section ends with a discussion of the connection between the two conceptual frameworks of *political ecology* and *vulnerability*.

5.4.1 THE PROGRESSION OF VULNERABILITY

The first component amongst the ones leading to vulnerability is the *root causes*. These are causes representing the more general processes in the global economy and within the society (Wisner et al, 2004). At Mafia, the processes within the society can be argued to be the limited access to power, structures and resources. Limited access to power, structures and resources for raising awareness or conserving the whale shark can be regarded as root causes. During the project held by WWF, the teachers participating expressed their concern for very limited economic and academic resources within the school systems. They emphasised especially their concern for the development of knowledge in biology and of marine species, such as the whale sharks. In addition, some workshops targeting the authorities and tour guides for raising the awareness of the sharks biology and behaviour were held by NGO's. However, it seems that the workshops did not achieve its goals as the workshops were not an annual occurrence (Sea Sense & MMF, 2015). Moreover, the fee collected from the whale sharks tourism, of 10-12UDS per person, suggests that the government collects some economic resources. However, this economic resource does not seem to be accessible. Even

though no direct study of the government's distribution of the resources has been done, the interviews and observations conducted gave the impression that little was accessible for the "Mafian" communities. Limited access to power, structures and resources can be regarded as root causes, which throughout the dynamic pressure lead to unsafe conditions for the whale sharks (Wisner et al, 2004).

Another important root cause is the ideologies affecting the Mafia society and the country's economy. These ideologies refer to the economic and political systems in place. These causes are more "distant" and represent the general processes within society (Wisner et al, 2004). However, as the root causes are connected to the state itself and how power are distributed and played out (Wisner et al, 2004), the economic and political systems affect the country's economy and the control within the country's societies (EIU, 2018: World Bank, 2018). The limited access to power, structures and resources for developing knowledge and conservation are likely to be caused by the country's political and economic systems. Such root causes are considered to be important causes that give raise to vulnerability, as well as producing it over time (Wisner et al, 2004).

The effects from these root causes will eventually lead to unsafe conditions for the whale sharks, through the factors from the *dynamic pressures* (Wisner et al, 2004). The dynamic pressures can be considered as a combination of the lack of factors and the macro-forces in place. Lack of factors such as education, knowledge and publications in Kiswahili about the whale sharks can be regarded as a dynamic pressure. As the interviews and questionnaire reveals, only the people depending directly on the whale shark, either as a fisher, a tour guide or as employed in the presented organizations, seemed to obtain knowledge about this species, but of different degrees. However, people in general in the nearby communities and tourists seemed to know hardly anything or very little about the whale sharks. Results from the questionnaire also revealed that knowledge about the whale shark was difficult to achieve unless you knew someone obtaining this information.

During the desk studies working on the literature review, very few publications about the whale sharks in Kiswahili were found. During the interviews and the questionnaire, I discovered that many people at Mafia didn't speak the English language. This indicates that the already published literature in English will be of little help in gaining and developing their knowledge. Without the right knowledge and education regarding the whale sharks biology

and behaviour amongst people interacting with them and the people living and growing up in its nearby habitat, this can lead to conditions threatening the shark. Moreover, the lack of knowledge and education in the schools results in a future generation of "Mafians", which will be little prepared for future conservation of the whale sharks. Root causes such as limited access to power, structures and resources results in a lack of education, knowledge and publications in Kiswahili in this field.

Another dynamic pressure is the lack of control of the functionality of the Code of Conduct. The interviews revealed that all the tour guides were aware of the code. However they seemed to misinterpret some of the guidelines. Observations conducted at sea supports this supposition. Some observations illustrated that the number of tourists interacting with the shark was way over the amount suggested in the code. In addition, close interaction with and touching the shark were also observed, as some of the tourists and organizations explain in the interviews. This supports the assumptions that the code is not always followed. There were no control or patrol at sea, ensuring that the code was adhered to or that the guidelines were understood. This lack of control is a factor that contributes to unsafe conditions for the whale sharks.

The dynamic pressures can also consist of a set of different macro-forces, which channels the root causes into unsafe conditions (Wisner et al, 2004). The increasing numbers of fishermen at the Tanzanian coast can be regarded as a macro-force. Several of the fishermen raised their concern regarding the increasing number of fishermen working in the Mafia waters during the last years. Some explained the increased number of fishermen as a result of overfishing in other parts Tanzania. Such conditions make the competition for fish resources harder, especially as many fishermen are depending on fish resources only (Bryceson et al, 2006). Limited access to resources for conservation as a root cause and an increasing number of fishermen dependent on resources from the Mafia waters, are creating unsafe conditions for the whale sharks.

An increasing number of tourists to Tanzania during the early 1990s (Walley, 2004) can also be regarded as a macro-force working as a dynamic pressure. Due to a rapid growth in the tourism, also at Mafia since 2010 (Sea Sence & MMF, 2015), an increasing number of tourists swimming with whale sharks have been observed (Rohner & Pierce, 2017). This growing number of tourists will demand an increase in the numbers of boats cruising in the

whale sharks feeding area. During the interviews, the guides said they normally did one whale shark trip a day. However, some responded that they would do several trips if the demand were greater. An increasing number of tourists visiting in order to swim with the whale sharks, and thereby more boat traffic, and poor regulations of the whale shark tourism (Rohner & Pierce, 2017), will result in unsafe conditions for the whale sharks.

Unsafe conditions are the third component leading to vulnerability (Wisner et al, 2004). Unsafe conditions refer to the habitat where the whale shark spends its time during daily activities. In the whale sharks physical environment there are several unsafe conditions. A high number of boats in the whale sharks feeding area are one unsafe condition in the sharks' physical environment. These boats are both fishing boats and tourist boats. As the whale shark is a species feeding on planktons and mostly near the surface (Rohner et al, 2013), it is extremely exposed to contact with boats. During the interviews, some fishermen confirmed that they had experienced collisions between whale sharks and boats. In addition, some of the literature also suggested that scars and injuries on the whale sharks came from boats with high speed in their feeding areas (Rohner & Pierce, 2017). The observations conducted at sea revealed scars on around half of the whale sharks observed, injuries similar to the ones described by Rohner & Pierce (2017). In this regard, boats in the whale sharks physical environment can be regarded as an unsafe condition.

