Resource dependence & conservation objectives of communities in South Ari Marine Protected Area

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EXECUTIVE SUMMARY

This study was carried out to provide the Government of Maldives with information on people's natural resource use, dependence and perceptions in four local community islands bordering the South Ari Marine Protected Area (SAMPA) with the aim to incorporate this information into a management plan. For this reason, in 2017, individual surveys and focus group discussions were conducted at Maamigili, Dhigurah, Dhidhdhoo and Fenfushi to 1) identify main stakeholders living in SAMPA and how they affect and are affected by the protected area and a future management plan; 2) understand how marine resources in and around SAMPA are used and how a management plan could affect these uses; 3) assess people's attitudes, perceptions and expectations towards the implementation of a management plan in SAMPA; and finally 4) provide important information for policy makers and planners to be used for an effective management plan for SAMPA.

Our results showed that there are two main stakeholder groups that depend economically on natural resources in SAMPA, fishermen who are involved in artisanal reef fish, tuna and baitfish fishery, and people working in tourism who rely on megafauna (whale sharks in particular) and coral reefs to attract tourists. Nevertheless, all people living in communities within SAMPA borders depend heavily on natural resources for traditional, livelihood and aesthetic services, therefore a management plan in SAMPA should also carefully consider opinions of people using resources for non-commercial purposes. Our study also revealed that SAMPA includes important fishing grounds used by local fishermen and fishermen from other atolls and where fishing effort is high. While fishermen were against closing fisheries within the MPA, strong support was found for other fishery management measures like differential closure of fishing grounds. Fishing grounds partly overlap areas used for tourism activities, in particular dive sites and whale shark watching areas but no major conflict was identified. People working in tourism, however, mentioned the urgent need to regulate whale shark watching activities to protect the whale sharks as well as the well-being and experience of tourists. Regulations on maximum number of people in the water, maximum number of vessels and maximum speed would have strong local support, as well as the implementation of a training system for whale shark guides best interaction practices. Rota systems were mentioned as a way to reduce the amount of number of vessels and people within SAMPA at the same time. This study also showed that people not working in the tourism or fishery sectors had little or no knowledge about SAMPA and this could undermine future compliance with regulations. Furthermore, as a consequence of lack of awareness, people did not perceive the MPA as a mean for job creation. Finally, SAMPA was seen as an opportunity not only to protect whale sharks but also to address other environmental issues like solid waste and pollution.

In light of these findings and based on SAMPA's management and conservation goals proposed as part of Project REGENERATE (2017) activities, we recommended:

- to improve general knowledge and awareness about SAMPA within local communities bordering the protected area;
- to consider seasonal closures of fishing grounds instead of complete bans or fishing quotas;
- to implement and enforce regulations limiting whale shark watching activities;
- to work with local community members to ensure that regulations are known and understood;
- to include local community members in the enforcement process (e.g. by hiring local rangers to monitor compliance with regulations);
- to broaden the original scope of SAMPA (i.e. the management plan should protect more generally SAMPA ecosystems and natural resources, not just the whale shark) and address other environmental issues like marine pollution and disposal of solid waste.

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ACRONYMS

GoM	Government of Maldives
EPA	Environmental Protection Agency
IUCN	International Union For Conservation of Nature
MoEnv	Ministry of Environment
MMRI	Maldives Marine Research Institute
MPA	Marine Protected Area
SAMPA	South Ari Marine Protected Area
USAID	United States Agency for International Development

1. INTRODUCTION

1.1 South Ari Marine Protected Area

Located on the southern fringe of coral reef of the South Ari Atoll (Alif Dhaalu), South Ari Marine Protected Area (SAMPA) encompasses a boundary extending 1 km seaward from the reef edges of all islands between southwest corner of Rangali Island (3° 38'10N, 72° 42'18E) to the northern tip of Dhigurah Island (3° 32'15N, 72° 55'58E) (EPA, 2009). SAMPA is the largest protected area in the Maldives, and it represents one of the world's most unique and significant sites for whale sharks due to their presence throughout the year (Donati et al., 2016). SAMPA encompasses 4 local communities within its boundary, Maamigili, Dhigurah, Dhidhdhoo and Fenfushi and four resort islands (EPA, 2009; Table 1). Occupation opportunities across all the four islands are largely similar. Main occupations include fishing, tourism industry (guest houses, resorts, dive centres), agriculture and public administration jobs.

Island	Area (km^2)	Coordinates	Total Population
Maamigili	1.05 km^2	03°28′30″N 72°50′15″E	2,077
Fenfushi	0.24 km^2	3°29′N 72°47′E	726
Dhigurah	0.87 km^2	03°31′35″N 72°55′26″E	522
Dhidhdhoo	0.225 km^2	03°29′01″N 72°52′40″E	137

Table 1 Location and population size of local community islands found in SAMPA

SAMPA was designated a Marine Protected Area (MPA) on June 5, 2009 by Directive Number 138- EE/2009/19 of the Ministry of Environment and Energy (EPA, 2009). The MPA status is the highest form of protection prescribed by the Government of Maldives and is supported by the Environmental Protection and Preservation Act: 4/1993 (EPA, 2009).

The MPA was established with the following objectives:

1. To protect and preserve an important Whale Shark (Rhincodon typus) aggregation area in the Maldives
2. To provide a means to promote and ensure the long-term conservation and protection of the South Ari ecosystem, and
3. To generate income for local islands through sustainable tourism, facilitating scientific research projects and fostering community-focused education and conservation initiatives.

"SAMPA is the largest protected area in the Maldives, and it represents one of the world's most unique and significant sites for whale sharks due to their presence throughout the year"

The ecosystems and marine habitats within the immediate vicinity and boundaries of the MPA are rich with species and biological diversity. The marine environment is not only the basis for sustenance for the local communities, but also boasts a robust tourism industry, as well as providing incalculable ecosystem services that underpins nearly all facets of life and economy in the area (Collins, 2013). The natural phenomenon of whale sharks frequenting the area is one of the most noteworthy examples (Cagua et al. 2014).

The Maldives Whale Shark Research Programme (MWSRP) has conducted formal research in the area since 2006. To date, 271 individual whale sharks have been sighted within the MPA, with many returning frequently to the area for unknown reasons (Donati et al., 2016). These re-sightings make SAMPA quite unique and it is probable that this area has the highest re-sighting rate of individual whale sharks in the world (Donati et al., 2016).

This ecological significance of SAMPA makes it also an area of significant value for the tourism sector. The number of tourists visiting the area (either to the numerous resorts and guest houses located in its vicinity or on live-aboard safari vessels) has been constantly on the rise (Ministry of Tourism, 2016). This contributes towards increasing economic value reaped from the MPA directly as profits for the tourism sector, and through indirect benefits such as job creation for the local communities. SAMPA is estimated to be used by over 65,000 tourists annually for whale shark excursions and the estimated value of whale shark tourism gained only from the MPA is US$8.5 million (Cagua et al. 2014).

To date, no management or monitoring plan exists for the area to regulate the tourists that visit the area annually for whale shark excursions, and to direct part of the benefits gained from this area to local communities (Collins, 2013). Implementation of a management plan is imperative to ensure the wellbeing of community members, tourists, and whale sharks, as well as the natural endowment of the area.

1.2 IUCN-GoM's work in SAMPA

So far, under the collaboration of IUCN and the Government of Maldives (GoM), several stakeholder consultation workshops had been held to understand social, ecological, and economic importance of the area in order to develop relevant policy. Based on the suggestions made by the stakeholders from these workshops, a report was developed recommending a phased introduction of a management plan for SAMPA. This report proposed modifications to the existing Maldives whale shark interaction guideline for vessels and snorkelers, and also recommended a set of new regulations previously not used in SAMPA (IUCN, 2014).

In addition, a study was conducted by IUCN in collaboration with the Government of Maldives and Global Blue in 2013 to explore the vulnerability within specific groups of fishers. The study showed that different groups of fishers were differently sensitive to MPA implementation. They found that commercial fishers were likely to be the most vulnerable since the implementation of a management plan could directly affect their income and hence livelihoods and recreational fishers were found to be the least vulnerable group as they did not depend economically from fishing grounds in SAMPA (Rasheed et al., 2016).

While these resources have been important information tools for IUCN, GoM, and the local councils, there is a need to expand the parameters of such events to incorporate socio- economic information on people living in SAMPA and develop a management plan to ensure the ecological and socio-economic sustainability of the communities in and around the MPA. With this consideration, we built upon previous activities and conducted extensive social surveys in the four community islands of SAMPA, followed by focus group discussions with local stakeholders to understand their resource use and dependence as well as locals' conservation targets of SAMPA.

1.3 Context of Maldives

The Republic of Maldives is a chain of 1,192 tiny coral islands, which are clustered into 26 geographical atolls. The country is 820 km in length and 130 km at its widest point, and spreads over an area of more than 150,000 km^2 in the Indian Ocean (Ibrahim, Bari, & Miles, 2002; Naseer, 2003). The Maldives have one of the largest reef system in the Indian Ocean, with a total reef area of over 4,513 km^2 (Naseer & Hatcher, 2004). The land and sea area of the Maldives is about 115,400 km^2, with an exclusive economic zone of 859,000 km^2, while the total land area of the Maldives is estimated at around 300 km^2 (Ministry of Home Affairs, Housing and Environment, 2001; Saleem, 2010). The land area accounts for only about 1% of the total area of the country, which makes it highly dependent on the marine environment (Ali, 2004).

Maldivians are highly dependent on their marine environment (Spalding, Ravilious, & Green, 2001; Ghina, 2003), both directly (e.g. fishery and tourism,) and indirectly (e.g. land formation and shoreline protection) (Mohamed, 2007). The main contributor to the economy of the country in terms of employment and GDP is the tourism industry, which depends directly on the maintenance of the local biodiversity (Ministry of Home Affairs, Housing and Environment, 2001; Emerton et al., 2009; National Bureau of Statistics, 2015). However, the marine ecosystems that sustain such biodiversity are under threat from increasing human impacts (e.g. pollution, habitat degradation, and resource over-exploitation) combined with the rising climate change impacts (e.g. warming seas and ocean acidification). In the Maldives, high sea surface temperature and coral bleaching as well as coastal modification including sand mining, channel construction, reclamation and harbor development have been identified as major stressors to coral reef ecosystems (MoEnv, 2016). A study commissioned by the United Nations Development Programme (UNDP, 2004) highlighted how social and economic changes in the Maldives are negatively affecting natural resources: population growth and changes in the consumptive behavior and livelihood strategies are exerting more and more pressure on already fragile reef ecosystems. Economic growth has also aggravated a change in how resources are being used that has led to the overexploitation of valuable reef fish species (Saleem & Adam, 2004; Sattar & Adam, 2005; Anderson, Adam, Kitchen-Wheeler, & Stevens, 2011).

In attempts to address such problems related to environmental degradation, the GoM has implemented various conservation policies, most of which have been centralised government interventions. An example of such efforts is the designation of 42 protected areas (MoEnv, 2015). Two of these areas were declared for the protection of mangroves, and 40 were declared MPAs (EPA, 2015). However, only one of these areas has a management and engagement plan, which means that most protected areas are just 'paper parks' (i.e. parks declared and existing on maps but with no conservation/management regulation in place) (Mohamed, 2007). Even though MPAs are an important tool for conservation of natural resources, limitations in technical and financial capacity to manage and monitor such areas have caused such efforts to fall short of their original goals, not only in Maldives but all around the globe (Rocliffe, Peabody, Samoilys, & Hawkins, 2014).

1.4 Project REGENERATE

Project REGENERATE, a GoM's project implemented by IUCN and sponsored by USAID, works towards establishing a Resilience Based Management

Framework to maintain healthy coral reef ecosystems in the Maldives. The principle purpose of this project is to develop an operational framework for incorporating resilience into management decisions. In this regard, the objectives of the project have been developed to identify opportunities to ecosystem trajectory by managing its functions to ensure its maintenance and persistence.

In developing the operational framework, IUCN has focused on enhancing the socio-ecological resilience capacity of coral reefs in the Maldives. With the country's commitment to establish Maldives as a UNESCO Biosphere Reserve, IUCN is assisting the government in developing mechanisms to safeguard the marine resources and associated ecosystem services. In this sense, formulating a management plan for one of the 42 protected areas in Maldives, South Ari Marine Protected Area (SAMPA), has been a priority for the year 2017.

2. SCOPE

The scope of this study was to understand resource dependence and use of local communities in SAMPA as well as their perspectives and attitudes towards the implementation of a management plan in their protected area. Specifically, this study aimed to:

1. Identify main stakeholders living in SAMPA and specifically how they affect and are affected by the protected area and a future management plan;
2. Understand how marine resources in and around SAMPA are used and how a management plan could affect these uses;
3. Assess people's attitudes, perceptions and expectations towards the implementation of a management plan in SAMPA;
4. Provide important information for policy makers and planners to be used for an effective management plan for SAMPA.

This survey sets the base for a comprehensive understanding of the socio-economic status of the community islands encompassing the largest protected area in the Maldives. In conjunction with the ecological surveys carried out in SAMPA, this study will inform the development of a management plan to ensure the sustainability of the area.

3. METHODOLOGY

3.1 Social Survey

3.1.1 Survey Design

Semi-structured surveys were conducted in four community islands (Maamigili, Fenfushi, Dhigurah, Dhidhdhoo) that encompass South Ari Marine Protected Area in July 2017.

The questionnaire was designed with a common section for all interviewees followed by specific sections for selected occupations (selected strata). The questionnaire included different types of questions (multiple choice, single choice, open ended, agreement to statements, ranking scale questions) to capture as much information as possible. For agreement to statements, we used a 5-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Don't know, 4 = Agree, 5 = Strongly agree). Maps were included in the questionnaire to identify resource use areas and perceived ecologically significant areas (e.g. turtle nesting grounds, whale shark aggregation points etc.) to obtain spatial data on resource distribution and use within SAMPA.

The questionnaire included 87 questions, grouped into major 5 sections:

- Section 1 - Demographic data: This section aimed at obtaining information on the demographics and economic variables of resource users in SAMPA. This included specific information about respondents' employment, income, their age, and gender (see Annex 1, questions 1 to 13).
- Section 2 - Resource use and dependence
  - + Section 2a - General resource use and dependence: This section aimed at identifying ways people use resources generally in and around their island, including extractive uses such as fishing and harvesting any other marine organism, and non-extractive uses such as boating, diving, or other recreational activities. Specific questions were asked to examine respondents' dependence on natural resources for income and livelihood, as well as traditional and aesthetic value associated to those resources (see Annex 1, questions 14 to 20).
    - + Section 2b - Resource use and dependence in SAMPA: This section aimed at understanding what resources are used within SAMPA borders, how extractive use areas such as fishing grounds have been modified before and after SAMPA was declared, and how this affected people's livelihoods (see Annex 1, questions 21 to 28).
- Section 3 - Level of concern and interest in SAMPA: The aim of this section was to understand respondents' perception on SAMPA declaration. This section also focused on examining perceived threats to the area (see Annex 1, questions 29 to 34).
- Section 4 - Attitudes and perceptions towards SAMPA: This section aimed to understand how respondents felt about developing a management plan for SAMPA. It assessed people's attitude/ perceptions to different scenarios of potential management measures for SAMPA; presenting different zoning configurations, regulations etc. (see Annex 1, questions 35 to 40).
- Section 5: Resource user groups
  - + Section 5a - For fishermen only: This section aimed at identifying fishing grounds within SAMPA, the gears commonly used in the MPA, and regularly caught species (see Annex 1, questions 41 to 78).
  - + Section 5b - For people working in tourism: The aim of this section was to understand how people working in the tourism sector felt about the management status of SAMPA and the current level of protection of the whale sharks (see Annex 1, questions 79 to 87).

An early version of the questionnaire was reviewed by the relevant partners (MoEnv, EPA, MMRI) and was modified

substantially based on their comments. In order to ensure that the questions were easy to understand and worded appropriately, a questionnaire was pre-tested by interviewing general public in Male'.

3.1.2 Survey Administration

The surveys were designed for resident adult (over 18 years old) Maldivian citizens (Table 2). A stratified random sampling (proportionate stratifying) method was used to generate the sample for this survey. The adult resident population of each island was defined as N. Since we wanted to target specific resource user groups in our survey, we used 'occupation category' as our strata. The sample size (n) was 15% of the adult population in each island. Whereever possible, within this sample, we ensured that the number of units selected for the sample from each stratum is representative of the number of people in each employment category in the whole population (N). An estimated number of people in each occupational category per island was sought from each island council to estimate the proportion of each stratum in the sample.

Island	Total adult population	Approached	Surveyed	% rejection	% response rate	% total population
Maamigili	1330	211	198	6.2	93.8	14.9%
Fenfushi	445	90	87	3.3	96.7	19.6%
Dhigurah	325	75	72	4.0	96.0	22.2%
Dhidhdhoo	96	31	31	0	100.0	32.3%

Table 2. Survey response rate on each island in SAMPA, Maldives

The surveys were administered in Dhivehi by a team of nine trained surveyors. Interviewees were approached randomly door-to-door as well as on the streets during day time, and were given a little briefing about the scope of the survey before being asked if they wanted to take part in the study. Each survey lasted from 15 minutes to 45 minutes.

3.1.3 Descriptive data analysis

Island of residence, gender, age, main job, salary range, education level and residency status were selected as demographic data to identify groups with different perceptions and attitudes towards SAMPA.

Respondents were classified according to their main occupation in:

- Fishermen, i.e. people working in commercial or artisanal fishery;
- Working in tourism, i.e. people working in guest houses, dive centers, resorts, shops targeting visitors, etc.;
- Other kind of employment, i.e. people working in administration, education, construction, business not related to tourism, etc.;
- Unemployed, i.e. people without a stable paid occupation.

The residency status was classified as:

- Native, i.e. people who were born and raised in the island;
- Long-term residents, i.e. people who were born in a different island but had spent at least ten years in the island where they were interviewed;
- Short-term residents, i.e. people who were born in a different island and had spent less than 10 years in the island where they were interviewed.

Descriptive statistics were used to describe stakeholders groups, while cross tables and Pearson's chi square tests were run to identify significant differences in answers based on demographic data.

3.1.4 Spatial analysis of resources and their use

Respondents were asked to identify on a map the following areas:

- Resources present in South Ari Atoll and within SAMPA boundary (see Annex 1 Q15 and Q26)
- Activities taking place in SAMPA, including recreational fishing, snorkeling, diving, swimming (see Annex 1 Q16 and Q28), and commercial fishing grounds (see Annex 1 Q74, Q68 and Q57)

Respondents who were involved in commercial fishery were asked to indicate areas where most common species were harvested within SAMPA (see Annex 1 Q72, Q74. Q66 and Q68).

On further analysis, a number of maps were developed to identify ecologically significant areas as perceived by community members, multiple use area where different uses overlap and potential sources of conflict or problematic areas where management is proposed. For the purpose of this survey, ecologically significant areas were identified as locations where charismatic species are generally observed. All the analyses are based on overlapping areas identified by the respondents, derived from heat maps of resources, activities or fishing grounds in SAMPA. A criterion of using upper 66% of overlapping areas were used.

All hand-drawn maps from respondents were digitised by creating polygon feature classes in ArcGIS v10.4.1 Software ® by ESRI. A separate polygon feature class was created for each question about a resource, activity or fishing ground, identifying each record with survey form numbers.

The resource, activity or fish type was identified within the feature class by using a separate field.

A raster for each resource or activity type was then created by first using the union tool to break up the polygons and then the dissolve tool to aggregate the common polygons and then converting the result to a raster with a spatial resolution of 10m.

3.1.5 Multiple correspondence analysis

As a management plan for SAMPA is being formulated, we were interested in knowing:

1. What do people in SAMPA already know about the protected area?
2. What is its perceived importance for people and natural resources?
3. What/how has the declaration of SAMPA affected people's lives?
4. What is the expected attitude towards a management plan?

In order to answer these questions, we generated indicators to assess respondents' knowledge of SAMPA, the effect SAMPA had on people's lives, the perceived importance of the protected area and the expected attitude towards a management plan. Indicators were created based on answers to questions as detailed in *Table 3.*

A multi-correspondence analysis (MCA) was chosen to understand how demographic data influence the four different factors (effect, knowledge, importance and attitude towards SAMPA), as this type of analysis allows for the use of nominal categorical values (e.g. Johnson and Wichern, 2007). For this analysis we selected only respondents that were aware of SAMPA (i.e. respondents that answered yes to question 21: are you aware that there is a protected area here?) and that completed the questionnaire (all sections from 1 to 4).

The statistical package R (R Core Team, 2017) was used for all statistical analysis. The R package ggplot2 was used for all graphics (Wickham, 2009), and the MCA was performed using the R package explor (Barnier, 2017).

Factor	Questions used for categorized answers	Level of answer per Factor
Effect of SAMPA declaration	Q23. Has SAMPA had an effect on the way you use resources? Q25. Has SAMPA had an effect on the location of resources? Q27. Has SAMPA had an effect on the location of activities? Q32. Has SAMPA had an effect on your salary?	Positive, Neutral, Negative
Knowledge of SAMPA	Q35. Are there guidelines in use in SAMPA? Q38. Are there management measures in place?	Low, Medium, High
Importance of SAMPA	Q29. Do you think it is important to protect SAMPA? Q31. Agreement to statements: • SAMPA has created job opportunities • SAMPA is important for marine life • Natural resources are doing better since SAMPA • Whale sharks need to be protected	Not important, somewhat important, important, very important
Attitude towards management	Q37. Agreement to statements: i. It is important to have a management plan in SAMPA ii. I would support new regulations in SAMPA iii. Establishing a no-take zone area is appropriate inside SAMPA iv. Allocating different zones for different activities will reduce conflicts v. SAMPA should be directly managed by the government vi. Community members should be involved in the management of SAMPA vii. Very negative, negative, positive, very positive Q40. SAMPA needs a steering committee	Very negative, negative, positive, very positive

Table 3. Indicators used to build effect, knowledge, importance and attitude towards SAMPA and level of answer per each factor.

3.2 Focus Group Discussions

Results from section 5 of the questionnaire were used as a baseline for a series of focus group discussions (FGD) in the 4 community islands bordering SAMPA. The FGDs targeted fishermen and people working in tourism, who were questioned in separate groups. Each FGD included:

1. A short summary of the main results obtained during the social surveys;
2. A mapping exercise to identify the location of resources and their intensity/frequency of use (when possible), the areas of conflicts/issues among users, and areas important for marine wildlife;
3. A harvest calendar where people indicated fishing seasons, gears used and targeted species (fishermen only) or high versus low tourist seasons and differences in tourists origin throughout the year (people working in tourism only);
4. A series of questions (Annex 2) for fishermen and people working in tourism to better understand what conflicts exist in SAMPA and what management measures would be needed to reduce such conflicts.

"57% of respondents working in tourism participated in whale shark activities."

4. RESULTS

4.1 Social surveys

4.1.1 Stakeholder analysis

Fishermen group:

Fishermen were defined as those that fish for commercial or subsistence purposes and whose main or second occupation is related to fishing (n=15). Following is a summary of their demographic traits:

- Fishermen were on average older than people in other groups (median age = 47);
- Based on number of people interviewed from each island in SAMPA, The highest proportion of fishermen was found in Dhidhdhoo (6%);
- Fishermen tended to have basic education;
- Fishermen tended to have a salary of MVR 10,000 or more;
- Only 13% of fishermen participated in whale shark activities.

People working in tourism:

People working in tourism were defined as all whose primary or secondary job was related to the tourism industry (i.e. job in a resort, dive center, guesthouse, local guide, souvenir shop owner, etc.) (n=49). Following is a summary of their demographic traits:

- People in tourism were on average younger than people in other groups (median age = 32);
- Based on number of people interviewed from each island in SAMPA, the highest proportion of people working in tourism was found in Dhigurah (28%);
- They tended to have Grade 10 to tertiary education level;
- They had a salary similar to fishermen (MVR 10,000 or more);
- 57% of respondents working in tourism participated in whale shark activities.

Other jobs:

In this category we included all people with jobs not directly related with the use of marine resources (i.e. administrators, teachers, educators, health carers, etc.) (n=158). Following is a summary of their demographic traits:

- Median age for people in this category was 35.5 y.o. (similar to people in the unemployed category);
- Based on number of people interviewed from each island in SAMPA, the highest proportion of people in jobs not directly related to marine resources was found in Dhidhdhoo (65%);
- Most people in this category had up to grade 10 education;
- More frequently, their salary was reported as equal or below MVR 10,000;
- 90% of people in this category had not been involved in any whale shark activities.

Unemployed:

- In this category we included all people that did not have a stable source of income at the time of the survey (n=166). Following is a summary of the demographic traits of people in this category:
- 78% of unemployed people were women;
- Median age for unemployed people was 36 years old (similar to people in the 'Other jobs' category);
- Based on number of people interviewed from each island in SAMPA, Fenfushi and Maamigili had the highest proportions of unemployed respondents (46% and 45% respectively);
- Unemployed people had generally basic/ Grade 7 education level;
- 99% of respondents in this category had not been involved in whale shark related activities.