A large number of fishing nets and other fishing gears in the whale sharks feeding area can also be considered as an unsafe condition in the whale sharks physical environment. As the fishermen use the whale shark as a sign for fish, whale sharks are often entangled in the nets (Rohner et al, 2013). All the fishermen interviewed used fishing nets as a gear and the majority had experienced the whale sharks trapped or entangled in the net. However, all the fishermen explained that they *"did not mean any harm"* to the shark and they had a method for releasing them without causing injuries. Even though the release of the shark can be carried out without causing it any physical injuries, it is likely to believe that the situation is stressful for the whale shark as well as disrupting its feeding habits, especially when the number of nets and fishing gears are many. It is clear that a large number of fishing nets in the whale sharks physical environment can be regarded as an unsafe condition for the whale sharks.

Unsafe conditions in the whale sharks physical environment are also the many snorkelers chasing the whale shark in its feeding areas. As some of the interviews and observations reveals, a large number of tourists interacted with the whale sharks, some of which interacted very close. Several of the observations at sea indicated that the whale sharks changed directions when the tourists were dropped into the water. Large groups of people also seemed to stress the sharks, especially the smaller ones. When the whale sharks were observed feeding, the tourist interaction seemed to disrupt the feeding in several occasions. In this regard, the swimmers seemed to cause stress to the whale sharks as well as disrupt their feeding habits. Human disturbance of the whale sharks natural feeding behaviour create an unsafe condition for the whale sharks.

Unsafe conditions can also be caused by the local economy at Mafia. Low-income levels (HDR, 2016) and predictable food supplies ("food security"), are examples in the local economy which might create unsafe conditions for the whale sharks. With low-income levels, people become extremely dependent on the work they do, and food security makes people much dependent on their local resources. As resources from fishing are crucial for the food security for thousand of people at Mafia (Sea Sense, 2012), fishing in Mafia waters are necessary. The fishermen are an important contributor to the people's food security, as well as depending on its income, whereas many fishermen are dependent on income from fishing only (Bryceson et al, 2006). As a result, many fishermen need to fish in order to survive and contribute with resources to the food market. This results in an interaction with the whale sharks, when the fish targeted for catch often are in the same area as the sharks chasing food.

The income levels are also affecting the tour guides. The tour guides are dependent on the income from tourism. In this regard they have a pressure in making the tourists satisfied with the service. This often implies boat trips offering close and too many people interacting with the shark, as observed in the observations at sea. The lack of control of the Code of Conduct and rules amongst the different tour companies when interacting with the sharks, makes the situation difficult for the guides. In this regard, the local economy creates unsafe conditions for the whale shark, as the guides are dependent on the tourists' interaction with this species.

The unsafe conditions in the whale sharks physical environment can be considered to be caused by the many boats in its feeding area, the many fishing nets and the many swimmers chasing the whale sharks. In addition, unsafe conditions in the local economy can be

considered to be caused by low-income levels and food security. These conditions are all caused by the root causes such as the political and economic system in place, limited access to power, structures and resources for developing the knowledge level and for conservation. These root causes are through the dynamic pressures (such as lack of education, knowledge, and publications in Kiswahili about the whale sharks, the lack of control of the Code of Conduct and the macro-forces, such as the increasing number of fishermen and number of tourists), creating unsafe conditions for the whale sharks. This represents the progression of vulnerability, which is illustrated in the PAR model (see Figure 16).

The progression of vulnerability illustrates how vulnerability can occur (Wisner et al, 2004). Figure 16 illustrates how the political and economic situation at Mafia affects the people's knowledge and action and thereby creates vulnerability for the whale sharks around Mafia Island. The root causes and dynamic pressures contribute to an explanation of why people act the way they do. Even though this study does not perform a vulnerability analysis of the people at Mafia, Figure 16 suggests that the people affected by the whale sharks presence are also vulnerable. Taking this into consideration, the whale shark can be regarded as vulnerable, partly because of the conditions in the whale sharks' physical environment but also because the people close to its habitat are vulnerable. Peoples vulnerability are caused by the root causes, which provides them with limited access to power, structures and resources and making them highly dependent on the resources and income from their interaction with the whale sharks. The vulnerability of the whale shark can be regarded as generated by the social, economic and political processes in place (Wisner et al, 2004).

5.4.2 PAR MODEL

The progression of vulnerability illustrates how the whale shark at Mafia can be regarded as vulnerable. This progression or causes leading to vulnerability is one step, which together with the impact from a hazard creates the risk for a disaster. In order to investigate how a possible disaster amongst the whale sharks around Mafia can develop, the hazard and its impacts affecting this vulnerable species needs to be taken into consideration (Wisner et al, 2004).

A *hazard* can have several meanings and can be understood in different ways. Wisner et al (2004) define a hazard as a natural event. They typically refer to hazards as natural events such as storms, floods and fires and much more. In the case of Mafia, none of these natural

events has occurred during the fieldwork for this study. The whale sharks around Mafia can be considered to face another type of hazard. The hazard affecting the whale sharks is the multiple stressors from the human activities around Mafia. Stressors from the human activities can be regarded as a hazard; it is a condition or process threatening the whale sharks by being "alive" (Robbins et al, 2014).

Previous research on the whale sharks have raised the concern that anthropogenic activities, such as fishing and aquatic tourism including snorkelling and scuba diving can have an affect on the whale sharks ecology and behaviour (Colman, 1997; Pierce & Norman, 2016; Graham & Roberts, 2007). In the majority of the observations conducted at sea, the whale sharks were observed changing behaviour when groups of people were dropped into the water and swimming and snorkelling with them. The whale sharks behaviour changed, they seemed to become more stressed, whereas the smaller sharks seemed more affected by stress compared to the bigger ones. At Mafia, the majority of the whale sharks are juvenile (Rohner & Pierce, 2017), which implies that they are smaller in size compared to the mature sharks. This indicates that the number of sharks affected by stress from the human interaction will be high in the Mafia waters.

Moreover, in the observations at sea when the whale sharks were observed feeding, the tourist interaction seemed to disrupt the feeding in many occasions. As a result, the whale shark stopped feeding and was forced to move or change directions to escape the crowds. This type of disruption, together with the stressors from the human activities, can be regarded as threatening to the sharks, when it comes to its feeding and natural behaviour.

Other non-human factors, such as environmental factors causing threats for the whale sharks at Mafia, were not investigated. Still, some participants from the organizations expressed during the interviews their concerns for factors such as climate changes, plastic and pollution to be threatening for the species. Some however, claimed that these factors were not threatening to the whale shark at Mafia. The observations conducted at sea did not reveal significant evidence to support the concerns regarding environmental threats. However, all the participants from the organizations agreed that human activities, such as tourism and fishing, could be threatening for the whale sharks.

In this regard, the multiple stressors from the human activities can be regarded as a hazard threatening this species. The hazard is there, due to the lack of regulations of the tourism industry and the high dependency on fish resources as well as the income from the activities involving interaction with the whale sharks. In this way, the economic, political and social processes that generate vulnerability do influence and shape the way this hazard affects (Wisner et al, 2004). The PAR model initially suggests that the progression of vulnerability and the hazard, are two isolated factors, which together produce the risks for a disaster (Wisner et al, 2004). In this case however, the progression of vulnerability and the hazard cannot be regarded as isolated factors but rather as factors affecting each other. Together they form the risk for a disaster.

A *disaster* can be regarded as a mix of human action and natural hazards. This means that a disaster does not need to be caused by storms, floods and other natural events alone. It can also develop as a result from the economic, political and social environments and systems in place (Wisner et al, 2004). Throughout the PAR model, the whale shark is considered a vulnerable species, exposed to hazards in terms of stressors from human activities. These two factors contribute to a risk for a possible future disaster, involving a chance for the whale sharks to disappear from the Mafia waters. Until present, a disaster has not occurred. During the interviews, the participants expressed much disagreement regarding the whale sharks population estimates over time. Whether the number of whale sharks has increased, decreased or has been stable were difficult to determine, as the participants responses were almost equally divided amongst these views. However, the risk for a future disaster can be regarded to be in place.

As the whale shark is highly dependent on feeding on the nutrient (Colman, 1997) brought to the Mafia waters during the northeast monsoon*, Kaskazi,* (Rohner et al, 2013), which also happens to be the period for the tourist season at Mafia (Table 3), the lack of regulations and control of the tourism, as well as the fishing activities, may cause too much stressors in the whale sharks feeding area. It is likely to believe that an intensification of the present hazard can make the whale sharks change its feeding habits around Mafia, and thereby chose a different location as their habitat. If this happens, which implies that the whale sharks disappear from Mafia, the island will lose an iconic species, an important contributor for the tourism industry, and a species of huge importance for the fishermen. Furthermore, scientists will lose a unique opportunity to follow individual sharks for investigation and development

of the knowledge about this species. This type of disaster can be caused by a combination of the whale sharks vulnerability and the impacts from the hazard in place. This is illustrated in the PAR model below.
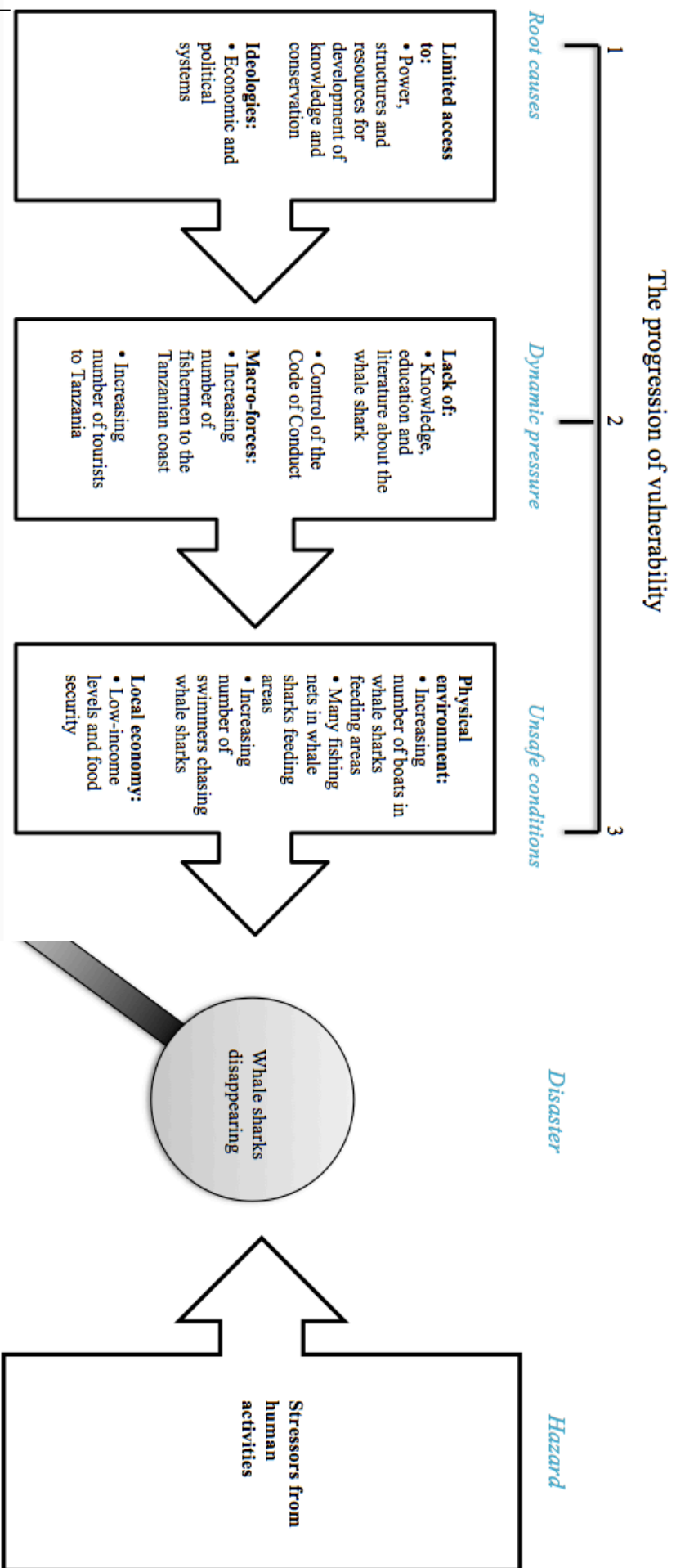
The progression of vulnerability