4.1.2 Descriptive statistics

Stakeholder groups

The number of respondents belonging to each stakeholder group was different according to the island of origin (Pearson's Chi-squared test, $p < 0.0001$). Compared to men, women were mostly unemployed, none of the

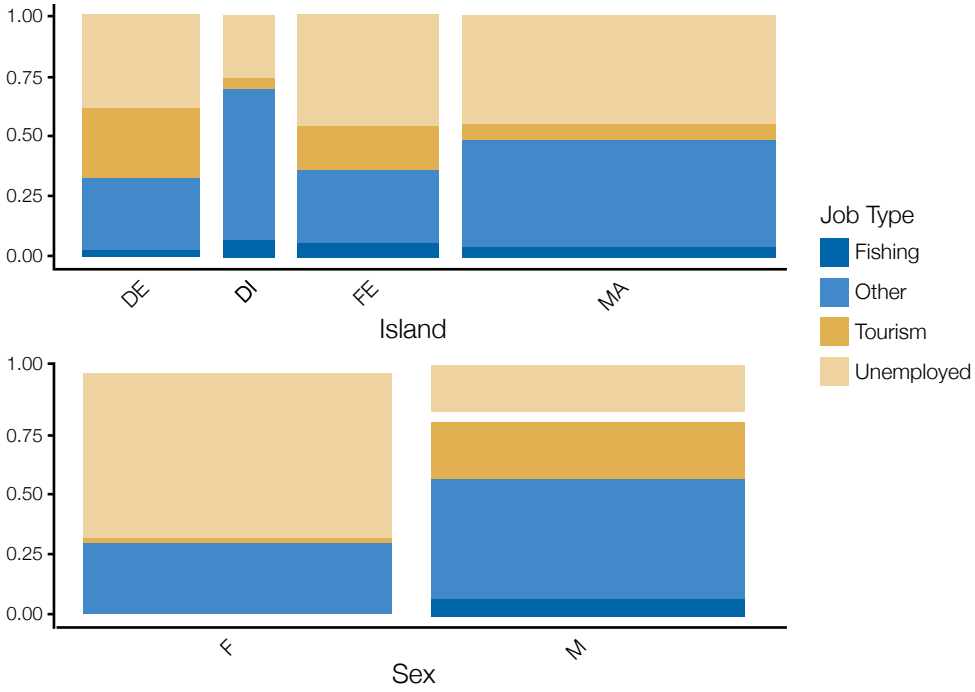

Figure 1. Mosaic plots showing significant differences in job category per island (top) and among men and women (bottom).

women who participated in this survey worked in the fishing sector (Pearson's Chi-squared test, p = p <0.0001) (*Figure 1*).

The mean age of respondents varied significantly according to the island of origin (ANOVA, p <0.0001) and job type (ANOVA, p = 0.04507) (*Table 4*).

The residency status did not change significantly among islands or among different job types. However, the household size and the ratio of people in the household contributing to the household income varied according to the island (ANOVA, p <0.0001) and the job type (ANOVA, p <0.0001) respectively (*Figure 2*).

The maximum level of education was different according to the job type (Pearson's Chi-squared test, p <0.0001), but it was not significantly different between men and women, or among islands (*Figure 3*).

Resource use and dependence

In the questionnaire, resources that have extractive and non-extractive uses were listed together. Nevertheless, it is important to clarify that:

- Reef fish, tuna fish, bait fish, coconut palms, wood and shells were associated with extractive use (e.g. fishery, construction, souvenirs, etc);
- Megafauna (whale sharks, sharks, turtles, seabirds), beaches, coral reefs were associated with non-extractive use (e.g. marine wildlife watching, diving, etc.);
- Seagrass was associated with extractive (e.g. medicine, fertilizer, etc) and non-extractive uses (swimming, snorkeling, etc).

	Mean Age	SD	Range	n
Island				
DG	41.04	14.5	19-88	72
DI	45.71	14.71	21-71	31
FE	37.43	13.63	20-90	87
MA	37.97	14.65	18-84	198
Job				
Fishing	42.53	15.08	22-66	15
Other	39.16	14.36	18-90	158
Tourism	34.35	12.57	19-79	49
Unemployed	39.99	15.02	18-88	166

Table 4. Mean age, standard deviation and range per island and job category. DG = Dhigurah, DI = Dhidhdhoo, FE = Fenfushi, MA = Maamigili

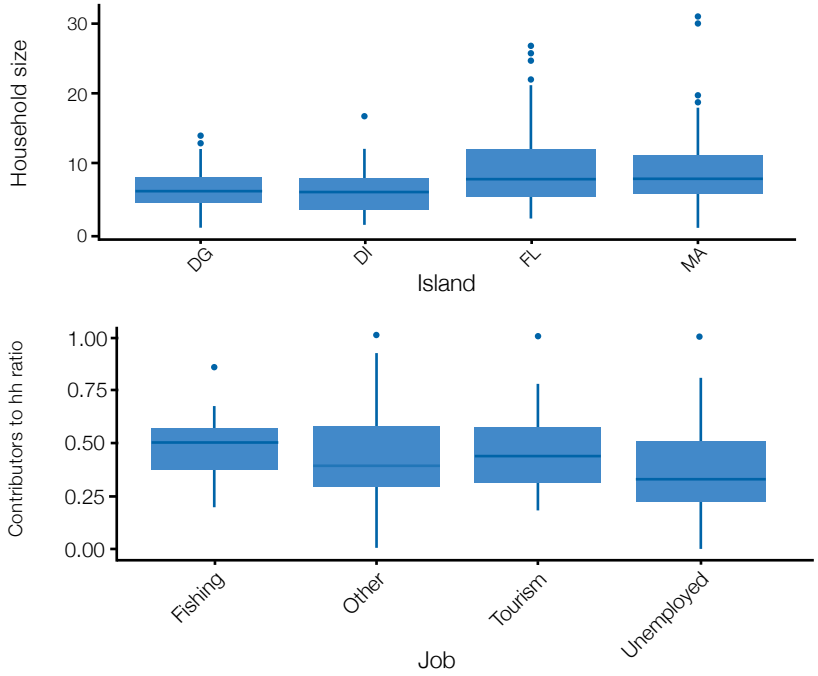

Figure 2. Average household (hh) size and average household contributor ratio are significantly different per island (top) and per type of job (bottom) respectively.

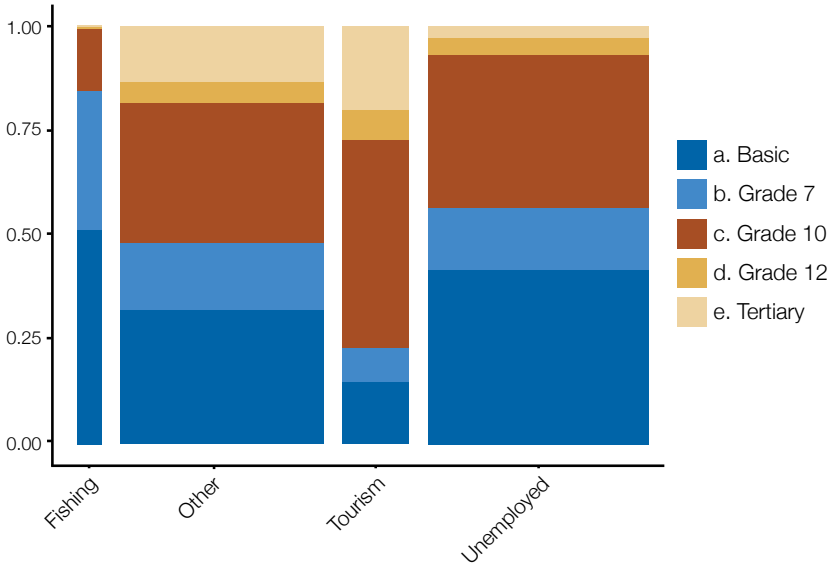

Figure 3. Mosaic plot showing that maximum level of education is significantly different per type of job.

"Generally (i.e. in the local community islands where surveys were conducted), whale sharks (non-extractive resource) and reef and tuna fish (extractive resources) were identified as the most important elements in generating income"

Generally (i.e. in the local community islands where surveys were conducted), whale sharks (non-extractive resource) and reef and tuna fish (extractive resources) were identified as the most important elements in generating income. These were also the resources with the highest traditional value. Tuna, reef fish and other (i.e. agricultural products like breadfruits, fruits and vegetables) were the most important resources extracted for livelihood. Whale sharks, beach and manta rays were the most important resources with aesthetic value *(Figure 4)*.

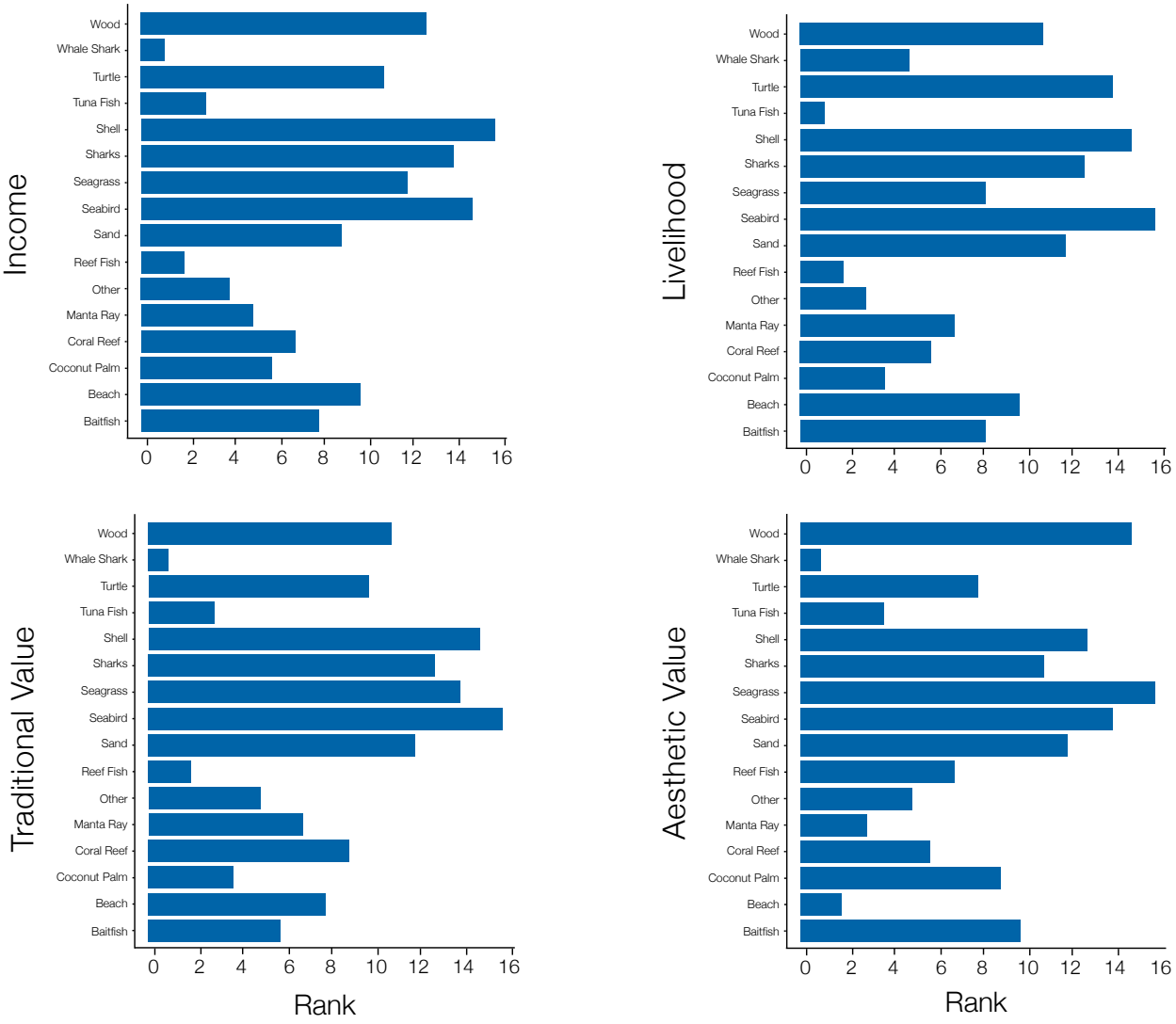

Figure 4. Most important resources for income (upper left), livelihood (upper right), tradition (lower left), aesthetic value (lower right). Resources are ranked from most important (1) to least important (16)

All resources important for income were used frequently or daily with the exception for shells, seagrass and seabirds which were used rarely. Top ranked resources important for livelihood were used frequently or daily. Non-extractive (e.g. seagrass, seabirds, sharks, turtles) and extractive (e.g. baitfish) resources were only rarely used for livelihood. Coconut palm, tuna fish and reef fish were identified as traditional extractive resources that were used frequently. Whale sharks, sharks and manta rays were also frequently used for traditional purposes but in a non-extractive manner. Finally, tuna fish, sand, and coconut palms were among the most frequently used resources associated with an aesthetic value. Seagrass beds were generally used less frequently than any other resource (*Figure 5*).

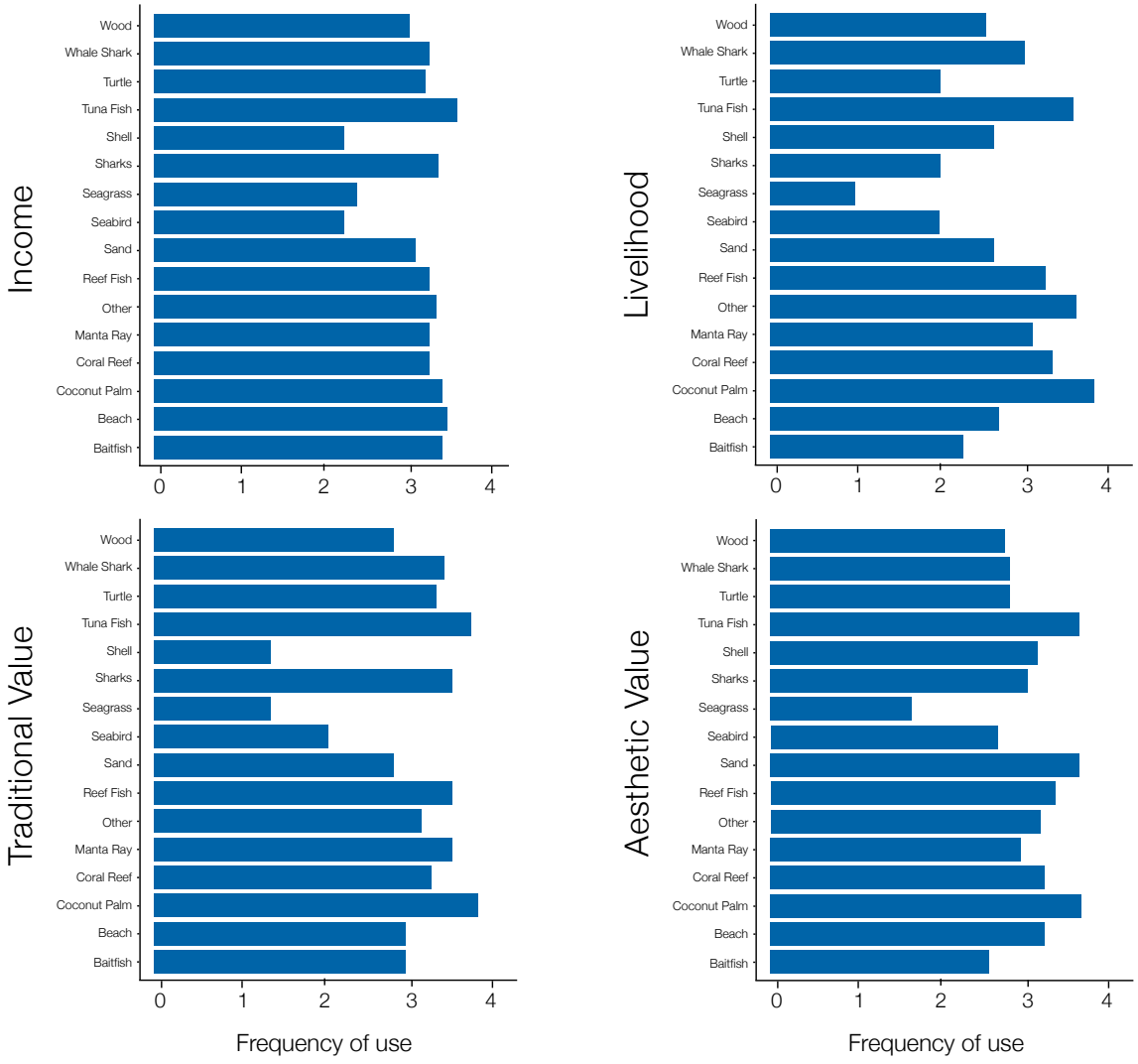

Figure 5. Frequency of use of resources important for income (upper left), livelihood (upper right), tradition (lower left), aesthetic value (lower right). Frequency of use: 1= never, 2 = rarely, 3 = frequently, 4=daily.

Respondents ranked 1) whale sharks; 2) manta rays; 3) turtles; 4) sharks; and 5) coral reefs as the resources most frequently found specifically within SAMPA (*Figure 6*).

The locations of the most ecologically significant areas where the most cited 4 resources (whale sharks, manta rays, turtles, sharks) are overlapping are shown below (*Map 1*). Locations of the individual resources can be found in Annex 4.

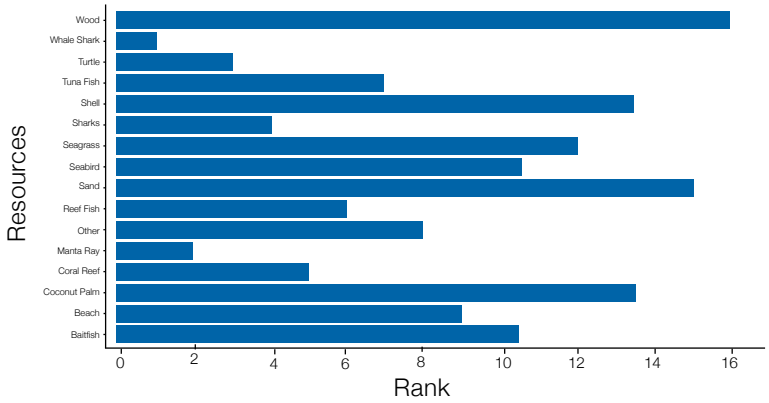

Figure 6. All islands considered, the five most important resources found in SAMPA were whale sharks, manta rays, turtles, sharks, and coral reefs.

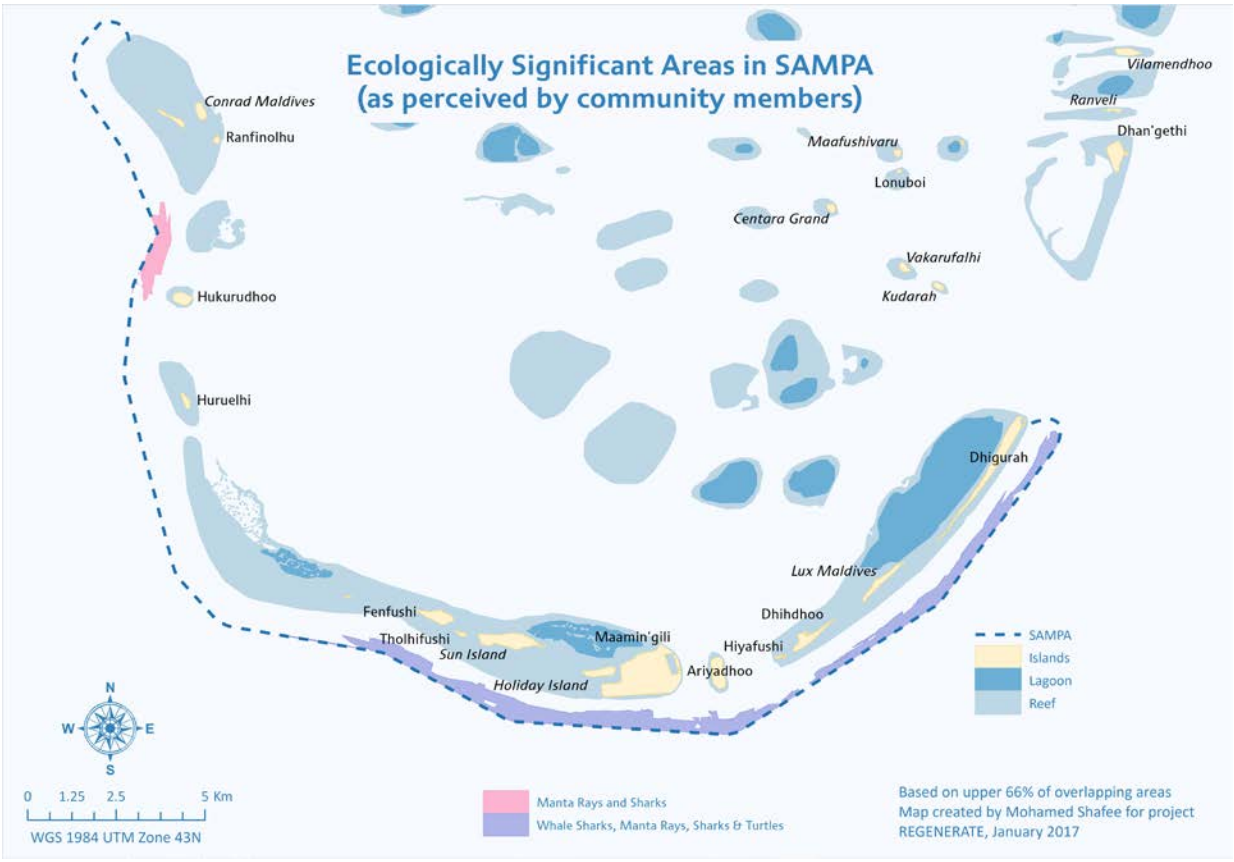

Figure 7. Ecologically significant areas in SAMPA as perceived by community members. These are areas where most resources are overlapping. Seabirds and shells were excluded for this analysis.

Involvement in whale shark related activities

Only 10% of the respondents (n=41) confirmed to be involved in activities related to the whale shark tourism industry. Essentially, people involved in whale shark related activities were working mostly in the tourism sector (Pearson's Chi-squared test, p <0.0001). The number of women involved in whale shark related activities was significantly smaller compared to the number of men (Pearson's Chi-squared test with Yates' continuity correction, p <0.0001) *(Figure 8)*.

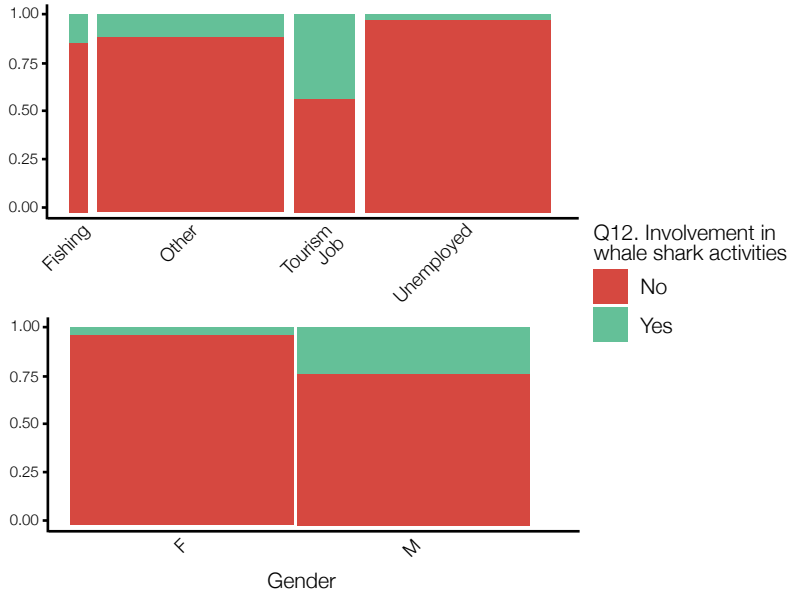

Figure 8. The number of people involved in whale shark related activities is different based on their job (top) and gender (bottom).

Knowledge of SAMPA

206 out of the 388 people interviewed (approx. 53% of the respondents) were not aware that a protected area had been declared in South Ari Atoll. Women were significantly less aware than men (Pearson's Chi-squared test, p <0.0001). Among the various stakeholder groups, unemployed people were the least aware about SAMPA, followed by fishermen (Pearson's Chi-squared test, p <0.0001) (Figure 10). We found no significant difference among people of different age.

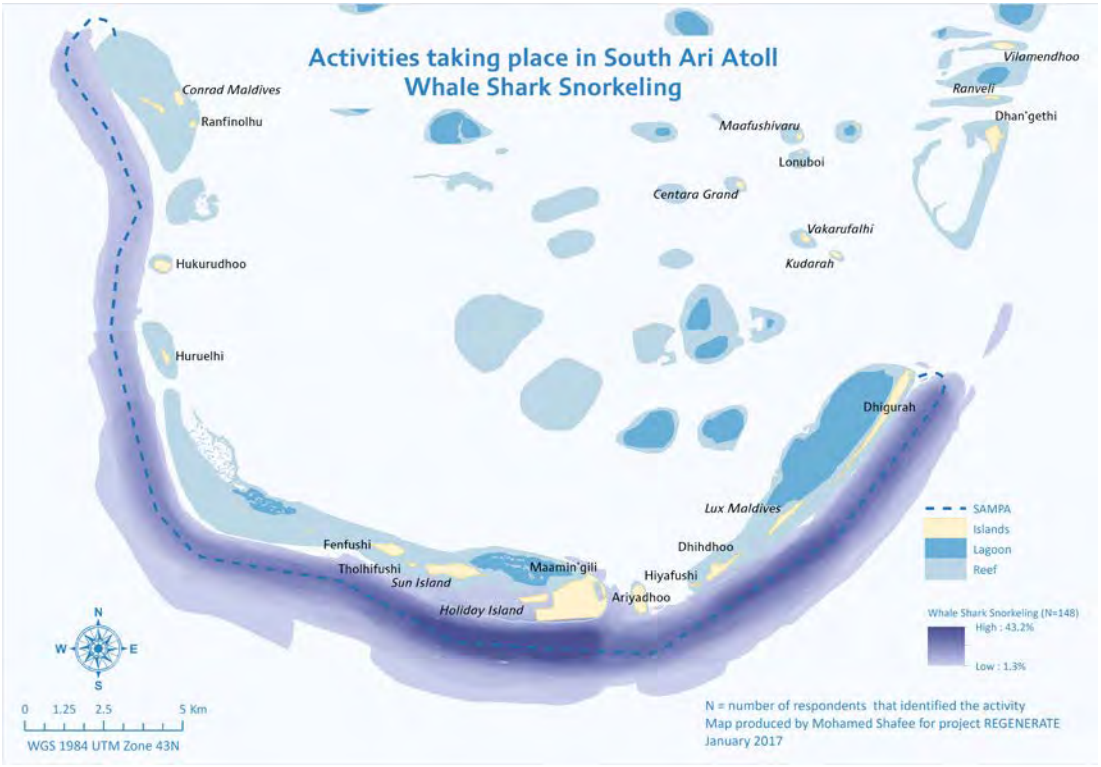

Figure 9. Areas where whale shark snorkeling takes place. Value for the heat map indicates number of responses for the activity.

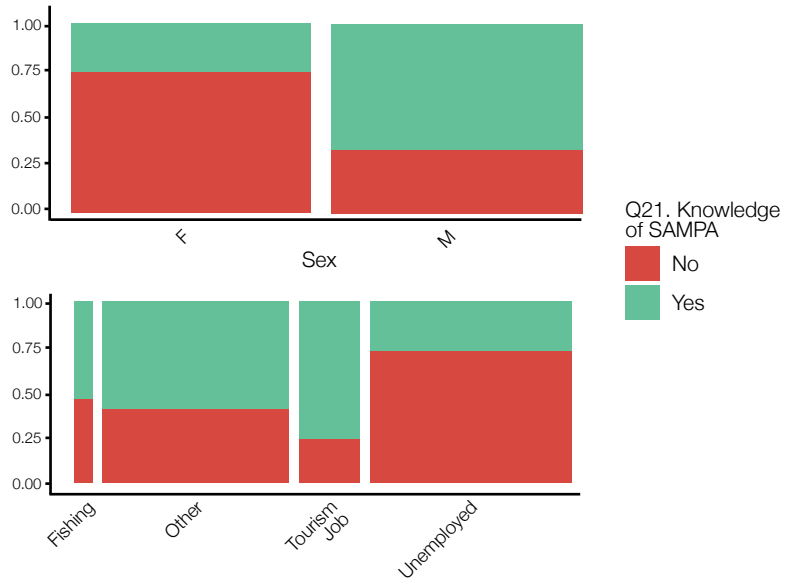

Figure 10. Not all respondents were aware of the existence of SAMPA: significant differences were found among men (M) and women (F) (top) and among people in different jobs (bottom).

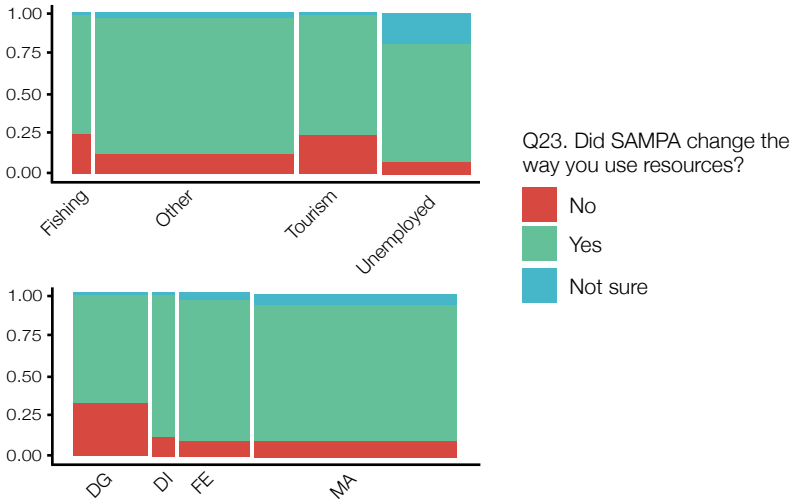

Figure 11. The SAMPA declaration in 2009 had a significant effect on how people used resources based on the respondent's job (top) and the island of origin (bottom).

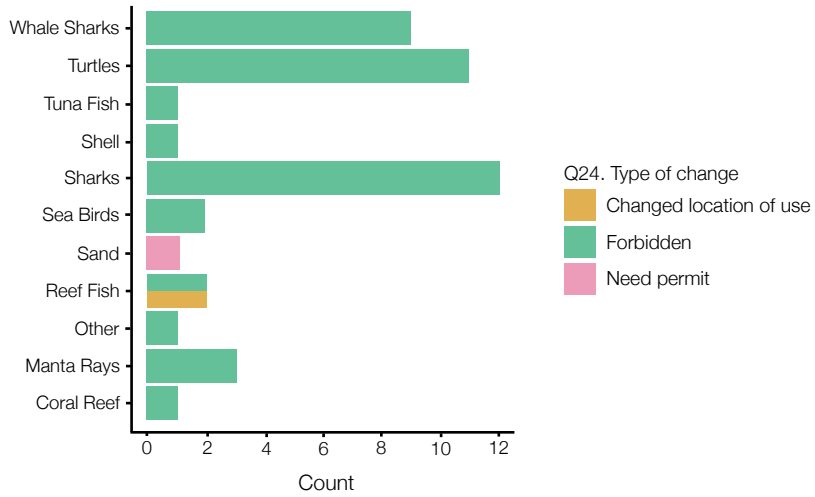

Figure 12. The SAMPA declaration changed the way people used resources, mostly by introducing limitations to the resources that could be exploited/extracted.

Effect of SAMPA declaration on resource use and location

Only 25 respondents mentioned that SAMPA declaration changed the way they used the resources (approx. 6%). Fishermen and people working in the tourism sector (Pearson's Chi-squared test, $p < 0.0001$) and those living in Dhigurah (Pearson's Chi-squared test, $p = 0.0105$) were those most affected (*Figure 11*).

Generally, with the declaration of SAMPA, use of certain resources was forbidden. Two respondents mentioned that they had to change the location where they used to get reef fish from, and one person mentioned that they required a permit to extract sand from the protected area (*Figure 12*).

A higher proportion of respondents in Dhigurah and Maamigili compared to the other two islands reported that the SAMPA declaration had an effect on the areas they used (Pearson's Chi-squared test, p = 0.0259) (*Figure 13*).

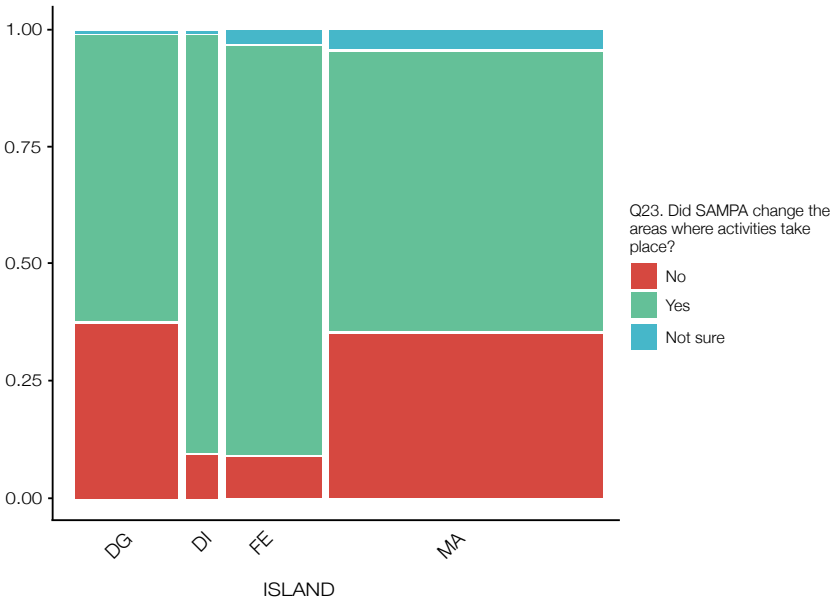

Figure 13. In Dhigurah and Maamigili, the SAMPA declaration changed the areas traditionally used for various activities (fishery, recreational use, etc.)

The declaration of SAMPA generally had no effect on salary, however when a change in salary occurred, it was different according to the respondent's job (Pearson's Chi-squared test, p = 0.0110) (*Figure 14*).

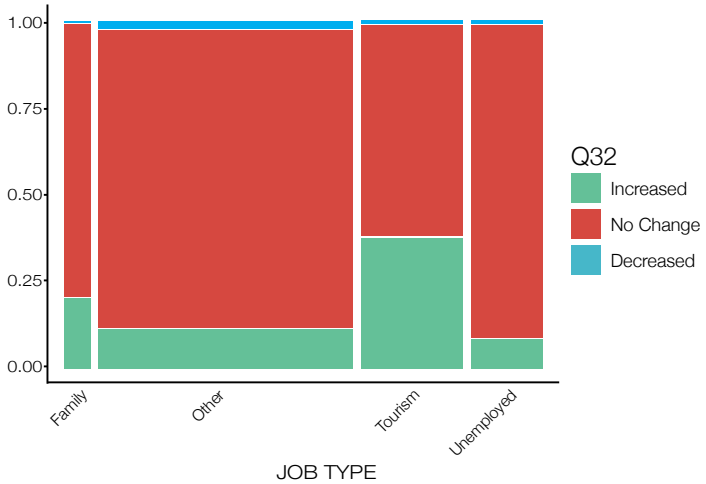

Figure 14. The declaration of SAMPA had a positive effect on the salaries of people working in the tourism industry, although it generally had no effect or had a slightly negative effect in other job categories.

Importance of SAMPA in respondents' opinions

All respondents considered SAMPA to be somewhat important to very important (mostly very important). Women were less convinced than men about its importance (i.e. women's answers were more frequently 'somewhat important', Pearson's Chi-squared test, p = 0.0076).

In people's opinion:

- SAMPA was important for marine resources, the whale shark needed protection and natural resources were doing better since SAMPA was declared;
- SAMPA created job opportunities, although respondents agreed with the statement only to a certain extent (*Figure 15*).

The three threats most frequently associated with SAMPA were: 1) marine pollution; 2) other (see details below); 3) boat collisions on megafauna, and 4) climate change (*Figure 16*).

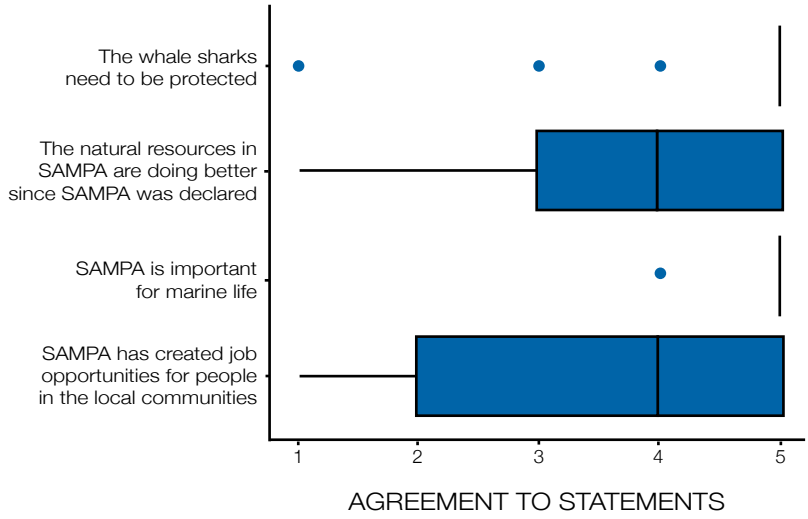

Figure 15. Box-plot showing agreement of respondents to statements (1= strongly disagree, 5=strongly agree).

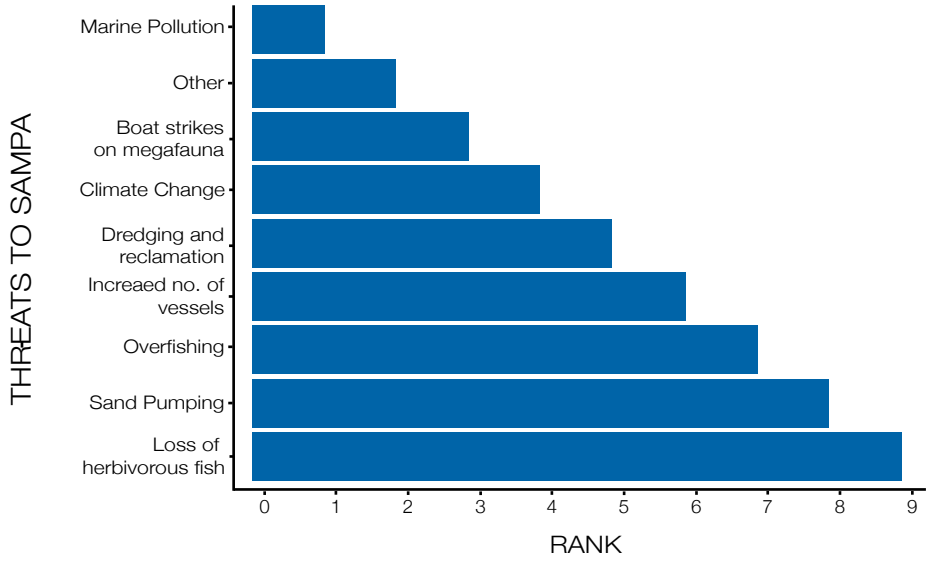

Figure 16. Ranked threats to SAMPA (1= most important threat, 9=least important threat)

Other identified threats were: unregulated/illegal fishing activities, people behaving against the general diving / snorkeling best practices (usually in relation to megafauna), boats approaching megafauna too fast, tagging (tagging for scientific purposes was seen as a method that injured whale sharks) and other threats (*Table 1*).

Other threats	Frequency
People misbehaving	13
Fishing activities	11
Tagging	2
Vessels approaching too fast, too close	1

Table 5. Detailed description of other threats identified in SAMPA by respondents and frequency of answer.

Attitudes and concerns related to a management plan in SAMPA

Most people were not sure if there was any organisation working within SAMPA for the management of the protected area or even the whale sharks. Among those that knew about a local organization working in the area (i.e. Maldives Whale Shark Research Programme, based in Dhigurah), the majority of respondents admitted to rarely or never participating in meetings and/or activities (58%, n= 11). A large majority of the respondents, 74% (n = 140) were not aware of any guidelines followed by people using SAMPA, but 83% of those who were aware of guidelines (n = 30) confirmed that they always complied with them.

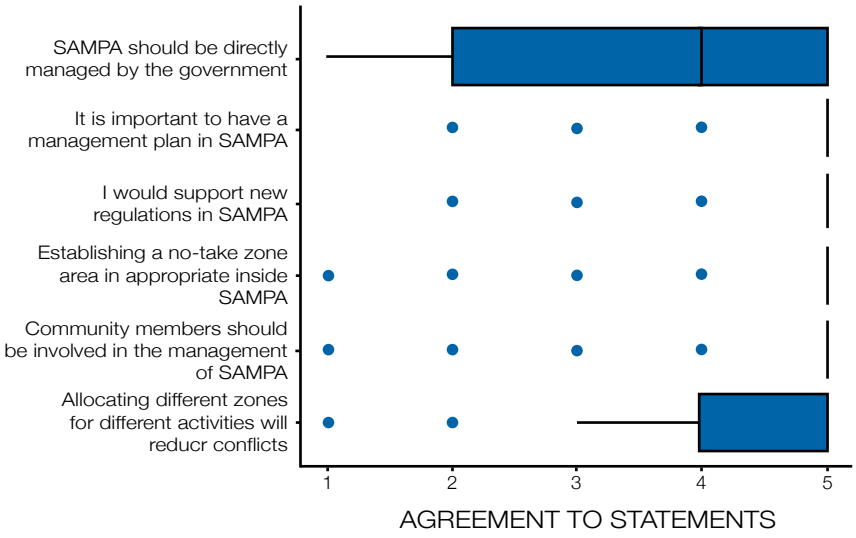

Figure 17. Respondents agreement to a series of proposed management measures (1=strongly disagree, 5=strongly agree)

Concerning the different management measures proposed in the questionnaire and the level of support for a potential management plan (*Figure 17*):

- Respondents agreed with the fact that SAMPA should be managed directly by the Government, nevertheless significant differences existed among respondents in different islands (ANOVA, p = 0.0081);
- There was generally a strong agreement concerning the importance of having a management plan for SAMPA;
- Respondents generally strongly agreed to support regulations in SAMPA, however the level of agreement differed across islands (ANOVA, p= 0.0037);
- People generally agreed with the idea of establishing no-take zones within SAMPA, however people in Dhidhdhoo seemed to disagree (ANOVA, p = 0.0041);
- There was generally strong agreement about community members participating in the management of SAMPA, although people in different jobs tended to differ in their level of agreement (ANOVA, p = 0.0003);
- Finally, there was agreement with the idea of allocating different zones for different activities in order to reduce conflicts, however, people in different jobs had different levels of agreement with the statement (ANOVA, p = 0.0146).

Only 24% of the respondents (n=56) were aware of activities organized by locals in SAMPA. Awareness events (like the whale shark festival organised by the Maldives Whale Shark Research Programme), clean-up events and waste management programmes were among the most popular ones.

4.1.3 Resource users: fishermen

In this part of the study, we looked specifically at how fishers used SAMPA and what they thought about it. As subsistence and recreational fishery are traditional activities in the Maldives, we included in this part of the surveys those who:

- declared to be fishermen as their main job;
- had a second job in the fishing sector;
- fished for recreational or subsistence purposes.

In total, 25 respondents completed this part of the survey, all of which were men.

Fishing activities in SAMPA

Respondents spent on average 15±12 years fishing in SAMPA (n=25, range: 1-40 years). Fourteen respondents engaged in commercial fishery only, one in recreational fishery, and one in subsistence fishery only. Five respondents engaged in all types of fishery, three in commercial and subsistence fishery and one in commercial and recreational fishery (*Figure 18*).

Sixteen respondents engaged only in reef fishery, six only in tuna fishery and two engaged in both reef and tuna fishery. Various fishing gears were used for reef fishery (*Table 6*), while only handline, trolling and pole-and-line were used for catching tuna.

Gear	Frequency
Lift net	2
Drop line	12
Handline	7
Rod and Reel	3
Spear	2
Pole and line	3
Trolling	7
Jigging	8

Table 6. Gears used for reef fishery and frequency of answer (n=25)

Among the respondents, 10 owned a fishing boat and provided some detailed costs for boat and fishing operations that are summarized in *Table 7*. 52% of the respondents did not use fishing grounds within SAMPA borders (n=13). General characteristics of fishing trips and operations are summarized in *Table 7*.

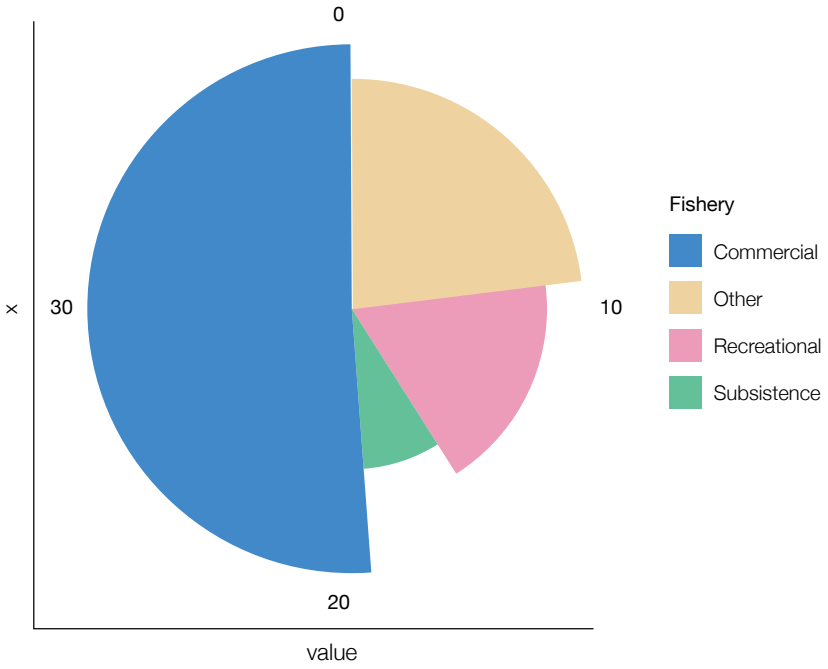

Figure 18. Respondents engaged in commercial, recreational and subsistence fishery (n=39).

	Mean	SD	N
Average fishing trips per month	13.3	11.4	24
Average no. of fishing trips in SAMPA per month	3.7	6.8	24
Average petrol used per fishing trip (l)	118	99	24
Average annual expenditure for boat engine (MVR)	29350	17990	10
Average monthly expenditure for fishing gears (MVR)	9700	5657	10
Average expenditure for food per fishing trip (MVR)	21100	28748	24
Average time spent on one single fishing trip (hrs)	9.5	4.7	24
Average time spent in one fishing ground during one fishing trip (hrs)	5.1	2.4	24

Table 7. Characteristics of fishing operations and average expenditure for boat maintenance.

Resorts and local markets/households make up 94% of buyers of fish caught by respondents. The price of fish varied among islands but was generally around MVR 26±6 per kg.

58% of the respondents mentioned that fishermen from other atolls (mainly from Faafu, Dhaalu, Alifu Alifu) used fishing grounds within SAMPA. Fishermen from Meemu, Raa, Kaafu, Vaavu and Thaa have also been observed using fishing grounds within SAMPA (*Figure 19*).

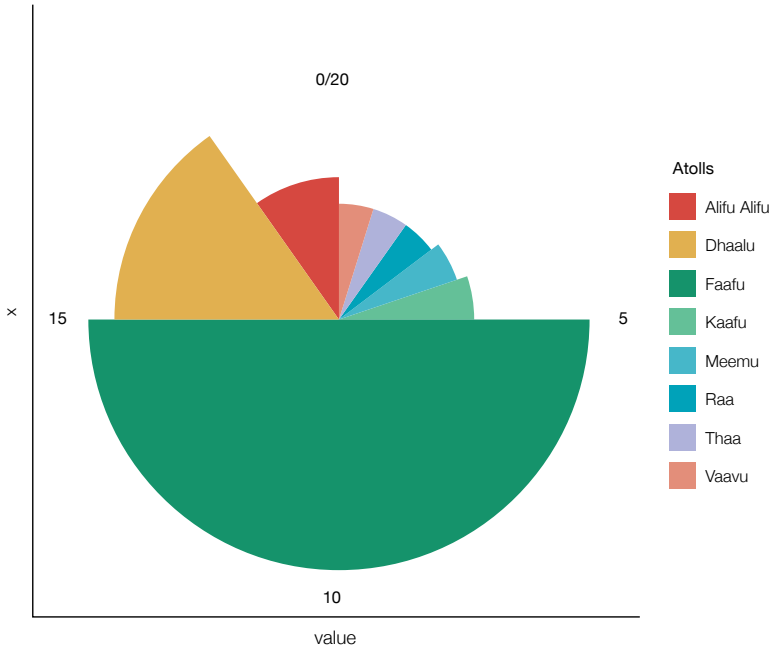

Figure 19. Respondents reported that SAMPA fishing grounds are used by fishermen from other atolls as well

Livebait fishery

Only respondents who engaged in livebait fishery were asked to complete this section (n=14). Livebait was harvested mainly using nets and lights. Nets were used to catch fusiliers, silver sprats, silversides and cardinal fish. Lights were used less frequently and mostly to catch anchovy, big-eye scads, round scads and silver sprats. On average, people spent 2.6±1.4 hours for bait fishing. Some fishermen (4 out of 8 that answered this question) found that livebait fishery had decreased and associated this with climate change and overexploitation of fishing grounds.

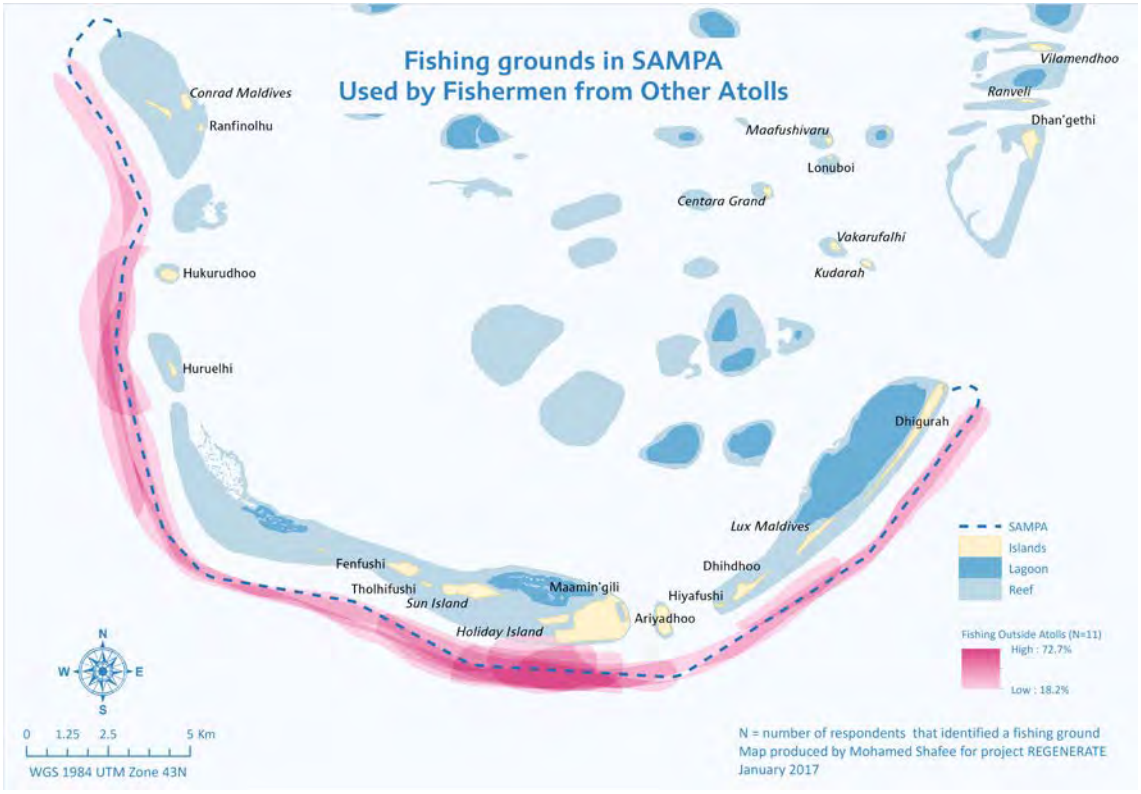

Figure 20. Fishing grounds in SAMPA used by fishers from other atolls. Value for the heat map indicates number of responses for the location.