1

Limited access to:
• Power, structures and resources for development of knowledge and conservation

Ideologies:
• Economic and political systems

Dynamic pressure

2

Lack of:
• Knowledge, education and literature about the whale shark

• Control of the Code of Conduct

Macro-forces:
• Increasing number of fishermen to the Tanzanian coast

• Increasing number of tourists to Tanzania

Unsafe conditions

3

Physical environment:
• Increasing number of boats in whale sharks feeding areas

• Many fishing nets in whale sharks feeding areas

• Increasing number of swimmers chasing whale sharks

Local economy:
• Low-income levels and food security

Disaster

Whale sharks disappearing

Hazard

Stressors from human activities

Figure 16: Pressure and Release (PAR) model. Adapted from Wisner et al, 2004

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The model illustrates how a future disaster, involving the whale sharks disappearing from Mafia, can occur when a number of vulnerable whale sharks experience a hazard, such as stressors from human activities, which causes damage and disrupts their behaviour and habits in a way that makes recovery at Mafia difficult. The PAR model shows how the whale sharks become vulnerable through the root causes, dynamic pressures and unsafe conditions, which seem to be connected to the vulnerability of the people living near its habitat. The whale sharks vulnerability might be partly caused by conditions in its physical environment and partly by people's vulnerability in its nearby habitat. However, the human interaction seems to be the main factor leading to the whale shark vulnerability, as well as it creates a hazard for this species. In combination, these factors create a risk for a future disaster, implying that the whale sharks might disappear from the Mafia waters.

5.4.3 CAN VULNERABILITY AND POLITICAL ECOLOGY BE CONNECTED?

The whale sharks vulnerability can be claimed to be caused by political ecology. The vulnerability of the whale shark can be regarded as generated by the social, economic and political processes in place (Wisner et al, 2004). The political and economic forces create a relationship between human and nature (Beymer-Farris et al, 2012), which involves the whale sharks. This relationship is, as explained in section 5.4, caused by limited access to power, structures and resources for developing knowledge and conservation. In addition, this relationship is also a contributing factor to the people at Mafia's dependence on the income from tourism, involving whale shark interactions, as well as the fish resources in the whale sharks habitat. This leads to reverse social and environmental states (Beymer-Farris et al, 2012). The people at Mafia can experience a reverse social state while the whale sharks can experience a reverse environmental state. As a result, people interact in a way which make the whale shark vulnerable.

In addition, the results discussed in section 5.2 suggest that the social constructed perceptions and narratives affect the way people interact with the whale sharks. As shown using the PAR model, some of the interaction is regarded to be threatening to the whale shark and contributes to its vulnerability. In this regard, vulnerability can be considered as socially produced (Wisner et al, 2004). Whether these perceptions and narratives are created directly by the economic and political systems in place is not clear. However, what is clear is that *if* more knowledge and development regarding the control and regulation of the interaction with the whale sharks had been in place, less threatening interaction would occur and this species

vulnerability might have been different. In this regard, political ecology can be claimed to illuminate the political economy of the management and use of natural resources (Beymer-Farris et al, 2012), which can result in reverse social and environmental states, and thereby contribute to vulnerability.

6. CONCLUSION AND RECOMMENDATIONS

The objective of this thesis was to investigate the socio-political aspects of the whale sharks' presence around Mafia Island and to assess the vulnerability regarding this species. This study attempts to contribute to the research on whale sharks, by illuminating the social and political aspects emerging from the whale sharks presence and whether these aspects contribute to the species vulnerability. These issues are addressed by combining the conceptual frameworks of *political ecology* and *vulnerability*. The effects from the whale sharks' presence and whether it contributes to the whale sharks' vulnerability were analysed by using a mixed method approach. This approach involved both quantitative and qualitative methods, such as desk studies, interviews, a questionnaire and observations.

The social and political aspects of the whale sharks involve the whale sharks' interaction with humans, people's perceptions and narratives of this species, the winning and losing actors as a result from the advantages and disadvantages emerging from the whale sharks' presence, and the whale sharks' vulnerability and risk for a possible future disaster at Mafia. In order to investigate these aspects, the research question was formed in the following manner: *How does the whale sharks' presence at Mafia Island create advantages and disadvantages, with associated winners and losers, and how can these factors, together with people's perceptions and narratives affect the whale sharks' vulnerability and risk of a possible future disaster?* In order to provide an answer to the research question, this concluding chapter answers each of the objectives and sub-research questions presented in the thesis' introduction in section 1.3.

This study has shown that the whale sharks' biology and ecology affects the humans' opportunity to interact with this species. The result from the reviewed literature reveals that the whale sharks are characterized as gentle by nature, they feed near the surface and are often accompanied with schools of smaller fish in tropical waters. These biological and ecological characteristics create opportunities for human interactions. As the whale shark does not oppose any direct threat to humans and are located in tropical waters, often with other small fish targeted for catch, it makes them attractive for organized aquatic tourism as well as an important species for fishing activities. This study reveals that the whale sharks biological and ecological characteristics are affecting the way humans interact with this species. However, the human interaction can also affect the whale sharks' natural behaviour.