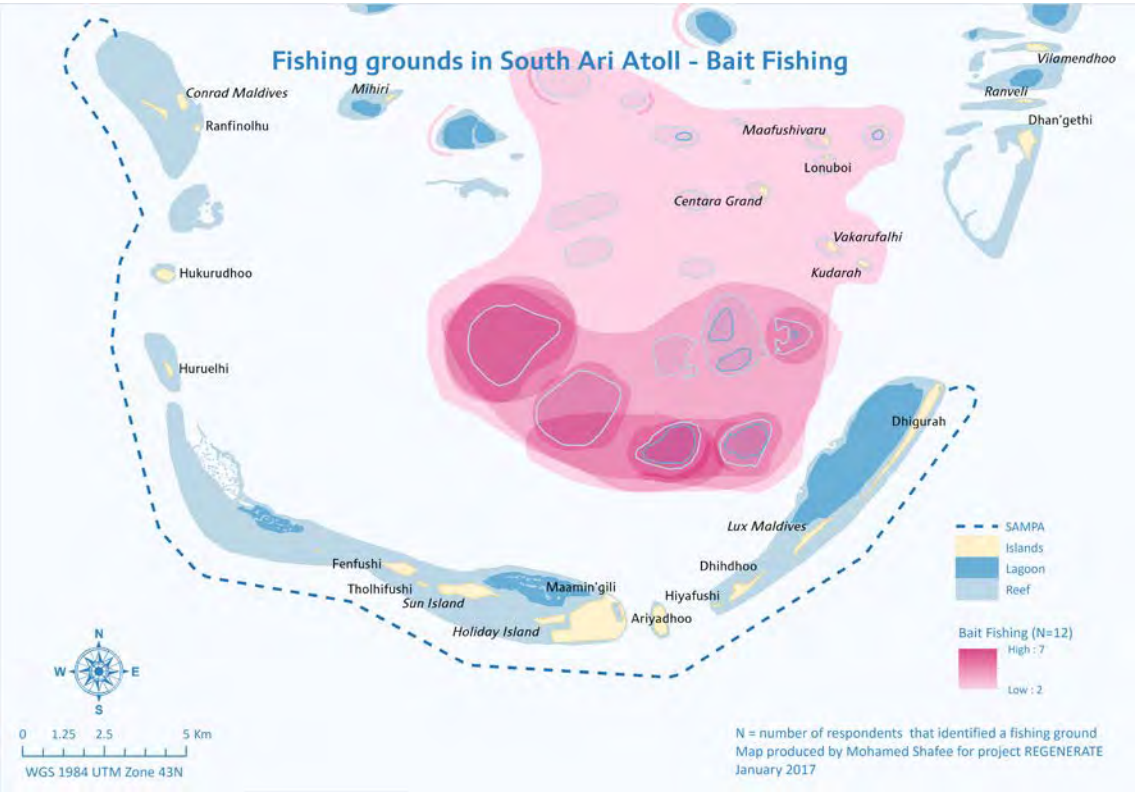

Figure 21. Areas where bait fishing takes place close to SAMPA boundary. Value for the heat map indicates number of responses for the location.

Reef fishery

Only respondents engaged in reef fishery were asked to complete this part of the survey (n=18). Most commonly caught reef fish species were red snappers, jacks and trevallies, and green job fish (Figure 23). Other species mentioned in the answers were: big-eye scad, goatfish, mullet, rudderfish, barracuda, kawa kawa, rainbow runner, and rusty jobfish. Respondents mentioned to never or rarely catch herbivorous fish.

The general opinion was that reef fishery had decreased during the past 10 years (8 out of 11 respondents). Overexploitation of fishing grounds and climate change were considered the main causes for this decline. However, the majority of respondents did not notice a change in the size of reef fish over the past 10 years (8 respondents out of 12).

Fishing interactions with other species

72% of the respondents mentioned finding non-targeted species in their fishing gears. For example, sharks were frequently found entangled in fishing nets, and mantas, napoleon wrasse, parrotfish and surgeonfish were only rarely observed. All respondents claimed that non-targeted species are released (n=18).

Injured whale sharks have been observed by 7 respondents, and in 6 cases people witnessed a boat making contact with a whale shark. In all these occasions, the collision happened within SAMPA borders. However, most respondents reported that collisions happen quite rarely (less than once a year).

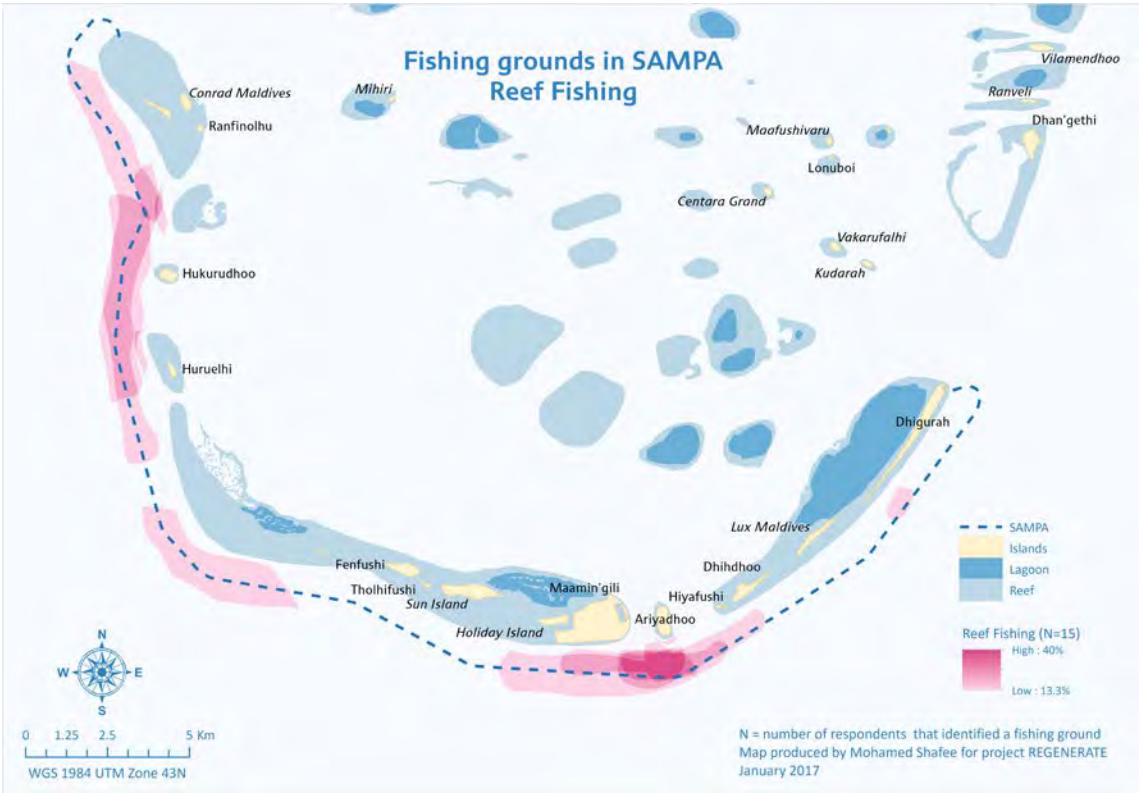

Figure 22. Reef fishing grounds in and around SAMPA. Value for the heat map indicates number of responses for the location.

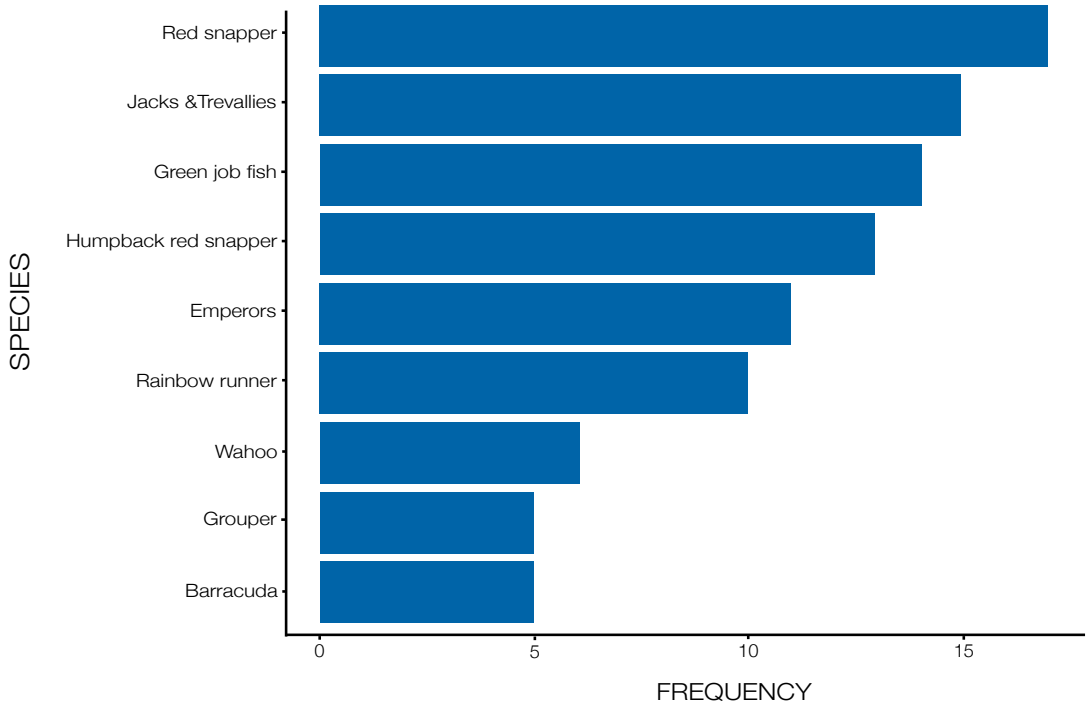

Figure 23. Most commonly caught reef fish species. Frequency refers to the frequency of the answer.

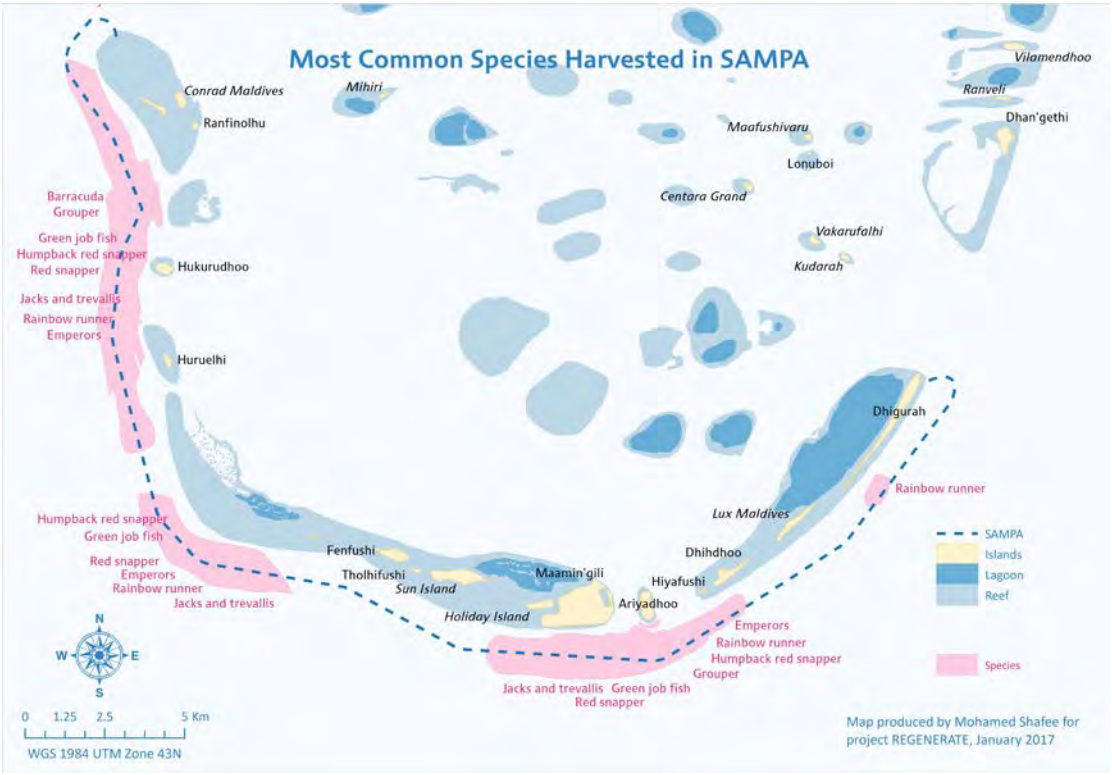

Figure 24. Areas where the most common reef fish species are harvested in and around SAMPA

4.1.4 Resource users: people working in the tourism industry

In this part of the study, we looked specifically at what people working in the tourism sector thought about SAMPA. People working in the tourism sector were defined as those who:

- had a main job in the tourism sector;
- had a second job in the tourism sector;
- helped friends or family members in running their tourism related business.

In total, 41 respondents completed this section of the survey, only one of them was a woman.

Effect of SAMPA on tourism

56% of respondents (n=23) found that tourism had increased or significantly increased since SAMPA declaration, while 37% did not notice any change (n=15) and 7% of respondents (n=3) mentioned that tourism has decreased since SAMPA declaration.

Effect of SAMPA on whale sharks

68% of respondents reported having seen injured whale sharks. Injured whale sharks were more frequently observed by people in Maamigili and Dhigurah than people in the other two islands (Pearson's Chi-squared test, $p = 0.0225$). Due to these sightings, 70% of respondents (n=28) thought that whale sharks in SAMPA were under significant threat. However, this opinion differed across islands, for example, people in Fenfushi and Dhidhoo thought that whale sharks were not under much threat (Pearson's Chi-squared test, $p = 0.0139$).

Most frequent threats to whale sharks mentioned in the surveys were intentional or accidental interference with swimmers and vessels (*Figure 25*).

Lack of awareness and unsustainable fishing practices were some of the 'other' threats identified by the respondents.

Even if accidental inference by boats was one of the top ranking threats, only 27% of respondents (n=11) had witnessed a collision between a vessel and a whale shark inside SAMPA. Similarly, to what was reported by fishermen, collisions were deemed to be rare (once or twice a year or less). Nevertheless, 9% of (n= 4)respondents reported frequent accidents (twice a month, every month or other month).

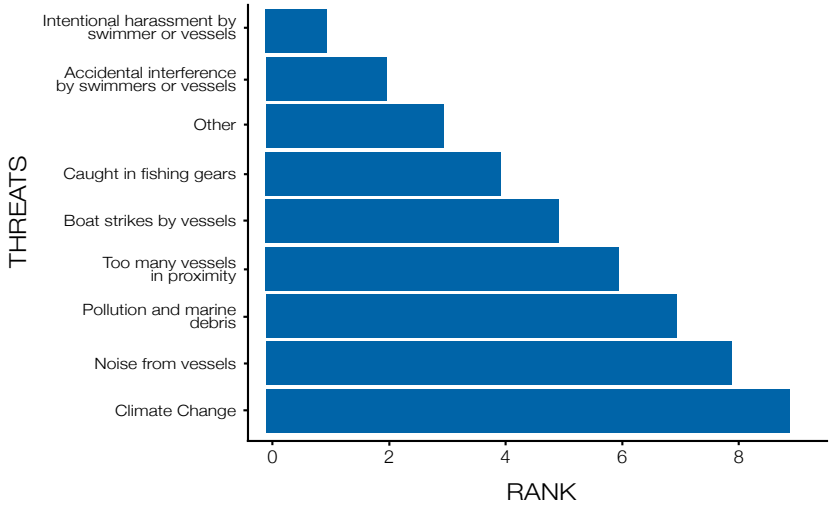

Figure 25. Ranked threats to whale sharks in SAMPA (1=most important threat, 9=Least important threat).

Attitudes towards a management plan

People were asked to agree or disagree on a number of management measures that could be implemented as part of the new management plan, including regulations on the distance between whale sharks and boats, maximum number of people in the water at a given time, licensing mechanism, etc.

People generally agreed or strongly agreed with the need for a licensing mechanism for tour operators using SAMPA, a limit to the maximum number of vessels allowed inside SAMPA at a given time, a minimum separation distance between people and whale sharks and a minimum distance of 500m between the reef and any vessel looking for whale sharks *(Figure 26)*.

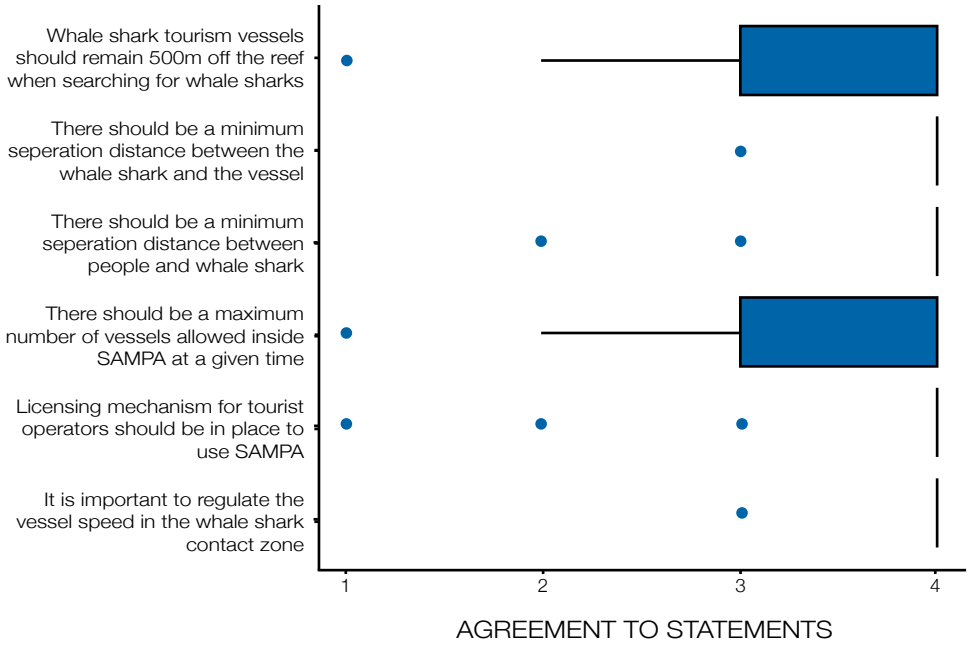

Figure 26. Respondents agreement to statements concerning various management measures proposed for tour operators working in or visiting SAMPA.

When asked about potential ways to finance the MPA, respondents mentioned a ticketing system for tourists, a licensing scheme for tour operators and/or an annual conservation fund to which all partners should contribute (*Figure 27*).

Other quoted financing mechanisms were: a green tax, donations, and selling food items (e.g. packed lunch, drinks) to tourists/vessels within SAMPA.

Finally, when asked about the biggest challenges in implementing a management plan in SAMPA might be, people suggested 1) the surveillance of vessel speed, 2) other challenges (the lack of law enforcement mechanisms was the most frequently mentioned under this category), 3) ensuring that swimmers follow the guidelines and 4) making sure that boat operators respect the maximum number of vessels allowed around a whale shark at any given time (*Figure 28*).

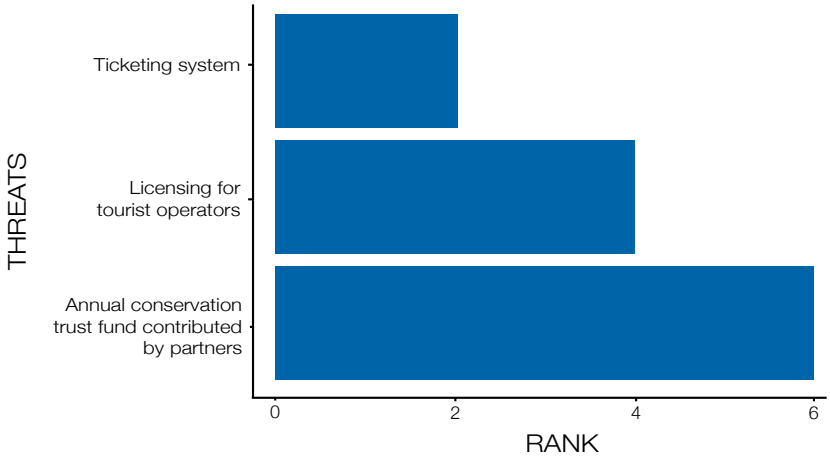

Figure 27. Ranked financing mechanisms proposed to support SAMPA (1=Most recommended system, 3=Least recommended system).

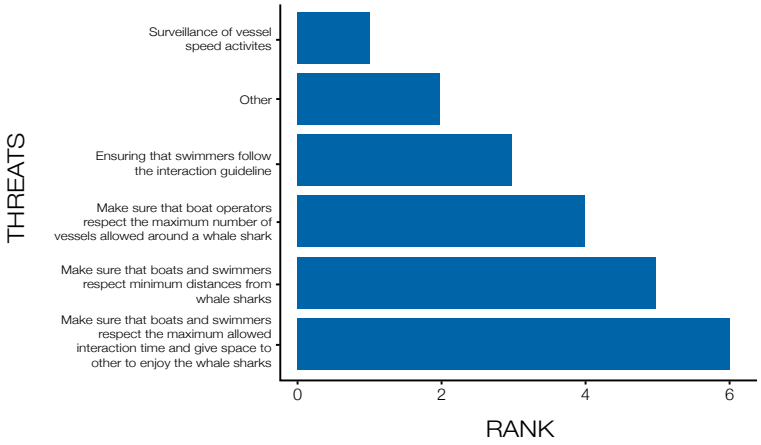

Figure 28. Top rated challenges that enforcing a management plan in SAMPA would face (1=biggest challenge, 6=lowest challenge).

4.1.5 Multiple Use Areas

In order to identify areas where potential conflict may occur due to multiple use, the following maps were developed by overlapping swimming/snorkeling areas and fishing grounds. The highest density of overlap between tourism related activities and commercial fishery is found between Holiday Island Resort and Ariyadhoo (*Figure 29*) whereas the overlap between tourism related activities and recreational fishery extends up to Dhigurah (*Figure 30*).

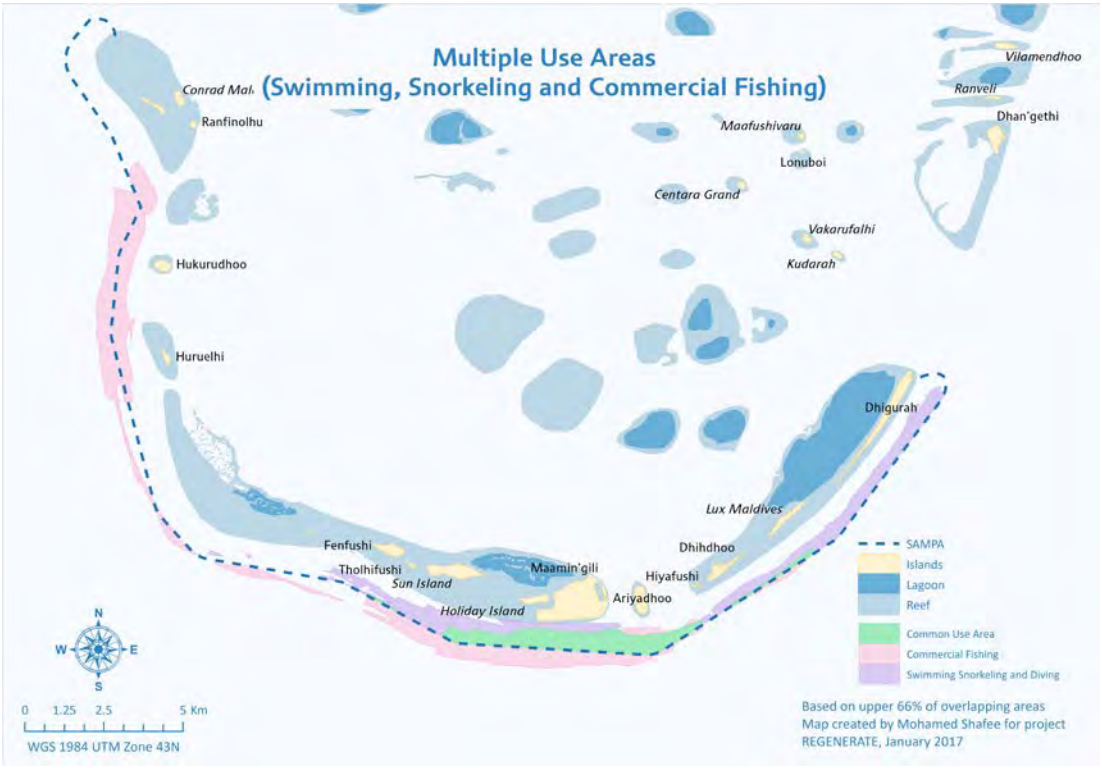

Figure 29. Multiple Areas where swimming, snorkeling and commercial fishing overlap.

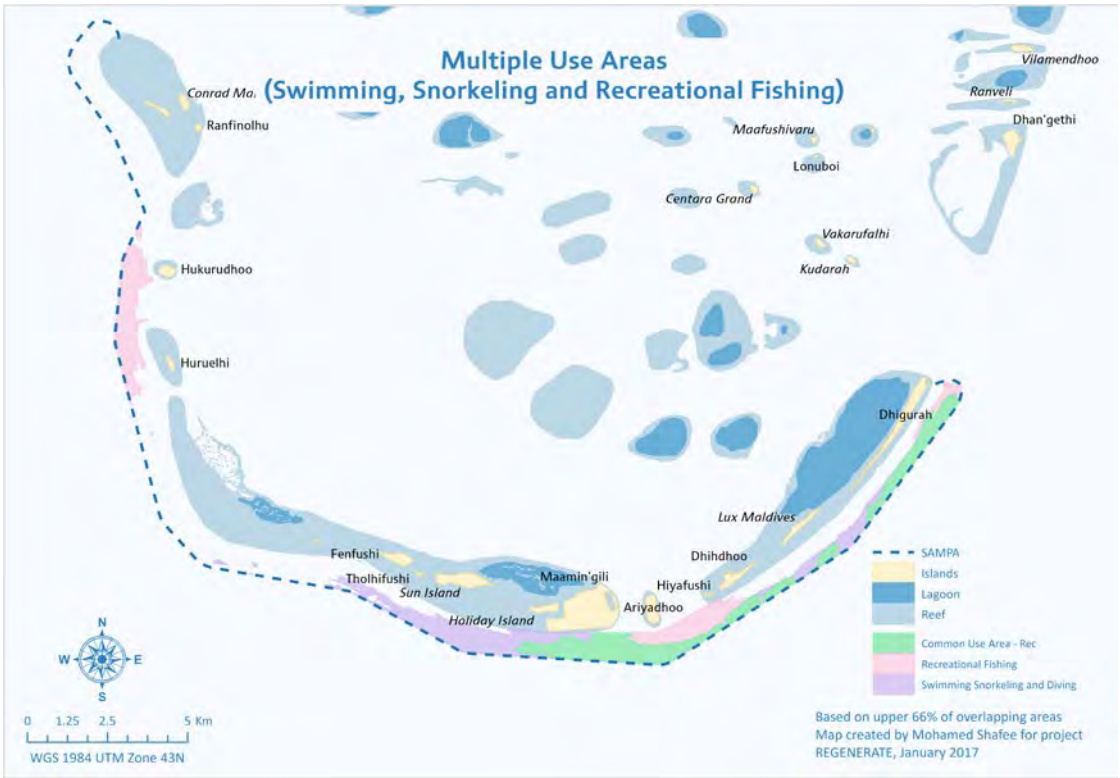

Figure 30. Multiple Areas where swimming, snorkeling and recreational fishing overlap.

4.1.6 Potential Management Areas

The perceived ecologically significant areas and commercial fishing areas were overlapped with a specific weighting for each component (whale shark points and fishing areas = 3, manta rays = 2, turtles and sharks = 1) to indicate locations where management should be prioritized. Whale shark points and fishing areas were given similar weights based on our findings which indicated that whale shark points coincide with the snorkeling/diving spots, and given that these are the activities that generate income for the communities. The highest density of overlap runs between Sun Island and Lux* Maldives.

4.2 Multi correspondence analysis

A multi correspondence analysis (MCA) was used to identify important relations between social factors (age, job, island, residency, sex, level of education) and variables related to the attitude towards SAMPA (knowledge of SAMPA, involvement, perceived effect of SAMPA declaration, perceived importance of SAMPA, and attitude towards a management plan).

The MCA (*Figure 32*) showed three main groups:

- People working in the tourism sector showed a positive attitude towards management of SAMPA. Generally, this group has better education and better knowledge of SAMPA. In Dhigurah, where a high percentage of people worked in the tourism industry, there was a positive perceived effect of SAMPA. People working in the tourism industry valued SAMPA more (i.e. SAMPA was more important) than people in other jobs. They also tended to be more involved in activities related to whale sharks;
- Fishermen generally had a less positive perception of a management plan. People in Dhidhdhoo, where we found a higher proportion of fishermen based on number of people interviewed in each island of SAMPA,, tended to have a less positive attitude towards management;
- Unemployed people, who were found in higher proportions in Maamigili and Fenfushi, generally had a neutral perceived effect of SAMPA but still considered the MPA very important and had a positive attitude towards management. Unemployed people tended to have basic education levels and were predominantly women.

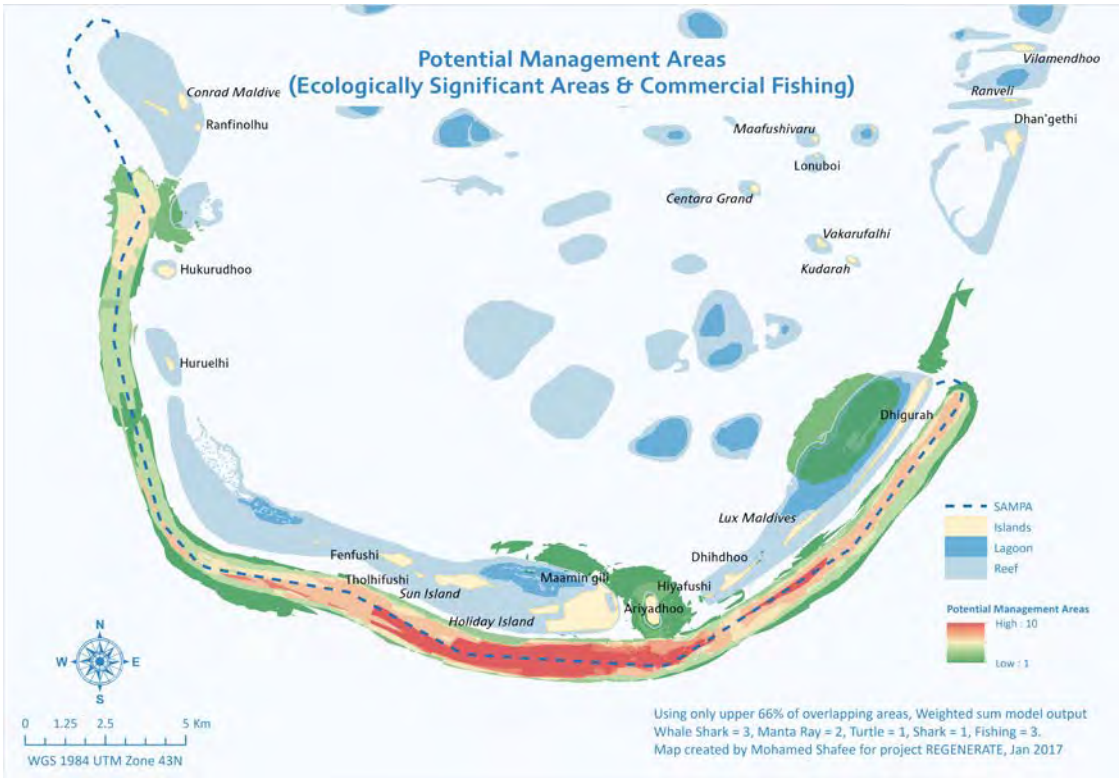

Figure 31. Potential management areas where ecologically significant areas and commercial fishing overlaps.

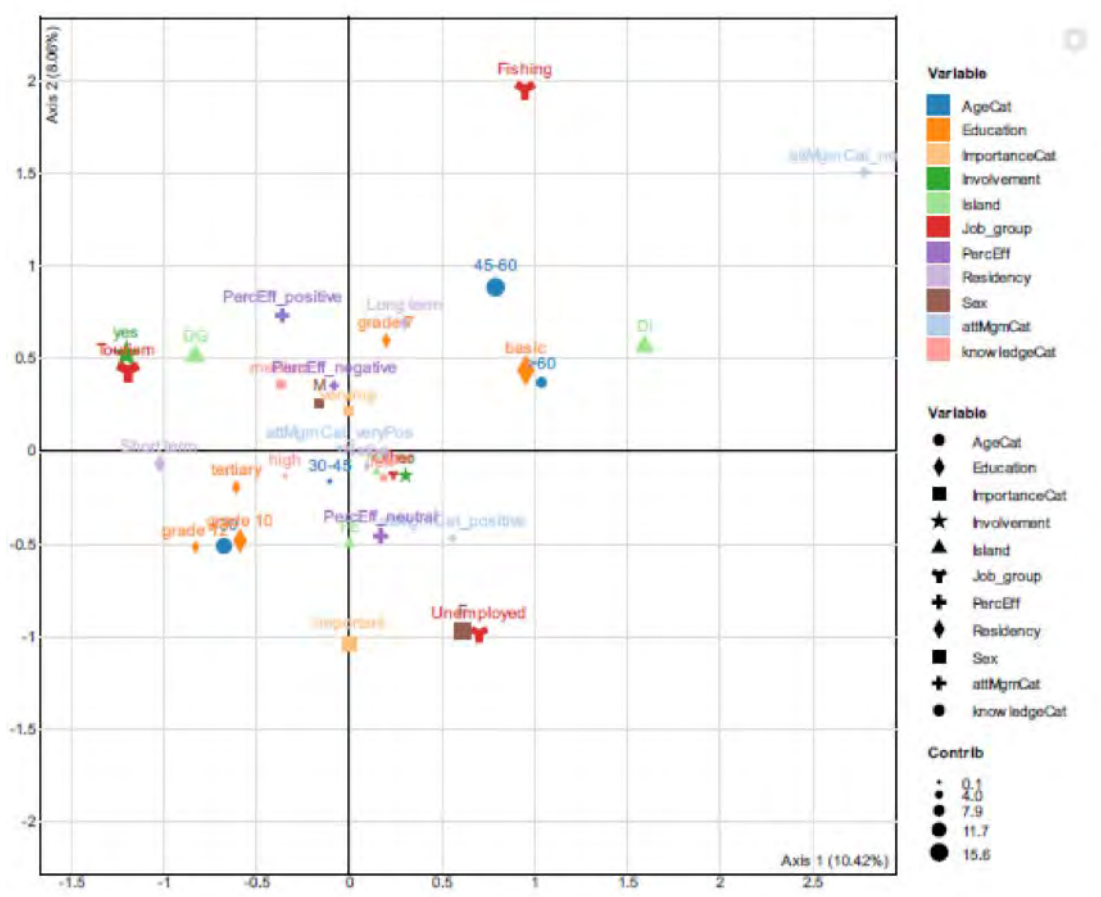

Figure 32. MCA variable plot. The size of the variable mark is proportional to the variable contribution to the axis.

4.3 Focus group discussion

4.3.1 Participants

A total of 48 stakeholders participated in the focus group discussions FGDs). This includes 18 fishermen, 22 representatives of the tourism industry, and 8 elected Island Council members (Annex 3). We were able to consult members from the three groups in all islands except in Dhidhdhoo, where the local tourism sector has not yet been developed. A summary of the participants is given in *Table 8*.

Island	Number of fishers	Number of people working in the tourism sector	Number of council members	Total number of participants
Maamigili	3	6	2	11
Fenfushi	1	6	3	10
Dhigurah	9	9	3	21
Dhidhdhdhoo	5	0	2	5

Table 8. Summary of stakeholders that participated in focus group discussions in the four islands

4.3.2 Results of the map exercise

Participants to the focus group discussions were asked to map fishing grounds, areas where conflicts or issues were observed, areas used to observe marine wildlife (whale sharks in particular), and areas used for recreational activities (wildlife watching, snorkeling, diving, and fishing). For fishing grounds and marine wildlife watching areas, a measure of intensity of use was also asked (1 = very low use to 5 = very high use).

Fishing grounds were found mostly close to Dhigurah and Maamigili, however fishing areas scattered all along SAMPA were found (*Figure 33*).

Fishing intensity was particularly high in the Ariyadhoo channel and on the Western side of SAMPA. Intensive fishing activities also occurred outside SAMPA boundary (*Figure 34*).

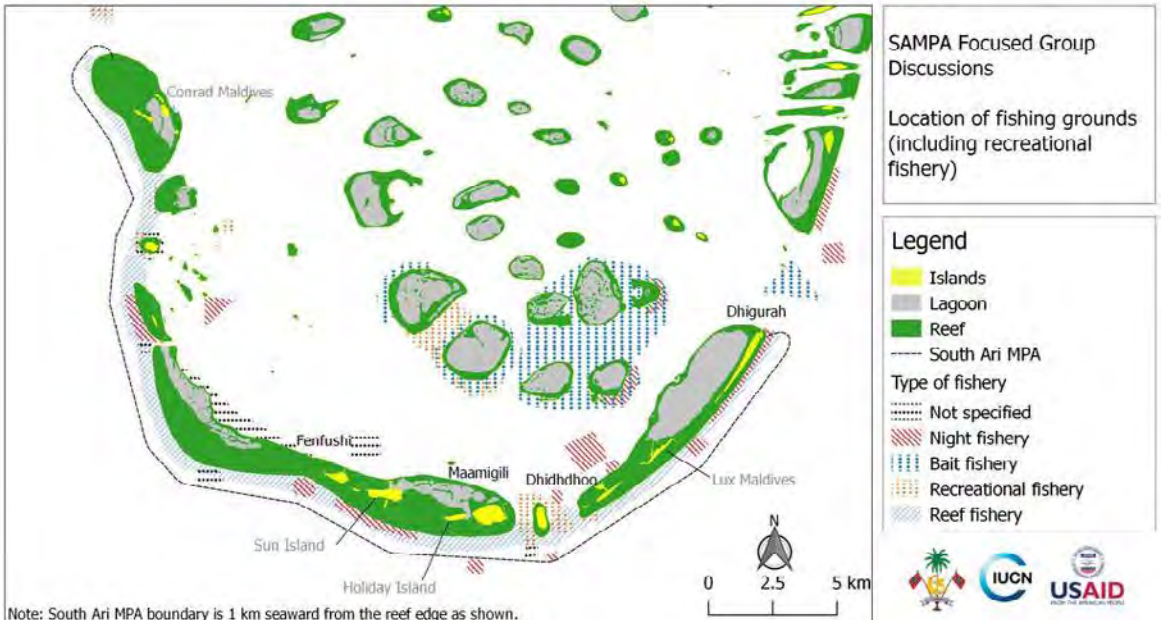

Figure 33. Fishing grounds used by commercial and recreational fishermen in SAMPA.

Figure 34. Fishing intensity as reported by commercial and recreational fishermen in SAMPA.

Ecologically important areas were defined as areas where sightings of charismatic megafauna occurred and reef fish spawning grounds. Two possible spawning grounds were identified (one inside South Ari atoll and one at the north western end of SAMPA, outside the protected area). Sightings of whale sharks were reported in high frequency on the southern side of SAMPA, approximately between Fenfushi and Maamigili) (*Figure 35*).

Among conflicts and issues reported by participants during the FGDs, dumping of organic waste and dredging were the most common ones. Some areas where fishermen and whale sharks/ manta rays come into contact were also highlighted, even if these were not depicted as an issue (*Figure 36*). Nevertheless, during the social surveys some respondents mentioned that these interactions could be a problem (i.e. when whale sharks get too close to fishing boats, or they get entangled, or they are pushed away by people on the boat, etc).

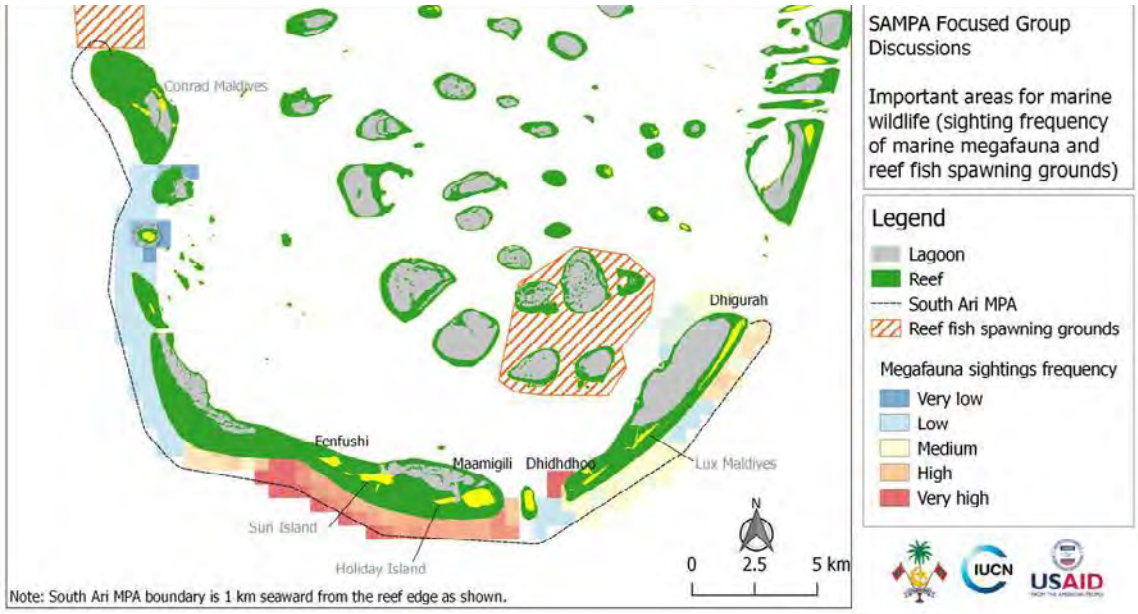

Figure 35. Important areas for marine wildlife and reef fish species.

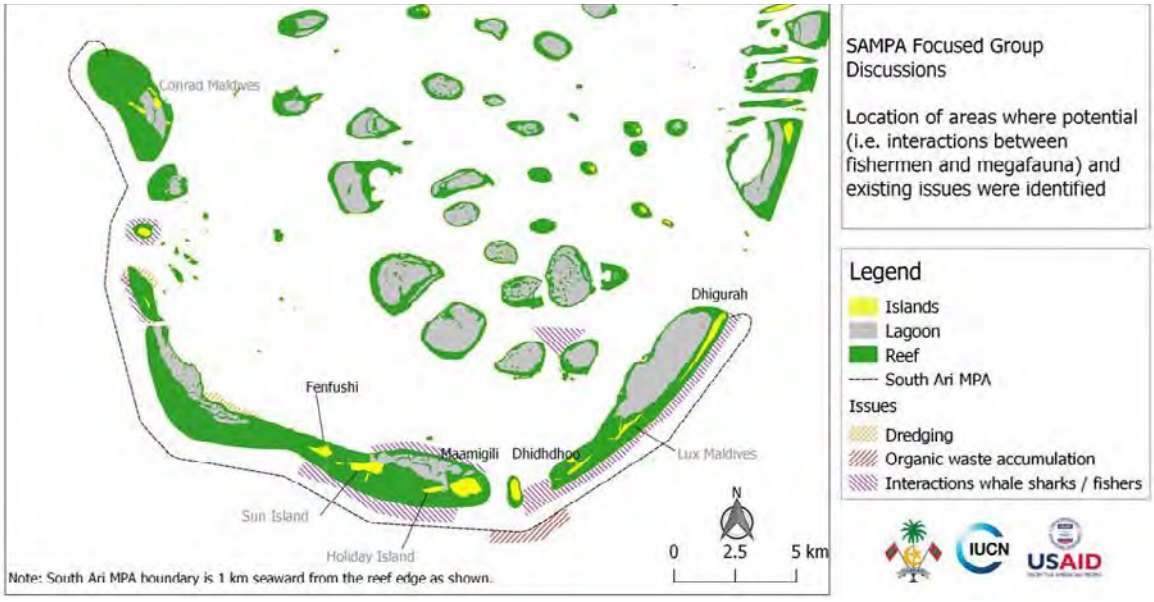

Figure 36. Location of potential and existing issues in SAMPA.

Figure 37. Areas used for recreational activities.

Recreational grounds where boat-based wildlife watching, diving, snorkeling and recreational fishing occurred were also identified. Wildlife watching occurred between Fenfushi-Maamigili, Dhidhdhoo-Dhigurah (whale sharks), or on the western side of SAMPA (manta rays). Diving, snorkeling and recreational fishery was reported within and outside SAMPA (*Figure 37).*

4.3.3 Results of the Q&A Exercise: Fisherman

Resource use

Most of the fish caught in SAMPA is sold to resorts and rarely, to community islands. On average, 9250 kg of fish are sold to resorts per week, and 155 kg to community islands. In Dhigurah, 1000 kg of fish per week are sold to dhonis coming from Malé. Most commonly caught species are:

- Resorts: red snappers, humpback red snapper, emperor, green job fish, orange-finned emperor, trevallies, wahoo, job fish;
- Community islands / guesthouses: red snapper, trevallies, kawa kawa, frigate tuna, rainbow runner, emperor, dogtooth tuna, yellow fin tuna
- Other (i.e. dhonis going to Malé): specimen heavier than 1 kg.

For the last 10 years or so, fishermen from Maamigili and Dhidhdhoo have been using fishing grounds in other atolls, where fish is thought to be bigger and more abundant.

There are generally agreements (either written or oral) between resort managers and dealers from local community islands or fishermen. Some resorts have agreements with fishermen from other atolls. The price of fish varies according to the buyer: to resorts fish is sold for MVR 25-40 per kg, to community islands fish is sold for MVR 25-35 per kg based on quantity requested.

Fishermen in Dhidhdhoo and Dhigurah reported illegal spearfishing activities from local divers. The use of spears, especially spear guns, was associated with change in fish behavior and therefore affecting fishery.

Knowledge and effect of SAMPA

Fishermen in Maamigili and Dhidhdhoo were not aware about SAMPA declaration. Fishermen in Fenfushi and Dhigurah were aware of the protected area but were unsure if any regulations were in place, and therefore kept using the area as usual (i.e. SAMPA declaration did not modify their fishing grounds).

Interactions with whale sharks and other marine species

Whale sharks and manta rays were commonly seen (i.e. every day), especially during night fishing during new and full moon phases. Injured whale sharks and whale sharks with paint on their back (possibly an indication of collision with boats) have been observed occasionally. On one occasion, a manta ray was found entangled in the anchor of a small fishing boat, and was released by those who found it. In Dhidhdhoo, fishermen mentioned that about 10 years ago they could encounter 10 to 17 whale sharks at the same time, while now they would only see one or two.

Challenges and potential solutions

Fishermen identified five main challenges and solutions and they are summarized in *Table 9.*

Attitudes towards management measures

All fishermen were against the idea of completely eliminating fishing activities in SAMPA. There was agreement related to seasonal closures of different areas at different times of the year for the replenishment of fish stocks. Fishermen also mentioned the need to clearly identify spawning grounds before selecting areas for fishing closures.

Suggested fishing closures:

- Area between Ariyadhoo channel and Dhidhdhoo: first two months of south west monsoon (Hulhang'u, May-Jun);
- Maamigili outer reef: first two months of northeast monsoon (Iruvai, Dec-Jan);
- Area between Bodu finolhu and Conrad: northeast monsoon (Iruvai);
- Area between Huruvelhi and Hukuruvelhi: northeast monsoon (Iruvai);

Generally, fishermen were against the idea of allocating quotas per fishing ground (i.e. limiting the maximum number of catches in each fishing ground). They mentioned that this was impractical and would cause economic as well as logistical challenges for fishermen.

Challenges / Issues	Proposed Solutions
Disposal of solid waste: in all islands, solid and organic waste was quoted as the most concerning problem. Some islands complained about not having a functional solid waste management facility and highlighted that because of this and the lack of appropriate storage system, waste ended up in the sea. It was also mentioned that waste was dumped at sea by resorts and safari boats on a daily basis, especially in proximity of channels. This waste, particularly the organic waste, tends to wash on beaches used by community island members or tourists in guesthouses.	Improving existing facilities by building barriers between dumping sites and the sea, and implementing fines and other deterrent measures to set an example for people illegally dumping waste at sea.
Simultaneous use of some areas for recreational and fishing activities: *thilas* are frequently used by both fishermen and divers, however due to the different natures of both activities; they are not compatible to be carried out at the same time.	Having separate areas for recreational and commercial activities, or at least a mechanism for diving centres and/ or guesthouses to inform fishermen beforehand that divers will be using certain fishing grounds at a certain time, so that this overlap is avoided.
Lack of regulations for people interacting with whale sharks: the high traffic of people and vessels in the water with one individual whale shark was a common concern of all participants. They believed that this causes negative consequences for both the whale shark and the observers.	Having a management plan and enforcement mechanisms in place to regulate the number of vessels and people in the water at a given time.
Overfishing and increased number of sharks: overfishing was thought to contribute to decreased catch rates for both reef and baitfish. In particular, it was noted that fishing effort had increased over the past few years, especially in areas inside the atoll (usually grounds for bait fishing). Other identified problems related to fishery were: 1) people using spear guns while diving in Dhidhdhoo / Dhigurah area; 2) the increased number of sharks that tend to break or steal hooks used for fishing and causing substantial economic damage (MVR 3000-4000).	No solution was proposed to address the issue of overfishing. The participants proposed to temporarily lift the ban on shark fishery for short periods in order to keep shark populations under control.
Other challenges: at the time of the discussions, dredging was taking place in two points within SAMPA's boundary and in areas of high currents. The participants were concerned that this was happening without a barrier, and believed that the amount of sediments released in the water had the potential to reduce coral survival.	When dredging activities are carried out, the appropriate mitigation measures should be used to avoid dispersal of sediments (i.e. sediment nets or traps).