This study has also illuminated people's perceptions and narratives emerging from the whale sharks' presence, and how these can affect the human interaction with the whale sharks. The findings revealed that the people working directly and indirectly with the whale sharks seemed to share much of the same perceptions. However, some groups of participants knew more than others. The participants from the organisations, the fishermen and the tour guides shared much of the same perceptions of the whale sharks' biology and ecology. In addition, these groups of participants had a higher level of knowledge compared to the tourists, fish trader women, children at the primary schools and other people in the communities near the whale sharks' habitat. The level of knowledge depended on the participants' access to information about whale sharks. The results show that the majority was interested in more knowledge. However, they did not have the access.

Amongst the different groups stories and narratives were explored. Their stories about the whale shark or *Papa Potwe* as a *"friend of people"*, an important species for fishing and an economic contributor to the tourism, also seems to be the dominating narratives amongst the people in general. However, some counter-narratives were discovered. These opposing stories explained the whale shark as a species causing problems for fishing, destroying their nets and for being dangerous. The sources of these narratives seemed to be the participants own experiences, discussions with others and published science and literature. People's knowledge level, perceptions and narratives also seemed to affect the possibilities for interacting with the whale sharks, as well as affecting the way people working in the different industries connected to the whale shark, interact with this species.

This study has also shown the advantages and disadvantages emerging from the whale sharks' presence and how these structures can create winning and losing actors. The advantages emerging from the whale sharks' presence are considered to be the signals for fish and thereby a contributor to more catch, the economic income for the tourism and the income for developing the Mafia communities. These advantages are achieved through knowledge and the positions and opportunities held by the fishermen, the tour guides and the government. The disadvantages emerging from the whale sharks' presence are considered to be the destruction of fishing gears and disruption of fishing, the "culture shocks" or the different cultures the tourism brings to the island, and a rising awareness of social differences between local communities and tourist. These disadvantages seem to have been distributed to a greater

extent in local communities, which already have limited access to, and knowledge about, the whale sharks.

As a result, the structures of advantages and disadvantages emerging from the whale sharks' presence leads to a type of injustice, in which winning and losing actors are produced. The fishermen, the tour guides and the government, with their access to knowledge and the opportunity to achieve advantages from the whale sharks' presence, can be regarded as the winning actors. The local communities near the whale sharks' habitat can on the other hand be regarded as the losing actors. The losing actors are a result of the injustice created by the uneven distribution of disadvantages to these communities, as well as their lack of knowledge and limited opportunities to achieve advantages from the whale sharks' presence. In this regard, the structures from the advantages and disadvantages are creating winning and losing actors.

In addition, this study has demonstrated how the whale sharks' vulnerability can develop through human actions creating risks for a possible disaster for the whale sharks' future presence at Mafia. By using the PAR model, this study has illustrated that human interaction with the whale sharks, throughout the *root causes* and *dynamic pressures* create *unsafe conditions*, which can make the whale sharks vulnerable. Based on the results from the PAR model analysis, the whale shark can be regarded as vulnerable due to the vulnerability of the people in its nearby habitat. Factors such as the economic and political system in place, limited access to power, structures, knowledge and resources for development, are factors that makes people vulnerable and thereby making the whale shark vulnerable, together with the conditions in the whale sharks physical environment.

The vulnerability analysis also illuminates the risk for a possible future disaster. The whale sharks' vulnerability and the effects from the stressors from human interactions can lead to a disaster implying the whale sharks disappearance from the Mafia waters. Without the whale sharks' presence, Mafia will lose an iconic species for the island, which have brought a large number of tourists and contributed to the development of the tourism sector. The island will also lose a species important for the fishing activities around Mafia Island. In this regard, the human interaction with the whale sharks seems to affect and create the vulnerability for the whale sharks, leading to the risks for a future disaster.

In general, the results from this study have shown that the whale sharks' vulnerability can be caused by some of the political ecology aspects in place. The social, economic and political forces in place created a relationship between humans and the whale sharks, which seems to cause the whale sharks' vulnerability around Mafia Island. The low knowledge level amongst people regarding the whale sharks, their perception and narratives and their access to interaction with the whale shark and to information about this species, are caused by the islands political and economic system. In addition, their knowledge level, perceptions and narratives seem to affect the way people interact with the whale shark. The systems in place have created limited access to power, structures and knowledge, which makes future local conservation difficult. In addition, many people at Mafia are highly dependent on the income from tourism, involving whale shark interaction, as well as the fish resources in the whale sharks' habitat. As a result, people interact in a way which make the whale shark vulnerable.

Considering the whale sharks' future at Mafia Island, this study recommends the following measures for the local development, management and conservation for this species:

- To develop a unit managing the income from the whale shark tourism (the fee of 10-12 USD per person) in order to create a budget and to ensure that the income goes to benefiting the local community and the conservation of the whale sharks.
- To establish a boat patrol to control and ensure that the Code of Conduct is adhered to during the tourist interaction with the whale sharks, as well as control of the number of boats and the boat speed in the whale sharks feeding areas.
- To implement classes at the primary schools, with syllabus in the islands ecosystems and it's associated species on land and in the sea, in order to raise awareness and develop conservation skills amongst the future generations of "Mafians".
- To conduct research on sustainable methods and techniques in order to develop sustainable fishing gears and methods that will be less threatening and stressful for the whale sharks when interactions with the fishermen occur.

These recommendations will contribute to a safer and better environment for the whale sharks, but will also facilitate a better environment for the fishermen, the tour operators, the tourists and the people in the nearby communities.

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8. APPENDIX

APPENDIX I

CODE OF CONDUCT

WHALE SHARKS OF MAFIA

- **Whale Sharks** (*Rhincodon typus*) are the largest **fish** in the sea.
- They can grow up to a maximum length of **20 m** and are thought to live up to **100 years**.
- They feed mainly on **zooplankton** and tiny fish which they filter out the water.
- Whale sharks are **COMPLETELY HARMLESS TO HUMANS**.

JUVENILE MALE

MATURE MALE
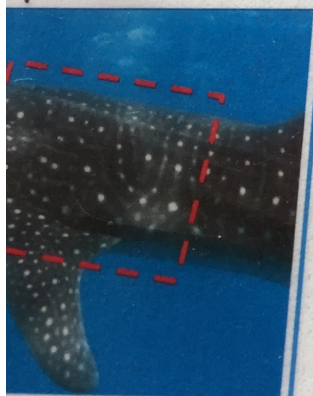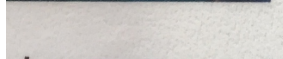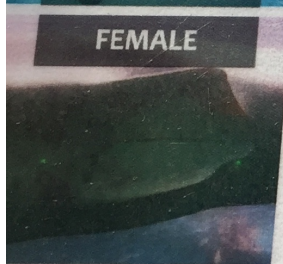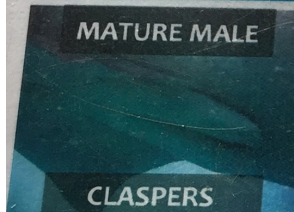
CLASPERS

FEMALE

REPRODUCTION
- Males have two sexual organs called **CLASPERS**
- Females have a **CLOACA**
- Whale Sharks mature **at ~30years** old at **9m** long.

DISTRIBUTION
- Whale Sharks are generally solitary animals.
  HOWEVER
- Aggregations are found in several locations around the world; Mexico, Australia, Mozambique, the Philippines, Seychelles, Qatar and here around Mafia Island.
- Sharks come to feed on seasonally abundant zooplankton or eggs and larvae from breeding fish and crabs.

RESEARCH
The **World Wide Fund for Nature (WWF)** Tanzania has funded the current whale shark research program on Mafia Island since 2012

Research on Mafia Island hopes to learn about:
- Population structure.
- The sharks' movements around Mafia Island.
- How environmental drivers affect whale shark sightings.
- How to better manage whale shark tourism in Mafia.

GET INVOLVED!
Photo identification gives us information on whale shark population number and movements.
Whale shark **SPOT PATTERNS** are like a **FINGERPRINT**.

(1) Take a photo of the boxed area indicated on the **LEFT side of the shar** (though photos from both sides is ideal).

(2) Note down the **DATE, TIME and LOCATION** you took the photo.

(3) 75% of Tanzanian sharks have scars. Try and take **photos or note dow** any **INJURIES/SCARS** you see on the animal.

(4) **PLEASE** upload your photos to **www.whaleshark.org** and find if your shark has been seen before and be updated every time it is s again!

APPENDIX II
INTERVIEW GUIDES

<u>INTERVIEW GUIDE FOR FISHERMEN</u>

Objective 2: Investigate human perceptions on the whale shark and how this perception influences their interaction with it.

> Q. For how long have you been working with fishing?
>
> Q. Are you familiar with the whale shark? If so, what do you know about it? And how do you experience it?
>
> Q. Do you consider the whale shark important for you/your community? If so, how?
>
> Q. Is your view on the whale shark based on your own observation/experience or is it based on others?

Objective 3: Investigate the advantages and disadvantages emerging from the whale sharks presence.

> Q. When you are out fishing, how often do you see the shark? What do you do?
>
> Q. Do you benefit in any way from the presence of the shark? If yes, how? If no, why not?
>
> Q. Do you experience any differences in the amount of catch you get in the period where the shark is present?
>
> Q. Do you experience any changes in the boat traffic during this period? If so, how?

Objective 4: Investigate if interaction with the whale shark creates or affect its vulnerability.

> Q. When you fish, what type of boat and equipment do you use?
>
> Q. At which times do you fish? How many fishing boats are out at the same time?
>
> Q. When you are out fishing, have you been colliding with the shark any time? If so, what happened?
>
> Q. Have you any experiences with the shark going info your equipment? If so, what happened?
>
> Q. Have you observed larger boats like ferries or tourist boasts colliding with the sharks?
>
> Q. Have you observed any changes in the population of whale sharks during your time as fisher? If so, which? What is the season for the whale shark?

INTERVIEW GUIDE FOR THE FISH TRADER WOMEN

Q. What kind of fish do you trade?

Q. Are you familiar with the whale shark?

Q. If so, what can you tell me about them?

Q. How did you get this knowledge?

INTERVIEW GUIDE FOR TOUR GUIDES AND TOUR OPERATORS

Objective 2: Investigate human perceptions on the whale shark and how this perception influences their interaction with it.

    Q. For how long have you been working in this industry?

    Q. Do you consider the whale shark important? If so, how? Can you describe it?

    Q. What did you know about the whale shark before you started to work with it?

    Q. Is this view based on your own observation or is it based on others observations/stories?

Objective 3: Investigate the advantages and disadvantages emerging from the whale sharks presence.

    Q. Do you benefit in any way from the presence of the shark? If yes, how? If no, why no?

    Q. Do you experience any competition from others? If so, how?

    Q. Do you operate in the same area as fishers or other boats when you are out searching for the whale shark?

    Q. Is there any other source of income in the period where the shark is not visible? If so, which?

    Q. Do people usually come here for the whale sharks?

Objective 4: Investigate if interaction with the whale shark creates or affect its vulnerability.

    Q. How often do you go out searching for the whale shark in the season?

    Q. How do you usually find the location of the sharks? Is it more/less difficult now?

    Q. How many tourists do you usually take on a boat trip?

    Q. How many other boats are usually out at the same time?

    Q. Is there any rules when you are interacting with the whale sharks?

    Q. Do you experience any changes in the boat traffic during this period? If so, how?

Q. When you are out sightseeing, do you know if there has been any colliding with the shark? If so, what happened?

Q. Have you observed larger boats like ferries or fishing boasts colliding with the sharks?

Q. Have you observed any changes in the population of whale sharks during your time in the tourist industry? If so, which?