Table 9. Challenges and issues identified by fishermen in SAMPA

4.3.4 Results of the Q&A Exercise: People working in tourism

Resource use

All participants were involved in whale shark activities directly (i.e. organizing excursions) or indirectly (i.e. working with a local water sport center that would provide this service to guests). Recreational fishing was offered on top of diving and snorkeling, although not frequently (i.e. subject to weather and demand from tourists). Humpback snapper, groupers, and emperors were commonly caught fishing species, which were generally served to the guests as a barbecue experience. Big game fishing was reported as an activity done by resorts, not by guesthouses at community islands.

Knowledge of SAMPA and regulations

All people working in tourism were well aware of the SAMPA declaration. Only few participants knew about the Whale Shark Interaction Guideline produced by the Maldives Whale Shark Research Programme. However, all guesthouses and dive centers mentioned following some kind of guidelines and briefing their guests before going for a whale shark excursion. There was general agreement with the fact that most people followed the rules, but some guests would simply touch or get too close to whale sharks, regardless of the briefing. The briefing generally includes information like:

- Do not touch whale sharks;
- Keep a safety distance from the tail (approx. 4 m) and the head of the whale shark (approx. 3m).

While briefings are not 100% effective, it was generally agreed that with no briefing at all the situation would be much worse.

Challenges and potential solutions

Five main challenges and solutions were identified by people working in tourism and they are summarized in *Table 10*.

Challenges / Issues	Proposed Solutions
Lack of regulations, especially concerning interactions with whale sharks: some people mentioned that some tourists do not receive appropriate briefings before going for a whale shark excursion. Furthermore, there are currently no regulations on the maximum number of tourists per guide, and resorts usually have big groups (30 to 40 people) with only one guide in the water. Finally, too many people and vessels are normally seen interacting with one animal at the same time. Lack of clarity on the corresponding governmental agency to which problems within SAMPA should be reported was also identified as an issue.	1) implementing and enforcing a management plan, making it compulsory for tourists to have a briefing before every whale shark excursion, 2) having an advertising strategy capable to better value SAMPA in the international tourism market, 3) having trained guides leading whale shark excursions, 4) having a ticketing/licensing system in place to limit numbers of boats and people in the water at a given time, 5) hiring rangers from local communities and stationing them at strategic entrance points such as the channels, 6) collaborating with community members and local councils to enforce SAMPA management plan.
Use of lights at night: fishermen usually use lights at night to catch baitfish, while safari boats use lights to attract mantas and whale sharks. Participants believed that using lights alter the behavior of whale sharks and manta rays. Fishermen were also thought to intentionally harm whale sharks to push them away from their nets.	Banning fishing activities using lights from within SAMPA.
Collision with boats: the presence of jet skies and luxury boats moving at high speed within SAMPA has been suggested as a growing cause of concern for the safety of whale sharks.	Having a ticketing/licensing system to limit the number of boats in SAMPA, and limiting access for boats to 1 km outside the reef.
Dredging: dredging was ongoing at two sites in SAMPA during the time of discussions, and was believed to damage coral reefs nearby because of the high presence of sediments in the water.	Requiring dredging operations to have the necessary mitigation measures in place to reduce the amount of sediment in the water.
Disposal of organic waste at sea: safari boats and resorts have been reported to dispose of waste (especially organic) at sea. The waste tends to strand on beaches used by community island members.	Banning disposal of waste at sea.

Table 10. Challenges and issues identified by fishermen in SAMPA

Attitudes towards management measures

Some people suggested creating a schedule and allocating time to resorts and guesthouses separately for whale shark excursions to avoid high concentrations of boats and people at the same time and location (i.e. morning sessions for resorts, afternoon sessions for guesthouses). Boats coming from nearby atolls would also need to be managed and their number limited.

Generally, people were against the idea of limiting the interaction time with one individual whale shark.

People agreed with the idea of having a ticketing and licensing system in place, nevertheless, the price for tickets should be proportional with the price of the excursion (i.e. resorts sell one excursion for USD 250 per person, guesthouses generally for USD 50). Ticket offices should be managed by local councils.

Rangers would be needed to make sure that the management plan and regulations are being enforced. Rangers should be hired from local community islands and placed strategically at the entrance points to whale shark areas.

5. DISCUSSION

5.1 Stakeholders in SAMPA

In the framework of marine protected areas, stakeholders have been defined as: "Those who use and depend on the MPAs, whose activities affect it or who have an interest in it" (RAC/SPA et al., 2013). For this study, we defined dependence as economic dependence (i.e. the use of resources is necessary for people's livelihoods and income), but we also recognized that in the Maldives, local communities have strong traditional ties to marine resources and it is important to understand and address traditional, recreational and subsistence use of the natural resources.

We therefore identified two main stakeholder groups: fishermen (commercial and subsistence) and people working in the tourism industry. These groups were considered to have economic interests/dependence on the marine resources in SAMPA and would therefore be a direct target in a management plan (i.e. rules and regulations in a management plan would change the way they use resources and therefore impact their livelihoods and income).

Another group was further identified during our surveys that included unemployed people and people whose job is not directly related to natural resources. This group included more generally the local population that had no direct economic dependence on resources in SAMPA but that had been using SAMPA for recreational and traditional purposes (i.e. recreational fishing, using sand for construction, going to the beach for leisure, etc). This broader group was less likely to be affected by regulations in SAMPA in terms of reduced livelihoods or income, but could resent negative effects due to limitations to recreational activities. It is therefore essential that 1) all people in SAMPA are informed about potential new regulations and 2) it is necessary to consider traditional and recreational uses as well when designing a zoning plan.

Other stakeholders like local NGOs and research institutions were not interviewed but their expert opinion should be sought to identify high use areas for whale sharks, and potential conflict zones where overlapping activities will need to be regulated. Local government representatives should also be consulted to identify best ways to ensure compliance of people from local community islands with a management plan. Finally, as SAMPA is frequently used by people from other islands and atolls, consulting these stakeholders would also improve compliance.

5.2 Resource use and dependence

5.2.1 Fishermen intensively use fishing grounds within SAMPA

Although various resources are used in SAMPA and surrounding islands, commercial reef and bait fisheries are the two extractive activities with potentially the highest impact on marine resources. The demand for reef fish from resorts is extremely high: more than 9,000 kg of fish per week alone from resorts near or within SAMPA. Local community islands usually receive 155 kg of fish per week. Fish price varies based on the buyer and the selling scheme (some islands sell to dealers that then sell for higher prices to resorts and other companies based in Male'), but generally fluctuates between 25 and 40 MVR per kg.

Most sought species are red snappers, trevallies and jacks, greenjob fish, big-eye scad, goatfish, mullet, rudderfish, barracuda, kawa kawa, rainbow runner, rusty jobfish (Figure 23). The level of fishery seems to have already affected fish abundance and size: results from social surveys and focus group discussions showed that fishermen have already started moving towards other atolls due to the presence of bigger specimen and larger fish populations there. Fishermen in SAMPA also come from other atolls and their presence seems to have increased over time. Access to SAMPA fishing grounds could be regulated by the management plan. A potential way forward could be to zone the SAMPA region and explore the prospects of using seasonal closures for some of the fishing grounds to enhance recovery of stocks and implement regulations on fishing practices within the MPA.

5.2.2 Non-extractive use of marine resources in SAMPA

An MPA is usually seen as synonym of pristine site, clear waters and biodiversity richness, all aspects that can increase the attractive value of a place for visitors (e.g. Eagles et al., 2002). In SAMPA, most people working in tourism understood the importance and value of SAMPA, particularly in relation to the presence of whale sharks but also of other iconic species (e.g. mantas, turtles, sharks) and ecosystems (e.g. coral reefs). There was also a generally good understanding that whale sharks are currently threatened by the lack of proper wildlife watching regulations.

5.3 Perceptions and opinions related to SAMPA

5.3.1 Limited knowledge of SAMPA could undermine future compliance with new regulations

Although SAMPA was declared in 2009, 53% of people surveyed did not know about it. Women in particular seemed to be generally less informed than men about it, probably because women tend to see themselves as less involved in natural resource management. Women usually use natural resources for recreational purposes such as picnics and this could one of the reason they tend to stay away from conversations in regard to natural resources (for an example in the Maldives, see Mancini et al., 2017). Furthermore, we found limited knowledge concerning SAMPA declaration among people that were not involved in any whale shark activities.

Limited knowledge could be due to the lack of a comprehensive communication strategy and could result in scarce public participation to activities related to SAMPA, as well as in poor compliance when new regulations are implemented (i.e. Trakolis, 2001).

5.3.2 SAMPA had positive effects on natural capital but not on human/ financial one

In people's perceptions, SAMPA declaration had very limited effect on their livelihoods and use of resources. Although, technically all extractive activities in protected areas in the Maldives are forbidden, in this case, due to lack of enforcement and possibly scarce information available, most people seem to have gone on doing 'business as usual'. SAMPA had a positive effect on whale sharks and to a lesser extent on other marine resources; however no particular job opportunity has been created by the declaration of this MPA. Benefits on financial capital have been observed by people working in tourism, whose salaries have increased and for which a raise in the number of tourists has been positive.

There is an opportunity here to support local communities through the creation of jobs related to SAMPA management, particularly in the islands where tourism is low due to lack of infrastructures (i.e. Dhidhdhoo and Fenfushi). When an MPA is seen as an opportunity for improved livelihoods, community support and compliance levels with regulations tend to increase (i.e. Camargo et al., 2009).

5.3.3 SAMPA was considered as a mean to address other environmental problems, including climate change

When asked about major environmental threats in SAMPA, respondents did not limit themselves to problems within the marine protected area but expressed concern over wider issues like climate change and waste disposal. MPAs alone cannot stop climate change but they allow for the implementation of mitigation and adaptation measures through a management plan. As an example, MPAs play a fundamental role in managing human activities, promoting measures to adapt to a changing environment and therefore decreasing the pressure on natural resources (Simard et al., 2016).

SAMPA management plan should be seen as an opportunity to increase social and ecological resilience of marine resources and people living in SAMPA. Other important environmental threats like marine pollution and overfishing could be addressed locally through appropriate measures in the management plan and ultimately improve people's well-being and livelihoods.

"Limited knowledge could be due to the lack of a comprehensive communication strategy and could result in scarce public participation to activities related to SAMPA, as well as in poor compliance when new regulations are implemented."

5.4 Attitudes towards a management plan

People generally had a positive attitude towards management measures, and mentioned strong compliance with future regulations even if certain groups (like fishermen less strongly agreed with certain management measures). We also found that people from local community islands would like to be

more involved in the management of the MPA, although not all groups wanted to be involved equally.

Local community participation in the decision-making and management processes was found to enhance MPAs effectiveness, as well as increase compliance rates (e.g. Mascia, 2003; McClanahan et al., 2005).

5.4.1 The role of people in tourism in supporting SAMPA

People working in tourism generally have a positive attitude towards the declaration of marine protected areas, especially since most tourism activities are non-extractive (and therefore allowed, though with limitations). Approx. 68% of the respondents have observed injured whale sharks, even if only few (27%) had actually witnessed collisions between sharks and boats. Accidental and intentional harassment by swimmers and boats were seen as the primary threat to whale sharks in SAMPA, therefore we found a strong support towards the implementation and enforcement of proper marine wildlife watching rules.

Measures like minimum distance between boats and whale shark, and people and whale shark, as well as maximum speed, maximum number of boats and swimmers per animal, the implementation of a licensing system for whale shark tour operators would all receive large support among this group of stakeholders. Similarly, the need for a ticketing system to financially support the area was not questioned, although various alternatives were suggested.

As reported by most in this group, surveillance and enforcement of regulations will be the most challenging aspects of a management plan. Based on the generally positive attitudes towards management and a management plan, implementing a self-regulatory system where people are able to report violations to the code of conduct and/or alert rangers in case of major issues/repeated episodes of harassment of marine wildlife could be considered.

5.4.2 Unregulated tourism was seen as a major threat to whale sharks

SAMPA declaration was associated with the need to protect whale sharks and regulate the tourism industry. Accidental boat collisions and harassment by swimmers in the water were seen as the main threats to whale sharks by people working in the tourism business as well as people working in other sectors.

A whale shark interaction guideline developed by the Maldives Whale Shark Research Programme and endorsed by EPA exists to address and reduce these threats. Nevertheless, only 26% of the respondents were aware of these guidelines, highlighting again the need for a more comprehensive communication strategy on the MPA.

5.4.3 Considering seasonal closure instead of no-take zones or complete ban of fishery

Commercial fishermen would most likely be the most affected stakeholder group if a management plan was implemented limiting or forbidding extracting activities (Rasheed et al., 2016). A total closure of the fishing grounds in SAMPA would oblige fishermen in SAMPA to move towards other atolls, increasing the travelling distance and expenses. A general consensus was given to seasonal closures of specific areas to allow for fish populations to reproduce. Identifying spawning grounds and closing these to fishery was also seen as acceptable and increasing size of reef fish populations in SAMPA could be included as another goal of the MPA.

5.5 The role of women in SAMPA management and resource use

From our surveys, women in SAMPA were generally poorly informed about the MPA (75% of women participating in this survey did not know about SAMPA, i.e. did not know that SAMPA existed). Women in our survey were mostly unemployed (78% of women in this survey mentioned being unemployed) and were not involved in activities related to whale sharks. Due to their limited knowledge of SAMPA, most female respondents thought that the declaration of the MPA was important but had no clear idea of its potential role to boost the local economy and job creation. Most women that participated in this survey did not see a role for themselves in SAMPA management.

6. CONCLUSION

Declared in 2009, SAMPA was originally created 1) to protect and preserve an important Maldivian aggregation area for the whale shark, 2) to provide a means to promote and ensure the long-term conservation and protection of the South Ari ecosystem, and 3) to generate income for local islands through sustainable tourism, facilitating scientific research projects and fostering community-focused education and conservation initiatives (EPA, 2010). SAMPA borders were formally defined but no management plan has been developed yet. Establishing a management plan for SAMPA now is a great opportunity, not only to expand the original objectives of the MPA but also to include stakeholders' perceptions and opinions in the plan. As part of Project REGENERATE (2017) activities, some management objectives for SAMPA has been proposed, and results from the present report can be used to build on these suggested goals (*Table 11*).

Other recommendations include:

Improving awareness of SAMPA

Broader communication strategies should be implemented regarding SAMPA and future management plan, specifically women and people in jobs not directly related with SAMPA should be informed about the protected area and its potential socio-economic benefits for local communities. The communication strategy should not be limited to general meetings, due to low participation of certain groups (women, unemployed people, etc.), but should include a variety of initiatives to spread awareness on such an important initiative.

SAMPA as an opportunity for all community islands to grow/ improve their livelihoods

With the implementation of a management plan, there is an opportunity to create jobs especially for people in islands where tourism infrastructures are scarce (e.g. Dhidhdhoo). There are also opportunities to create and strengthen local markets, i.e. by supporting local fishery through resorts and guesthouses in the MPA as well as local handicraft.

Addressing wider environmental issues through the MPA management plan

While climate change and marine pollutions are problems that people all around the Maldives are already facing, SAMPA management plan could be designed to include both mitigation and adaptation strategies to help reduce the impact of climate and non-climate stressors.

Setting a global example in managing tourism and wildlife interactions

SAMPA is known worldwide as an important aggregation ground for whale sharks and contrary to most whale shark areas, it is used all year round by juvenile individuals (Rasheed et al., 2016). This is quite exceptional and could provide the Maldivian government with the opportunity to set an example for managing tourism and wildlife interactions. While whale shark interaction guidelines already exist, there is scope to work with local researchers to identify strategies to maximize the experience value for tourists while minimizing stress for whale sharks and other marine species and ecosystems in the area.

Involving people in the management process

Looking at examples from around the world, when users are involved in the management of natural resources, the effectiveness of MPAs and the compliance with regulations is generally higher. Finding a way for people in SAMPA to take part into this process would help spread awareness about the MPA and would encourage a positive attitude towards nature conservation. For example, rangers can be hired locally from community islands surrounding SAMPA and also an advisory committee can be established with representatives from all stakeholder groups where key management decisions on the MPA can be discussed and approved.

Implementing self-regulatory systems

Considering the high rate of approval of a management plan, specifically from people working in tourism, a self-regulatory system could be implemented where tour operators are trained on best practices during whale shark tours and are able to report misconduct from other operators. Self-regulatory systems have proven to be quite successful, even in other sectors like small-scale fisheries and have the advantage to improve people's behavior fearing public shame and reduce partially costs for monitoring and enforcement (Berkes, 2003; Haase et al., 2009).

Management goal for SAMPA [1]	Sub-goal [2]	Stakeholders' opinions and perceptions
To protect and preserve an important Maldivian aggregation area for the whale shark, Rhincodon typus.	N/A	The whale shark is one of the main attractions for tourists visiting SAMPA. Nevertheless, the unregulated tourism is a major issue: too many boats and people are currently in the water at the same time with potentially negative consequences for the health and safety of visitors, sharks and the ecosystem. A code of conduct and guidelines to interact with wildlife (whale sharks in particular) are needed and would be strongly supported by the community, as well as a ticketing/licensing system that would allow only trained operators to lead whale shark expeditions.
To provide a means to promote and ensure the long-term conservation and protection of the South Ari ecosystem.	To maintain the resilience of biological communities to stressors associated with climate change.	There was strong consensus among stakeholders concerning a zoning plan for the area that would ensure that different activities (i.e. fishery, diving and whale shark watching) do not occur at the same time and at the same location. Rota systems were also proposed in addition to geographically separated areas (i.e. fishing activities usually take place in the evening, diving and whale shark watching in the morning). Solid waste and disposal of waste at sea were considered as two major problems affecting marine ecosystems in SAMPA. Stakeholders suggested to have a system of fines for those dumping waste at sea, as well as helping local islands build appropriate solid waste management centers. Dredging operations within or near SAMPA are source of high amounts of sediments known to have negative effects on corals. Ensuring that sediments are trapped and appropriate mitigation measures are used would reduce damage to the coral reef ecosystems in SAMPA.
	To maintain populations of unharvested marine species for tourism, fishery enhancement and scientific purposes.	Stakeholders suggested having rangers stationed at key points of SAMPA. Rangers should be hired locally from community islands surrounding SAMPA. Research initiatives should involve and be shared with local community islands.
To generate income for local islands through sustainable tourism, facilitating scientific research projects and fostering community focused education and conservation initiatives	To generate jobs for local people with tour operators operating inside SAMPA.	Stakeholders suggested having rangers stationed at key points of SAMPA. Rangers should be hired locally from community islands surrounding SAMPA. Research initiatives should involve and be shared with local community islands.
	To generate income for local communities using tourist entry fees for SAMPA.	N/A
To foster marine based tourism, such as snorkelling and SCUBA Diving, at South Ari.		N/A

Table 11. Suggested management goals for SAMPA (Project REGENRATE, 2017) and stakeholders' opinions and perceptions based on results of this study. [1] These are the original management goals proposed by the EPA for SAMPA in 2009; [2] Used to define complex goals more precisely. This in turn helped us translate the goals into objectives.

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ANNEX 1: SAMPA SOCIAL SURVEY QUESTIONNAIRE

Identifying resource dependence and conservation objectives of communities in South Ari Marine protected Area (SAMPA)

This research is a component of the Project REGENERATE, funded by USAID, and implemented by International Union for Conservation of Nature (IUCN) in collaboration with the Government of Maldives. This survey seeks to understand resource use and dependence of local communities, local's conservation targets, perception on resource sustainability and their capacity to manage resources within South Ari Marine Protected Area (SAMPA) as well as their perspectives and attitudes towards the implementation of a management plan in SAMPA.

Answers of this survey will be strictly confidential and will be used for the sole purpose of the research.

Surveyor: _____

Date: _____

Survey Form Number: _____

Island: _____

SECTION ONE: DEMOGRAPHIC DATA

1. (Don't ask, just record) Gender
    a. a. Male
    b. b. Female

2. What is your main job? (Don't read options, single response, note other responses here)
    a. Agriculture and Forestry
    b. Fishing
    c. Manufacturing/Handicraft
    d. Mining and Quarrying
    e. Electric Gas Steam and Air conditioning supply
    f. Water supply, Sewerage waste management and remediation activities
    g. Construction
    h. Whole sale and retail trade
    i. Guesthouse
    j. Dive center
    k. Resort
    l. Public administration and defense
    m. Education
    n. Human health and social work activities
    o. Self employed
    p. unemployed
    q. Other

3. Do you have a second job?
    a. Yes (Go to question 4)
    b. No (Go to question 5)

4. If you answered yes to question 3, what is your second job? (Don't read options, multiple response, note other responses here)
    a. Agriculture and Forestry
    b. Fishing
    c. Manufacturing
    d. Mining and Quarrying

e. Electric Gas Steam and Air conditioning supply
f. Water supply, Sewerage waste management and remediation activities
g. Construction
h. Whole sale and retail trade
i. Guesthouse
j. Dive centers
k. Working at a resort
l. IPublic administration and defense
m. Education
n. Human health and social work activities
o. Self employed
p. Other

5. What is the average income for the above mentioned primary occupation? (Don't read options, single response, note other responses here)
   a. < 2,500 MVR per month;
   b. 2,500 - 5,000 MVR per month;
   c. 5,000 - 7,500 MVR per month;
   d. 7,500 - 10,000 MVR per month;
   e. > 10,000 MVR per month;
   f. Other……

6. How old are you?

……

7. What is the last school class you attended? (Don't read options, single response, note other responses here)
   a. Basic Education
   b. Grade 7
   c. Grade 10
   d. Grade 12
   e. Tertiary Education
   f. Other……

8. How many people are in your household?.....

9. Which members of your family provide in your household?.....

10. You are: (Read options, single response)
   a. Born in this island (Go to question 12)
   b. Living in this island (Go to question 11)
   c. Working in this island (Go to question 11)

11. If you answered 'b', 'c' to question 10, for how long have you been in this island?
   a. Less than one year
   b. More than one year
   c. One to five years
   d. Six to ten years
   e. More than years

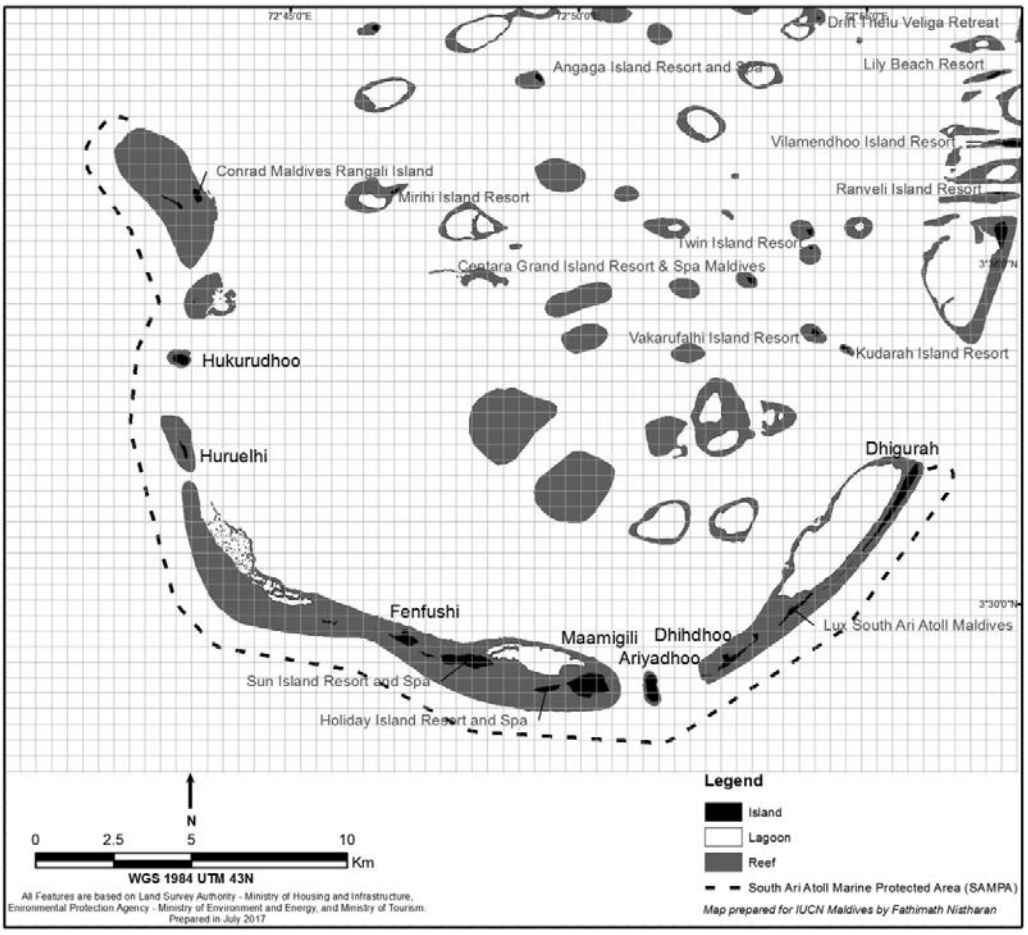
12. Are you involved in any activities related to whale shark tourism?
   a. Yes (Go to question 13)
   b. No (Go to section 2)

13. If you answered yes to question 13, what activities are you involved in?

SECTION 2A: RESOURCE USE AND DEPENDENCE

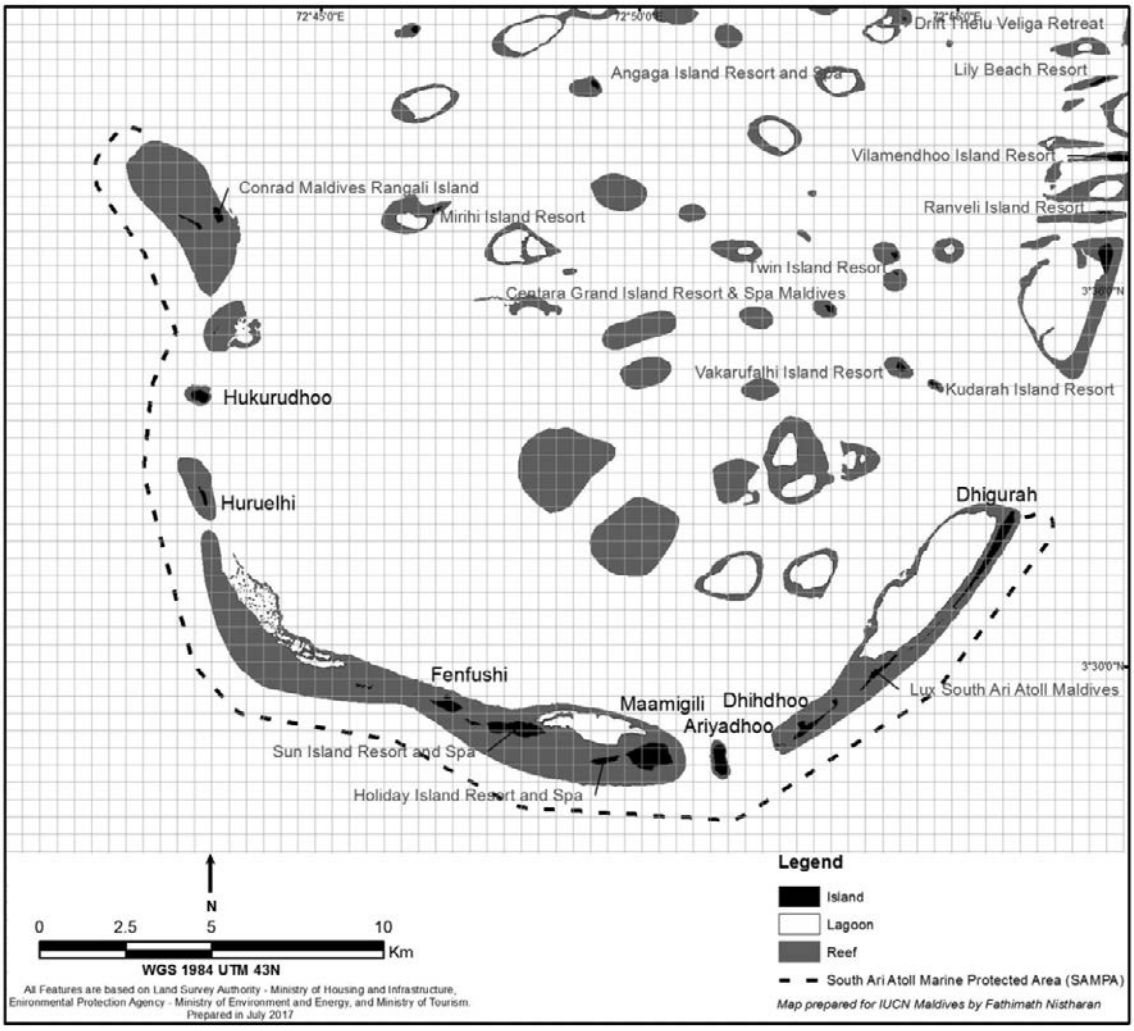
14. Apart from tuna fish, reef fish, coral reef and beach, what of the following can be found on or around your island? (Don't read options, multiple response, mark as many responses as applicable and note other responses here)
    a. Whale sharks
    b. Manta rays
    c. Sea grass patches
    d. Baitfish
    e. Turtles (including eggs)
    f. Sharks
    g. Sea birds
    h. Shells
    i. Palms and trees
    j. Other….

15. Can you mark on this map the current location of the following? (Draw circles around the area and write the respective letter in the circle to show what resources are found there)
    a. Whale sharks
    b. Manta rays
    c. Sea grass patches
    d. Turtles (including eggs)
    e. Sharks
    f. Sea birds
    g. Shells
    h. Other….



16. Can you mark on this map where the following activities currently take place? (Draw circles around the area and write the respective letter in the circle to show what activities take place there)

a. Recreational fishing
b. Swimming, snorkeling and diving for locals
c. Swimming, snorkeling and diving for tourists
d. Whale shark snorkeling
e. Other tourism related
f. Other….



17. What natural resources are important for your income and how frequently do you use it? (Don't read options, multiple responses, mark as many responses applicable and fill in the table. Rank in the order of importance). Mark the applicable response for the frequency in the table)

Resource	Rank (1=most important)	Frequency of use		
	1	2	3	4
a. Reef fish				
b. Tuna fish				
c. Whale shark				
d. Manta rays				
e. Coral reef				
f. Coconut palm				
g. Sea grass patches				
h. Baitfish				
i. Beach				
j. Sand				
k. Wood				
l. turtles				
m. sharks				
n. Sea birds				
o. Shells				
p. Other				
q. Don't know				

Never-1, Rarely-2 (once a month), Frequently-3 (once a week), Daily-4

18. What natural resources are important for your livelihood and how frequently do you use it? (Don't read options, multiple responses, rank in the order of importance). Mark the applicable response for the frequency of use in the table)

Resource	Rank (1=most important)	Frequency of use		
	1	2	3	4
a. Reef fish				
b. Tuna fish				
c. Whale shark				
d. Manta rays				
e. Coral reef				
f. Coconut palm				
g. Sea grass patches				
h. Baitfish				
i. Beach				
j. Sand				
k. Wood				
l. turtles				
m. sharks				
n. Sea birds				
o. Shells				
p. Other				
q. Don't know				

Never-1, Rarely-2 (once a month), Frequently-3 (once a week), Daily-4

19. What natural resources have a traditional value and how frequently do you use it now? (Don't read options, multiple responses, rank in the order of importance). Mark the applicable response for the frequency of use in the table. If it is the same resources as above, no need to ask the frequency)

Resource	Rank (1=most important)	Frequency of use		
	1	2	3	4
a. Reef fish				
b. Tuna fish				
c. Whale shark				
d. Manta rays				
e. Coral reef				
f. Coconut palm				
g. Sea grass patches				
h. Baitfish				
i. Beach				
j. Sand				
k. Wood				
l. turtles				
m. sharks				
n. Sea birds				
o. Shells				
p. Other				
q. Don't know				

Never-1, Rarely-2 (once a month), Frequently-3 (once a week), Daily-4

20. What natural resources have an aesthetic value (generally for attracting tourists)? (Don't read options, multiple responses, rank in the order of importance). Mark the applicable response for the frequency of use in the table. If it is the same resources as above, no need to ask the frequency)

Resource	Rank (1=most important)	Frequency of use		
	1	2	3	4
a. Reef fish				
b. Tuna fish				
c. Whale shark				
d. Manta rays				
e. Coral reef				
f. Coconut palm				
g. Sea grass patches				
h. Baitfish				
i. Beach				
j. Sand				
k. Wood				
l. turtles				
m. sharks				
n. Sea birds				
o. Shells				
p. Other				
q. Don't know				

Never-1, Rarely-2 (once a month), Frequently-3 (once a week), Daily-4

SECTION 2B: RESOURCE USE AND DEPENDENCE IN SAMPA

21. Are you aware that there is a marine protected area in the atoll?
    a. Yes (Go to question 22)
    b. No (Skip remaining questions of 2b, section 3 and section 4. If the respondent is a fisher, go to section 5a, if the respondent is a tourism operator, go to question 5b, otherwise end the survey)

22. What resources can be found in SAMPA? What are the three most important resources amongst these? (Don't read options, multiple responses, rank in the order of importance).

Resource	Resources in SAMPA (Tick all applicable)	Rank (1=most important)
a. Reef fish		
b. Tuna fish		
c. Whale shark		
d. Manta rays		
e. Coral reef		
f. Coconut palm		
g. Sea grass patches		
h. Baitfish		
i. Beach		
j. Sand		
k. Wood		
l. turtles		
m. sharks		
n. Sea birds		
o. Shells		
p. Other		
q. Don't know		

23. Did the SAMPA declaration change the way you used resources?

a. Yes (Go to question 24)

b. No (Go to question 25)

c. Don't know (Go to question 25)

24. If you answered yes to question 21, what of the following were affected by SAMPA declaration? What changed? (Don't read options, tick as applicable next to their response, multiple responses)

Resource	Rank (1=most important)	Frequency of use			
	1	2	3	4	Other
a. Reef fish					
b. Tuna fish					
c. Whale shark					
d. Manta rays					
e. Coral reef					
f. Coconut palm					
g. Sea grass patches					
h. Baitfish					
i. Beach					
j. Sand					
k. Wood					
l. turtles					
m. sharks					
n. Sea birds					
o. Shells					
p. Other					
q. Don't know					

I can't use this resource anymor e- 1, It is forbidden-2, I had to change the zone where I use this -3 resource, I have to ask for permits to use this resourc e-4, Other: specify

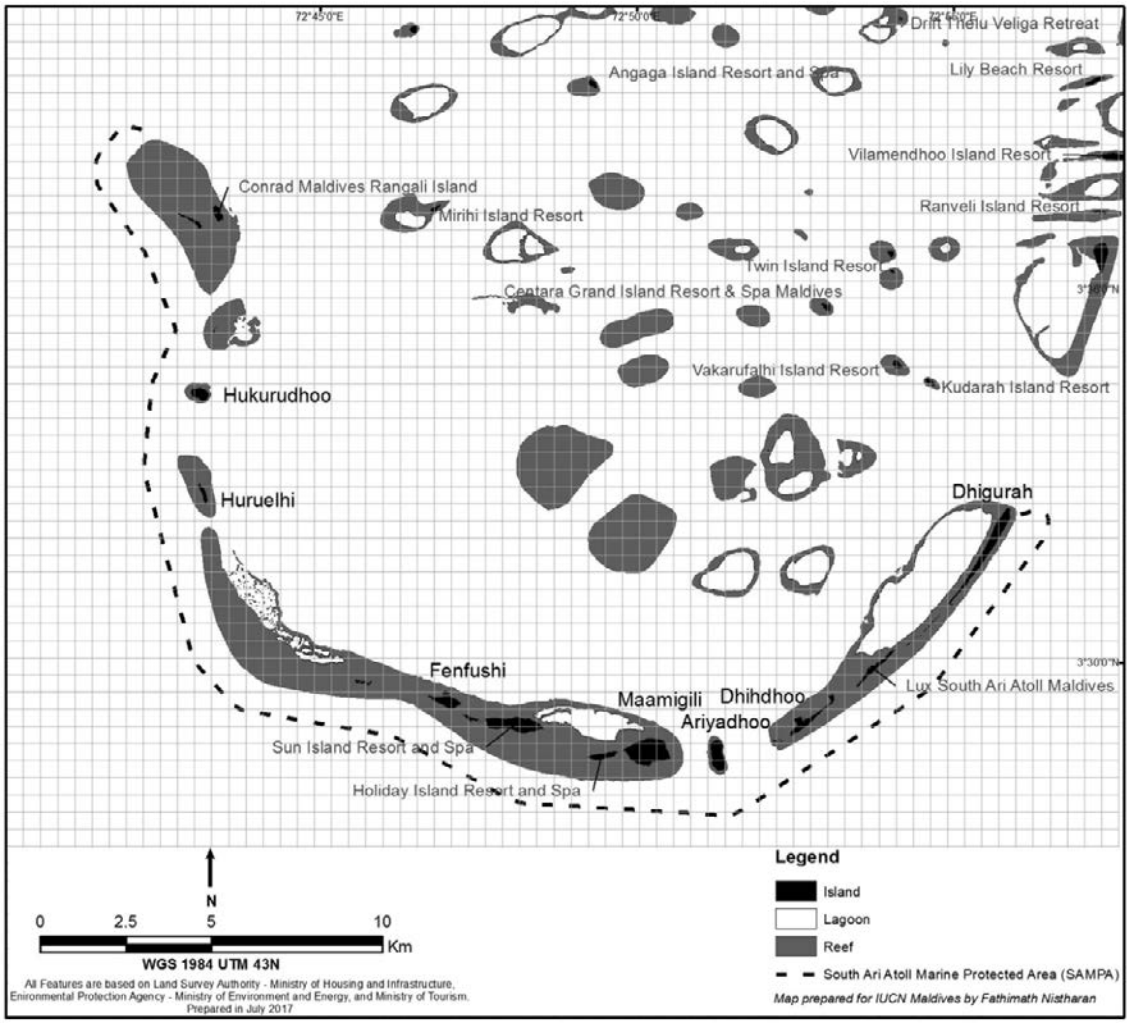
25. Did the SAMPA declaration change the location of available resources?
    a. Yes (Go to question 26)
    b. No (Go to section 27)
    c. Don't know (Go to section 27)

26. Can you mark on this map the location of the following resources before SAMPA? (Draw circles around the area and write the respective letter in the circle to show what resources are found there)
    a. Whale sharks
    b. Manta rays
    c. Sea grass patches
    d. urtles (including eggs)
    e. Sharks
    f. Sea birds
    g. shells
    h. Other….

27. Did the SAMPA declaration change the areas where activities take place?
    a. Yes (Go to question 28)
    b. No (Go to section 3)
    c. Don't know (Go to section 3)

28. Can you mark on this map where the following activities used to take place before SAMPA? (Draw circles around the area and write the respective letter in the circle to show what activities take place there)

a. Recreational fishing
b. Swimming, snorkeling and diving for locals
c. Swimming, snorkeling and diving for tourists
d. Whale shark snorkeling
e. Other tourism related
f. Other….



SECTION THREE. LEVEL OF CONCERN AND INTEREST IN SAMPA

29. Do you think it is important to protect SAMPA? (Don't read options, single response, tick as applicable)

a. Not important

b. Somewhat important

c. mportant

d. Very important

30. What are the main threats to SAMPA? (Don't read options, do not give examples, multiple responses, rank three responses in the order of importance)

Threat	Rank (1=most important)
a. Marine pollutants	
b. Climate change	
c. Overfishing	
d. Dredging and reclamation in near by areas	
e. Increasing number of vessels in the area	
f. Boat strike on mega fauna	
g. Sand pumping in nearby resorts	
h. Loss of herbivore fishes	
i. Other	
j. Don't know	

31. I am going to read out a list of statements about SAMPA, can you tell me how much you agree or disagree to these statements? (tick as applicable)

Statement	1	2	3	4	0
SAMPA has created job opportunities for people in the local communities					
SAMPA is important for marine life					
The natural resources in SAMPA are doing better since SAMPA was declared					
The whale sharks need to be protected					

Strongly disagree-1, Disagree-2, Agree- 3, Strongly agree- 4, Don't know- 0

32. Since SAMPA was declared my income has (Single response, tick as applicable)

a. Decreased

b. Increased

c. Not changed

33. Is there a local organization that deals with resource management in SAMPA?

a. Yes (Go to question 34)

b. No (Go to section 4)

c. don't know (Go to section 4)

34. If you answered yes to question 33, are you involved in this organisation? (Single response, tick as applicable)

a. Never

b. Rarely

c. Frequently

d. Always

SECTION FOUR. ATTITUDE AND PERCEPTION TOWARDS SAMPA

Now a few questions about attitude and perception towards SAMPA.

35. Are you aware of any guideline on management of resources inside SAMPA (E.g. Maldivian Whale shark interaction guideline)?
    a. Yes (Go to question 36)
    b. No (Go to question 37)
    c. Don't know (Go to question 37)

36. If you answered yes to question 35, please rate your compliance level on these (Single response, tick as applicable)
    a. No compliance
    b. Sometimes
    c. Always
    d. Not applicable

37. I am going to read out few statements about SAMPA management, can you tell me how much you agree or disagree to these statements? (tick as applicable)

Statement 37	Strongly disagree (1)	Disagree (2)	Agree (3)	Strongly Agree (4)	Don't know (0)
a. It is important to have a management plan in SAMPA					
b. I would support new regulations in SAMPA					
c. In the management of SAMPA, one idea is to include zonation (establishing specific areas for specific users) of SAMPA. In this zoning, a no-take zone for the replenishment of marine organisms and corals might be established. Do you think establishing a no-take zone area is appropriate inside SAMPA?					
d. Allocating different zones for different activities will reduce conflicts					
e. SAMPA should be directly managed by the government					
f. Community members should be involved in the management of SAMPA					

Strongly disagree (1), Disagree (2), Agree (3), Strongly Agree (4), Don't know (0)

38. Are there management measures inside SAMPA that are already taken by the locals as a community to protect natural resources such as coral reefs?
    a. Yes (Go to question 39)
    b. No (Go to question 40)
    c. Don't know (Go to question 40)

39. If you answered yes to question 38, list the measures you know of…….

40. SAMPA should have a steering committee to take management and monitoring decisions (Single response, tick as applicable)
    a. Strongly disagree
    b. Disagree
    c. Agree
    d. Strongly Agree

SECTION FIVE: RESOURCE USER GROUPS (FISHERS AND TOURISM OPERATORS)

Section 5a: For Fishers only

41. How long have you been involved in Fisheries? (years) ----------

42. What type of fishing are you involved in? (Multiple response)

- a. General reef fishery
- b. Grouper fishery
- c. Tuna fishery
- d. Other (ask to specify)

43. What type of gears do you use? (Tick as applicable, multiple response)

Gear	General reef fishery	Grouper fishery	Tuna fishery	Other
a. Lift net				
b. SCUBA gear				
c. Drop line				
d. Handline				
e. Longline				
f. Rod and Reel				
g. Spear				
h. Cast nets				
i. Pole and line				
j. Trolling				
k. kJigging				
l. lother				

44. Do you own a fishing vessel?

- a. Yes (Go to question 46)
- b. No (Go to question 47)

45. If you answered yes to question 45,

- a. What is the number of crew in the vessel?.....
- b. What is the type / size of the engine? (hosepower).....
- c. An estimate of expenditure for the maintenance of engine and the boat per year (MVR)……
- d. An estimate of the expenditure for the fishing gears per month (MVR)……
- e. An estimate of the expenditure for food and other incidentals per trip (MVR)……

46. On average, how many fishing trips do you undertake per month? ……..

47. On average, how many fishing trips are carried out in SAMPA?.....

48. How much petrol/diesel is spent for a fishing trip? (in litres) …….

49. On average, how much time is spent for a single fishing trip (hrs)? …….

50. On average, how much time is spent at the fishing ground(s) in a single fishing trip? (hrs)?.....

51. I fish for: (Multiple responses, tick as applicable)

a. Commercial purposes
b. Recreational purposes
c. Subsistence purposes
d. Other [ask to specify]

52. I sell my catch to: (Don't give options, multiple responses, tick as applicable)

a. Resorts
b. Export companies
c. Households and local markets
d. Processing factory
e. Middleman
f. Other….

53. What is the selling price of the fish (price/kg) (MVR)?.....

54. Do fishers from other atolls come to SAMPA region for fishing?

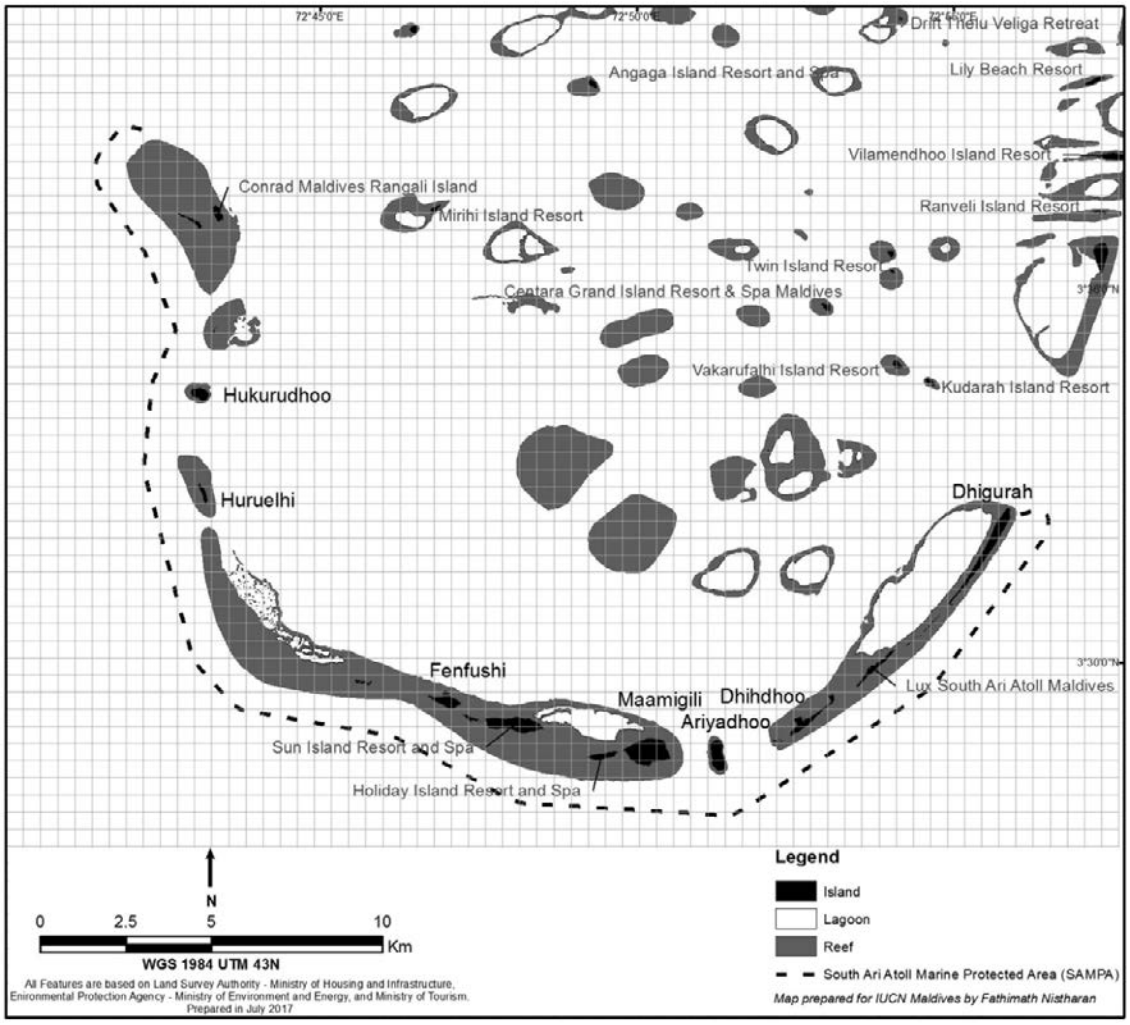
a. Yes (Go to question 56)
b. No (Go to question 58)
c. I don't know (Go to question 58)

55. If you answered yes to question 55, please list down the atoll (Multiple response, do not read options, tick as applicable)

a. Haa Alifu Atoll
b. Haa Dhaalu Atoll
c. Shaviyani Atoll
d. Noonu Atoll
e. Raa Atoll
f. Baa Atoll
g. Lhaviyani Atoll
h. Kaafu Atoll
i. Alifu Alifu Atoll
j. Vaavu Atoll
k. Meemu Atoll
l. Faafu Atoll
m. Dhaalu Atoll
n. Thaa Atoll
o. Laamu Atoll
p. Gaafu Alifu Atoll
q. Gaafu Dhaalu Atoll
r. Gnaviyani Atoll
s. Seenu Atoll
t. Don't know

56. Please use the South Ari map to identify the areas where fishers from other atolls usually harvest fish (Draw circles around the areas and write the respective letter for the atoll in the circle).

a. Haa Alifu Atoll
b. Haa Dhaalu Atoll
c. Shaviyani Atoll
d. Noonu Atoll
e. Raa Atoll
f. Baa Atoll
g. Lhaviyani Atoll
h. Kaafu Atoll
i. Alifu Alifu Atoll
j. Vaavu Atoll
k. Meemu Atoll
l. Faafu Atoll
m. Dhaalu Atoll
n. Thaa Atoll
o. Laamu Atoll
p. Gaafu Alifu Atoll
q. Gaafu Dhaalu Atoll
r. Gnaviyani Atoll
s. Seenu Atoll



57. Do you ever find non-targeted species in your catch?

a. Yes (Go to question 59)

b. No (Go to question 61)

58. If you answered yes to question 58, what species do you find and how often do you find non-targeted species?

Species	Frequency		
	1	2	3
a. Turtles			
b. Sharks			
c. Whale sharks			
d. Dolphins			
e. Manta rays			
f. Napoleon Wrasse			
g. Parrot fish			
h. Surgeon fish			
i. Other			

Rarely-1 (once a year),Frequently-2 (more than once a month),Always-3 (two to three times a week)

59. What do you do normally with the non-targeted species?..... (Don't read option, multiple response, tick as applicable and note other options here)

a. I release it

b. use it for consumption

c. I sell it

d. Other

60. Have you ever seen an injured whale shark?

a. Yes

b. No

61. Have you ever seen a moving boat inside SAMPA make accidental contact with a whale shark?

a. Yes (Go to question 63)

b. No (Go to question 65)

62. If you answered yes question 62, how often? (Single response)

a. Once in last five years

b. Once a year

c. Twice a year

d. Every other month

e. Once a month

f. Other

63. If you answered yes to question 62, is it usually inside SAMPA or outside SAMPA?

a. nside

b. Outside

64. Do you use live bait?

a. Yes (Go to question 66)

b. No (If a reef fisher, go to question 72, if not, end the survey)