INTERVIEW GUIDE FOR THE ORGANIZATIONS

Q. For how long have you studied the whale shark?

Q. What do you know of its behaviour? Ecology/Biology? Vulnerability?

Q. Do you see any threats? Human/environmental?

Q. Do you have any thoughts around tourist interaction?

Q. Change in population or behaviour during the years?

Q. What are the future studies/challenges?

INTERVIEW GUIDE FOR THE TOURISTS

Objective 2: Investigate human perceptions on the whale shark and how this perception influences their interaction with it.

Q. Nationality?

Q. Is it your first time on this Island?

Q. What was the reason for you choosing this destination?

Q. Are you familiar with the whale shark? If so, what do you know about them?

Q. Is this view based on your own observation or is it based on others observation/stories/media?

Q. Have you been able to observe it? How many times? How close?

Q. How did you see it? How did you experience the shark?

Q. How many tourists and boats were out at the same time?

Q. How much did you pay for the trip?

APPENDIX III

QUESTIONNAIRE (English version)

A QUESTIONNAIRE: GAIN AN OVERVIEW OF THE GENERAL KNOWLEDGE OF WHALE SHARKS AMONGST RESIDENTS AT MAFIA ISLAND

Dear respondent,

I'm Sophia, studying international environmental science at The Norwegian University of Life Science, conducting a research in order to gain an overview of the general knowledge of whale sharks amongst residents at Mafia island. You have been chosen to participate in this research by providing your views. Information provided will be treated confidentially and so you do not need to write any of your identity on the questionnaire. The information will be used only for academic purposes only.

Resident of…………..…………………………………………………Date…………….

TICK ALL THAT APPLY (choose the most suitable option under each question)

1. Gender:

[   ] Male

[   ] Female

2. Age group (tick one):

[   ] 18-35years

[   ] 36-53years

[   ] 54years and above

3. Educational level

[   ] No formal education

[   ] Primary education

[   ] Secondary

[   ] High school /College/University

4 What are your major economic activity?

[   ] Agriculture

[   ] Fishing

[   ] Service sector e.g. Shopkeeper, Restaurant/Bar owner/employee, Garage, retail business etc.

[   ] Others (Specify): …………………

5. Have you heard about the whale sharks?

[   ] Yes

[   ] No

6. How much do you know about the whale sharks? (0 is no knowledge and 5 is much knowledge)

[0] ………….. [1] …………….. [2] …………… [3] …………… [4] ……………… [5] …….

7. Where did you get the information from?

[   ] I did not get any information

[   ] I learned from parents/relatives

[   ] I learned in school

[   ] I learned from books/published science

[   ] I learned through own experience

[   ] Other…………Please specify………….

8. Are you interested in getting more knowledge about the whale sharks?

[   ] Yes

[   ] No

9. Do you think the whale shark is important for Mafia island?

[   ] Yes

[   ] No

[   ] I don't know

10. Why is it important?

[   ] Important for fishing

[   ] Important for tourism

[   ] Important as a symbol for the island

[   ] Important due to its ecological role

[   ] Other reasons

[   ] I don't know

Thank you for your time and participation!

APPENDIX IV

LIST OF INTERVIEWS

1. Tour guide 1. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 06.10.2017
2. Tour guide 2. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 06.10.2017
3. Tourist 1. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 06.10.2017
4. Tour guide 3. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 07.10.2017
5. Tour guide 4. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 10.10.2017
6. WWF. Location: WWF Office in Kilindoni, Mafia Island, Tanzania. Date: 10.10.2017
7. Tourist 2. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 11.10.2017
8. Tourist 3. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 12.10.2017
9. Fisher 1. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 12.10.2017
10. Fisher 2. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 12.10.2017
11. Fisher 3. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 12.10.2017
12. Fisher 4. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 12.10.2017
13. Fisher 5. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 12.10.2017
14. Fisher 6. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 12.10.2017
15. Fisher 7. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 12.10.2017
16. Fisher 8. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 12.10.2017
17. Tourist 4. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 13.10.2017
18. Tourist 5. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 13.10.2017
19. Fisher 9. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 14.10.2017
20. Fisher 10. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 14.10.2017
21. Fisher 11. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 14.10.2017
22. Fisher 12. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 14.10.2017
23. Fisher 13. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 14.10.2017
24. Fisher 14. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 14.10.2017
25. Fisher 15. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 14.10.2017
26. Fisher 16. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 14.10.2017
27. Fisher 17. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 14.10.2017
28. Fisher 18. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 14.10.2017
29. Fisher 19. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 14.10.2017
30. Tourist 6. Location: Chloe Bay, Mafia Island, Tanzania. Date: 17.10.2017
31. Tourist 7. Location: Utende, Mafia Island, Tanzania. Date: 17.10.2017

32. Tourist 8. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 21.10.2017

33. Fisher 20. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 21.10.2017

34. Fisher 21. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 21.10.2017

35. MIMP. Location: MIMP Office in Utende, Mafia Island, Tanzania. Date: 23.10.2017

36. Tourist 9. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 24.10.2017

37. Tourist 10. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 24.10.2017

38. Tourist 11. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 25.10.2017

39. Tourist 12. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 26.10.2017

40. Tourist 13. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 26.10.2017

41. Tour guide 5. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 26.10.2017

42. Tour guide 6. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 27.10.2017

43. Tour guide 7. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 28.10.2017

44. Tour guide 8. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 28.10.2017

45. Tourist 14. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 28.10.2017

46. Sea Sense. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 30.10.2017

47. Tour guide 9. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 30.10.2017

48. Tour guide 10. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 31.10.2017

49. Tour guide 11. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 11.11.2017

50. MMF. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 14.11.2017

51. Tourist 15. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 25.11.2017

52. Tourist 16. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 01.12.2017

53. Tourist 17. Location: Utende, Mafia Island, Tanzania. Date: 03.12.2017

54. Tourist 18. Location: Utende, Mafia Island, Tanzania. Date: 05.12.2017

55. Tourist 19. Location: Hotel in Kilindoni, Mafia Island, Tanzania. Date: 09.12.2017

56. Fisher 22. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 09.12.2017

57. Fisher 23. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 09.12.2017

58. Fisher 24. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 09.12.2017

59. Fisher 25. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 09.12.2017

60. Fish trader woman 1. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 09.12.2017

61. Fish trader woman 2. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 09.12.2017

62. Fish trader woman 3. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 09.12.2017

63. Fish trader woman 4. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 09.12.2017

64. Fish woman 5. Location: Kilindoni harbour, Mafia Island, Tanzania. Date: 09.12.2017

65. MIMP. Location: MIMP Office in Utende, Mafia Island, Tanzania. Date: 18.12.2017

66. Tourist 20. Location: Utende, Mafia Island, Tanzania. Date: 18.12.2017

APPENDIX V

LIST OF PARTICIPANTS TO QUESTIONNAIRE

1. Respondent 1. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
2. Respondent 2. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
3. Respondent 3. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
4. Respondent 4. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
5. Respondent 5. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
6. Respondent 6. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
7. Respondent 7. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
8. Respondent 8. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
9. Respondent 9. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
10. Respondent 10. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
11. Respondent 11. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
12. Respondent 12. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
13. Respondent 13. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
14. Respondent 14. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
15. Respondent 15. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
16. Respondent 16. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
17. Respondent 17. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
18. Respondent 18. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
19. Respondent 19. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
20. Respondent 20. Location: Kilindoni town, Mafia Island, Tanzania. Date: 14.11.2017
21. Respondent 21. Location: Kisimani Mafia, Mafia Island, Tanzania. Date: 16.11.2017
22. Respondent 22. Location: Kisimani Mafia, Mafia Island, Tanzania. Date: 16.11.2017
23. Respondent 23. Location: Kisimani Mafia, Mafia Island, Tanzania. Date: 16.11.2017
24. Respondent 24. Location: Kisimani Mafia, Mafia Island, Tanzania. Date: 16.11.2017
25. Respondent 25. Location: Kisimani Mafia, Mafia Island, Tanzania. Date: 16.11.2017
26. Respondent 26. Location: Kitoni town, Mafia Island, Tanzania. Date: 16.11.2017
27. Respondent 27. Location: Kitoni town, Mafia Island, Tanzania. Date: 16.11.2017
28. Respondent 28. Location: Kitoni town, Mafia Island, Tanzania. Date: 16.11.2017
29. Respondent 29. Location: Kitoni town, Mafia Island, Tanzania. Date: 16.11.2017
30. Respondent 30. Location: Kitoni town, Mafia Island, Tanzania. Date: 16.11.2017
31. Respondent 31. Location: Mfuruni town, Mafia Island, Tanzania. Date: 16.11.2017

32. Respondent 32. Location: Mfuruni town, Mafia Island, Tanzania. Date: 16.11.2017

33. Respondent 33. Location: Mfuruni town, Mafia Island, Tanzania. Date: 16.11.2017

34. Respondent 34. Location: Mfuruni town, Mafia Island, Tanzania. Date: 16.11.2017

35. Respondent 35. Location: Mfuruni town, Mafia Island, Tanzania. Date: 16.11.2017

36. Respondent 36. Location: Mfuruni town, Mafia Island, Tanzania. Date: 16.11.2017

37. Respondent 37. Location: Mfuruni town, Mafia Island, Tanzania. Date: 16.11.2017

38. Respondent 38. Location: Mfuruni town, Mafia Island, Tanzania. Date: 16.11.2017

39. Respondent 39. Location: Mfuruni town, Mafia Island, Tanzania. Date: 16.11.2017

40. Respondent 40. Location: Mfuruni town, Mafia Island, Tanzania. Date: 16.11.2017

41. Respondent 41. Location: Tumbuju town, Mafia Island, Tanzania. Date: 17.11.2017

42. Respondent 42. Location: Tumbuju town, Mafia Island, Tanzania. Date: 17.11.2017

43. Respondent 43. Location: Tumbuju town, Mafia Island, Tanzania. Date: 17.11.2017

44. Respondent 44. Location: Tumbuju town, Mafia Island, Tanzania. Date: 17.11.2017

45. Respondent 45. Location: Tumbuju town, Mafia Island, Tanzania. Date: 17.11.2017

46. Respondent 46. Location: Tumbuju town, Mafia Island, Tanzania. Date: 17.11.2017

47. Respondent 47. Location: Tumbuju town, Mafia Island, Tanzania. Date: 17.11.2017

48. Respondent 48. Location: Tumbuju town, Mafia Island, Tanzania. Date: 17.11.2017

49. Respondent 49. Location: Tumbuju town, Mafia Island, Tanzania. Date: 17.11.2017

50. Respondent 50. Location: Tumbuju town, Mafia Island, Tanzania. Date: 17.11.2017

APPENDIX VI

LIST OF OBSERVATIONS AT SEA

1. Trip 1. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 06.10.2017
2. Trip 2. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 11.10.2017
3. Trip 3. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 13.10.2017
4. Trip 4. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 22.10.2017
5. Trip 5. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 26.10.2017
6. Trip 6. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 28.10.2017
7. Trip 7. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 25.11.2017
8. Trip 8. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 29.11.2017
9. Trip 9. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 30.11.2017
10. Trip 10. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 01.12.2017
11. Trip 11. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 05.12.2017
12. Trip 12. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 06.12.2017
13. Trip 13. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 07.12.2017
14. Trip 14. Location: Kilindoni Bay, Mafia Island, Tanzania. Date: 18.12.2017

APPENDIX VII

LIST OF OBSERVATIONS CONDUCTED DURING PROJECT HELD BY WWF

1. Day 1. Primary schools: Jojo, Kirongwe and Dagani. Date: 08.11.2017
2. Day 2. Primary schools: Chungeroma, Tereni and Dongo. Date: 09.11.2017
3. Day 3. Primary schools: Kigombani and Msufini. Date: 10.11.2017