For live bait users only

65. If you answered yes to question 65, what is the most common species harvested and what type of gear is used to harvest live bait? (Don't give options, multiple responses, tick as applicable)

Live bait	Lift nets	Using lights	SCUBA	Other
a. Silver sprat (Rehi)				
b. Cardinal fish (Boadhi)				
c. Fusiliers (Muguran) (Caesionidae)				
d. Fusiliers (Garahitha Muguraan) (Pterocaesio tile)				
e. Anchovy (Miyaren)				
f. Indian Mackerel (Karaverimas)				
g. Bigeye scad (Mushimas)				
h. Round scad (Rimmas)				
i. Silverside (Thaavalha)				
j. Redtooth triggerfish (Vaalan Rondu)				
k. Blue-green damsel (Nilamehi)				
l. n.Others (please specify)				

66. How much time is spent for live bait harvesting (excluding the travel time) (hrs)? .....

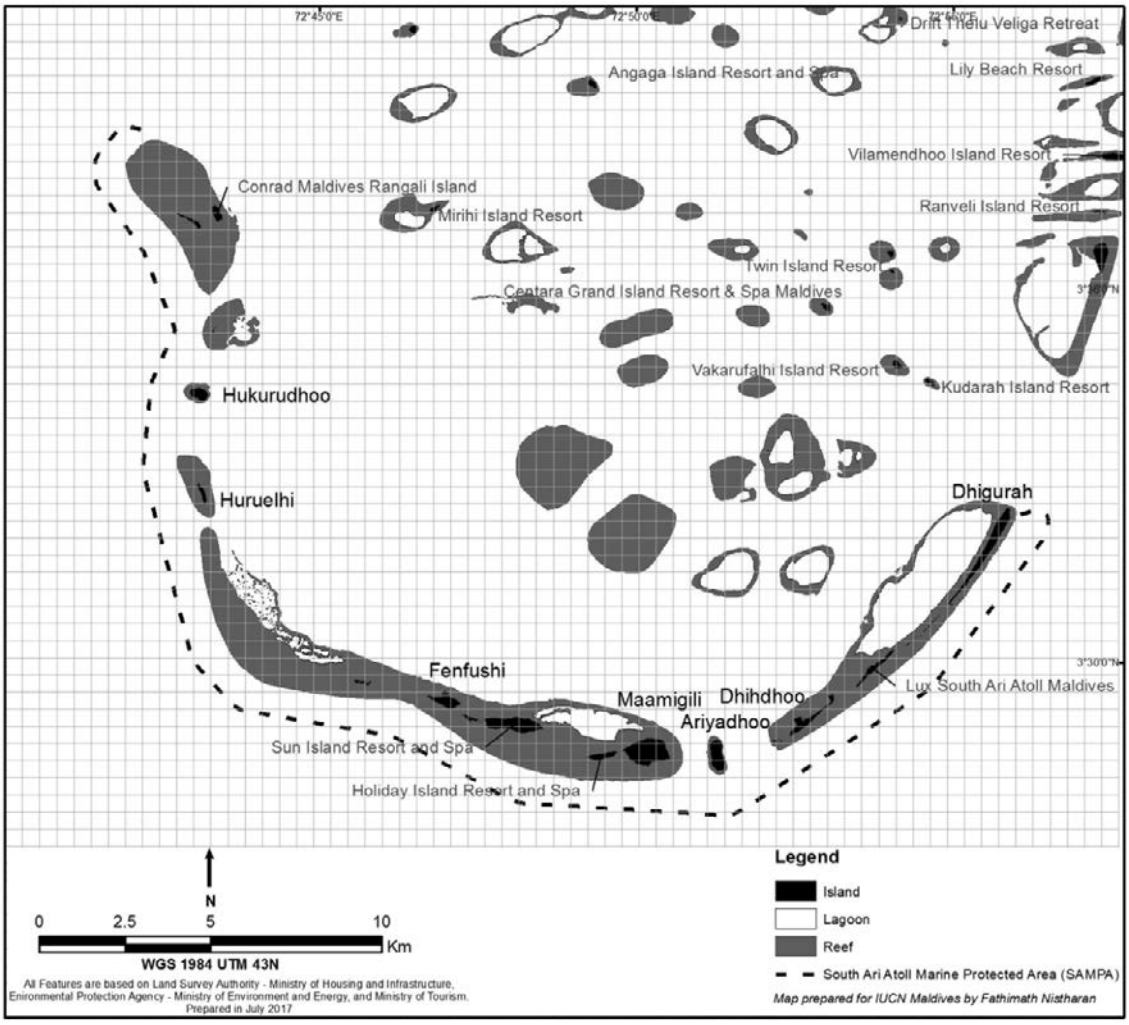
67. Please use the South Ari map to identify the areas where you harvest live bait (Draw circles around the areas and write the respective letter in the circle. In each circle also indicate top three species that they target from the area)

a. Every day

b. Once a month

c. Every other month

d. Twice a year



Go to question 69 for people who have been involved in live bait fishing for 10 or more years. For reef fishers, go to question 72, end the survey for others.

68. Live bait over the past 10 years has:

a. ncreased (Go to question 70)

b. Decreased (Go to question 70)

c. No change (For reef fishers, go to question 72, end the survey for others)

69. What could be the reasons for the change you mentioned in question 69?.....

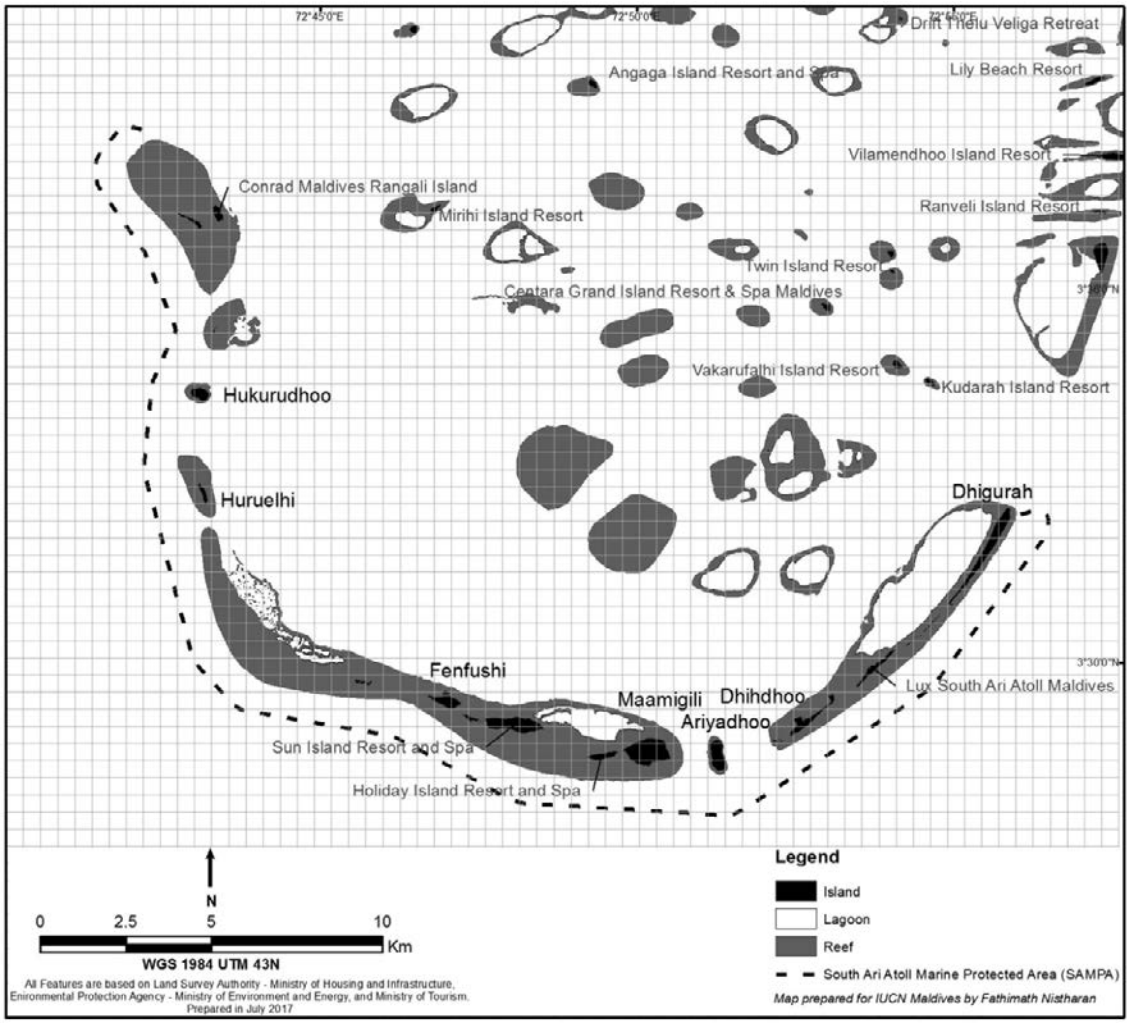
70. Please use the South Ari map to identify the areas where you harvest live bait 10 years ago if it changed (Draw circles around the areas and write the respective letter in the circle. In each circle also indicate top three species that they target from the area. For people who have not been involved in fishing for ten years, mark it as N/A)

a. Every day

b. Once a month

c. Every other month

d. Twice a year



Go to question 72 for reef fishers, for people in working in tourism industry, go to question 80 and for others, end the survey

For Reef fishers only

71. What are the most commonly caught reef fish species? (Don't give options, multiple responses, tick as applicable)

a. Grouper
b. Red snapper
c. Humpback red snapper
d. Emperors
e. Green job fish
f. Jacks and trevallis
g. Rainbow runner
h. Barracuda
i. Waahoo
j. Others (Please specify)

72. How frequently do you catch herbivorous fishes? (Single option)

a. Never
b. Rarely (once a year)
c. Sometimes (more than once a month)
d. Very common (two to three times a week)

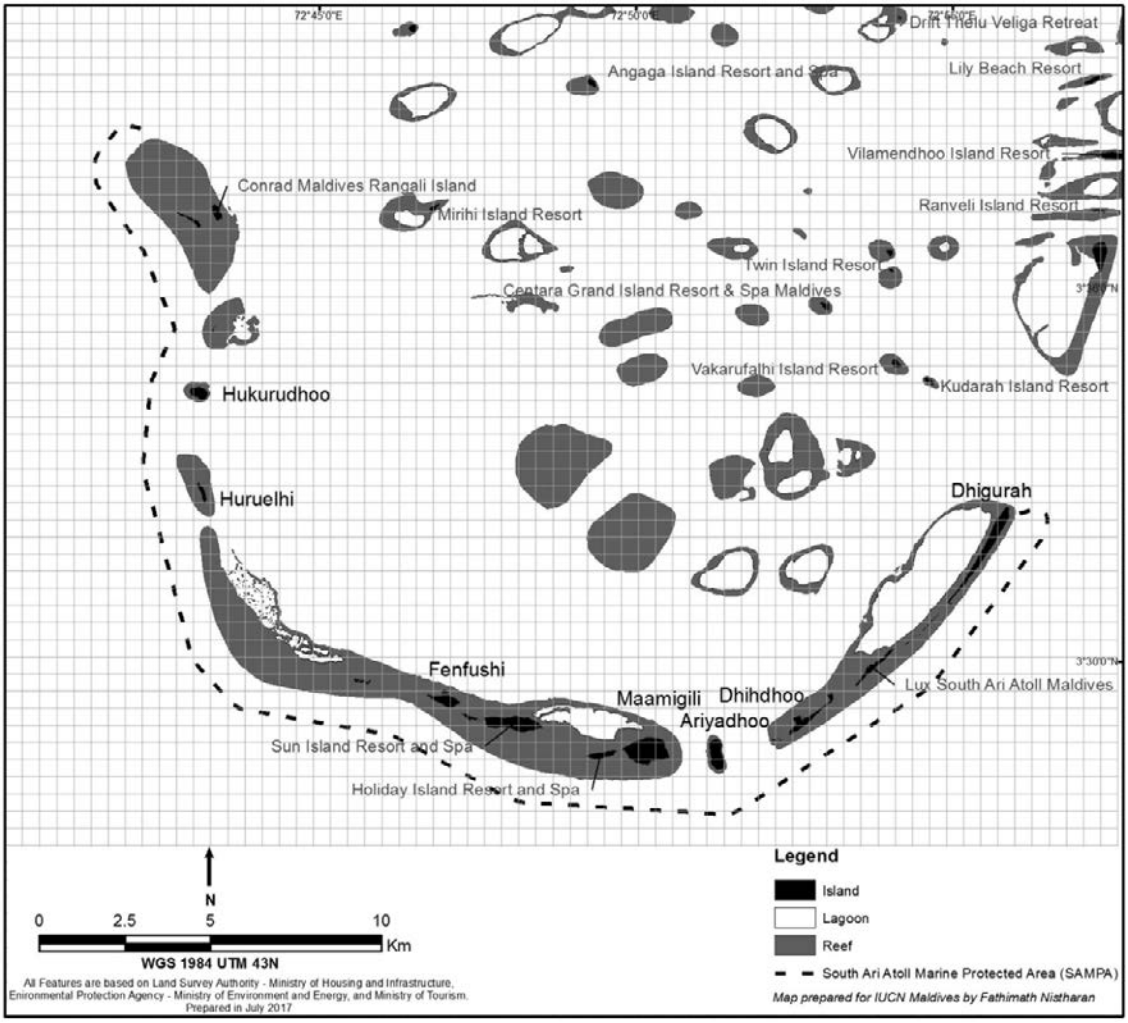
73. Please use the South Ari map to identify the areas where you harvest reef fish (Draw circles around the areas and write the respective letter in the circle. In each circle also indicate top three species that they target from the area)

a. Every day

b. Once a month

c. Every other month

d. Twice a year



Continue the survey for people who have been involved in reef fishing for 10 or more years, for people in working tourism industry, go to question 80, for others, end the survey.

74. Reef fishery over the past 10 years has:

a. Increased (Go to question 76)

b. Decreased (Go to question 76)

c. No change (Go to question 77)

75. What could be the reason for the change you mention in 76?.....

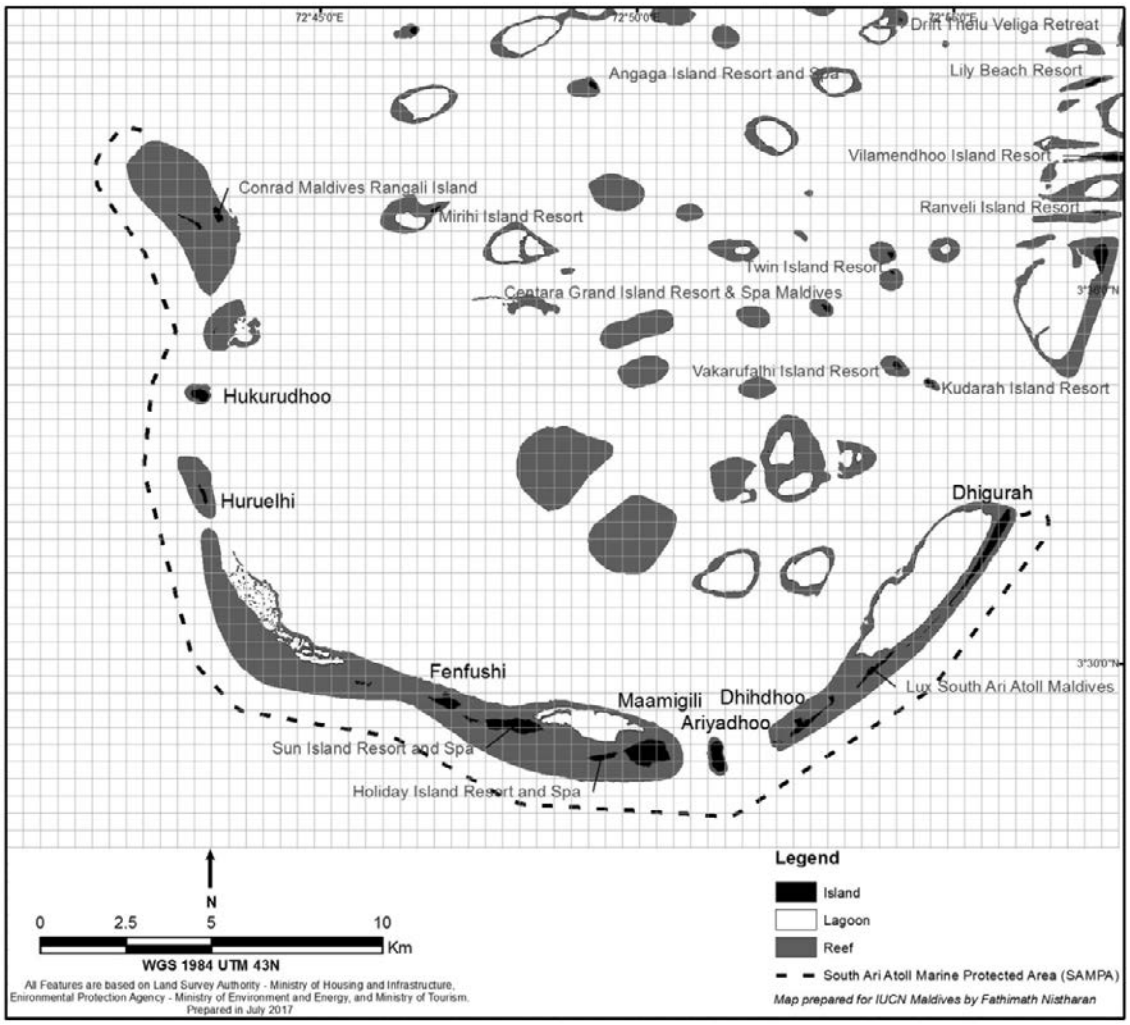
76. Please use the South Ari map to identify the areas where you harvest reef fish 10 years ago if it changed (Draw circles around the areas and write the respective letter in the circle. In each circle also indicate top three species that they target from the area)

a. Every day (17-20)

a. Once a month (13-16)

a. Every other month (9 – 12)

a. Twice a year (4-8)



77. Coral reef fish species size over the past 10 years has

a. Decrease in the size of the fishes (Go to question 79)

b. Increase in the size of the fishes (Go to question 79)

c. No change in the size of the fishes (End the survey for fishers, go to section 5b for people working in tourism)

78. What could be the reason for the change you mentioned in question 76?..... (End the survey for fishers, go to section 5b for people working in tourism)

Section 5b: For people working in tourism

79. How would you describe the change in tourist arrivals since SAMPA was declared? (Single response)
    a. Significantly decreased
    b. Decreased
    c. Increased
    d. Significantly increased
    e. No change

80. Have you ever seen an injured whale shark?
    a. Yes
    b. No

81. Are whale shark population under significant threat in SAMPA?
    a. Yes (Go to question 83)
    b. No (Go to question 84)
    c. Don't know (Go to question 84)

82. If you answered yes to question 82, what are the main threats to whale sharks in SAMPA? (Don't read options, do not give examples, multiple responses, rank three responses in the order of importance)

Threat	Rank (1=biggest threat)
a. Accidental interference by swimmers or vessels	
b. Intentional harassment by swimmers or vessels	
c. Boat strike by vessels	
d. Noise from vessels	
e. Pollution and marine debris	
f. Climate change	
g. Caught in fishing gears	
h. Too many vessels in the close proximity to whale sharks	
i. Other	

83. Have you ever seen a moving boat inside SAMPA make accidental contact with a whale shark?
    a. Yes (Go to question 85)
    b. No (Go to question 86)

84. If you answered yes question 88, how often? (Single response)
    a. Once in last five years
    b. Once a year
    c. Twice a year
    d. Every other month
    e. Once a month
    f. Two to three times a month
    g. Other

85. I am going to read out few statements, can you tell me how much you agree or disagree to these statements? (tick as applicable)

Statement 85	1	2	3	4	0
a. It is important to regulate the vessel speed in the whale shark contact zone					
b. There should be a maximum number of vessels allowed inside SAMPA at a given time					
c. There should be a minimum separation distance between the whale shark and the vessel					
d. There should be a minimum separation distance between people and whale sharks					
e. Whale shark tourism vessels should remain 500m off the reef when searching for whale sharks					
f. Licensing mechanism for tourist operators should in be in place to use SAMPA					

Strongly disagree (1), Disagree (2), Agree (3), Strongly Agree (4), Don't know (0)

86. What do you think are the most appropriate financing mechanisms for whale shark conservation? (Don't read options, multiple responses, rank three responses in the order of importance)

Financing mechanism	Rank (1=most appropriate)
a. Ticketing system	
b. Licensing for tourist operators	
c. A conservation trust fund contributed by partners annually	
d. Other	
e. don't know	

87. What will be the challenges in terms of assessing compliance? (Don't read options, multiple responses, rank three responses in the order of importance)

Challenges 87	Rank (1=biggest challenge)
a. Surveillance of vessel speed activities (e.g. whether they adhere to the speed limit allowed and follows the code of conduct)	
b. Ensuring that swimmers follow the interaction guideline	
c. Make sure that boat operators respect the maximum number of vessels allowed around a whale shark	
d. Make sure that boats and swimmers respect minimum distances from whale sharks	
e. Make sure that boats and swimmers respect the maximum allowed interaction time and give space to others to enjoy the whale sharks	
f. Other	
g. I don't know	

ANNEX 2: QUESTIONS FOR FISHERMEN AND PEOPLE WORKING IN TOURISM INDUSTRY

Stakeholder Annex 2	Questions
Fishers	1. How did the declaration of SAMPA affect you?
	2. How did you modify your fishing grounds after the declaration?
	3. What are the problems you are facing within this area? What are potential solutions?
	4. How would a no-take zone affect your livelihood?
	5. If a no-take zone is established, how would you modify your current fishing grounds, i.e. how far will you travel?
	6. What areas would you propose for limited fishing?
	7. How often do you interact with whale sharks or any other megafauna?
	8. Have you ever encountered an injured whale shark?
	9. How do fish prices differ for resorts and local markets?
	10. How much fish do you sell to resorts vs. local markets?
	11. How many resorts work with each island? Is there any sort of agreement?
	12. How do recreational fishery affect commercial fishery?
People working in tourism industry	1. 1.Are you aware of a code of conduct for whale shark tourism or whale shark interaction guideline in SAMPA?
	2. Do you think everybody follows the CoC and what are the challenges you face in following the Coc?
	3. What would you say the percentage of compliance is during a regular / busy / low day?
	4. What are the problems you are facing within this area? What are potential solutions?
	5. In your opinion, what are the main threats to whale sharks in SAMPA?
	6. What do you see as important management measures to reduce risks to whale sharks?
	7. In your opinion, what kind of enforcement does SAMPA need? Do you think having rangers is important? If so, what specific locations would you suggest them to be at?
	8. What do you think are the most suitable financial options for SAMPA?
	9. What do you think about a ticketing/licensing system? How much are you willing to pay, and who should pay?
	10. How often do you go recreational fishing or night fishing with guests? How many times per week and how many guests usually undertake this activity in a week? What are the most common species caught? What do you do with the fishes that you catch?

ANNEX 3: PARTICIPANT LIST-SAMPA FOCUS GROUP DISCUSSIONS

Focus group discussion in SAMPA
3 October 2017
ADh. Maamigili

#	Name	Gender	Age	Profession	Contact	Email	Signature
1	[illegible] Mohamed	Male	25	Tourism/Hotel [illegible]	[illegible]	[illegible]@gmail.[illegible]	
2	[illegible]	Male	41	[illegible]	9955228	[illegible]@gmail.com	
3	[illegible]	MALE	32	Sales [illegible]	[illegible]	[illegible]	
4	[illegible] Mohamed	MALE	34	CATERING	[illegible]	[illegible]@gmail.[illegible]	
5	AHMED [illegible]	MALE	33	Manager - [illegible]	[illegible]	[illegible]	
6	Shihan Mohamed	Male	32	COUNCIL (VP)	7770075	Shihanmohamed.[illegible]@gmail.com	
7	Mohamed [illegible]	male	27	council	[illegible]	[illegible]@gmail.[illegible]	
8	Mohamed Ali	Male	57	manager [illegible]	[illegible]	[illegible]@gmail.[illegible]	
9							
10	06/10/2017						
11							
12	Ali [illegible]	MALE	81	[illegible]	[illegible]	[illegible]@gmail.com	
13	[illegible]	MALE	43	Council	[illegible]		
14	[illegible]	Male	51	[illegible]	[illegible]		
15	[illegible] Mohamed	Male	30	Council	[illegible]	Shihanmohamed.[illegible]@gmail.com	
16							
17							
18							
19							
20							

Focus group discussion in SAMPA
4 October 2017
ADh. Fenfushi

#	Name	Gender	Age	Profession	Contact	Email	Signature
1	[illegible] A [illegible]	M	[illegible]	Councillor	[illegible]		
2	[illegible] Ali	M	27	"	[illegible]		
3	Mohamed Ibrahim	M		"	[illegible]		
4							
5	Ahmed Mohamed	M	35		7955263		
6	Yoosuf Ibrahim	M	36	A. Director	[illegible]	fenfushi@gmail.com	
7	[illegible] Ahmed	M	54	[illegible] Officer	[illegible]		
8	Rizwan Ismail	M	20		[illegible]	rizwan9999@gmail.com	
9	Ahmed [illegible]	M	[illegible]		[illegible]	ahmed.[illegible]@gmail.com	
10	Qasim Ali	M	60	Fisherman	[illegible]		
11	[illegible] Abdulsamad	M	39		[illegible]		
12							
13							
14							
15							
16							
17							
18							
19							
20							

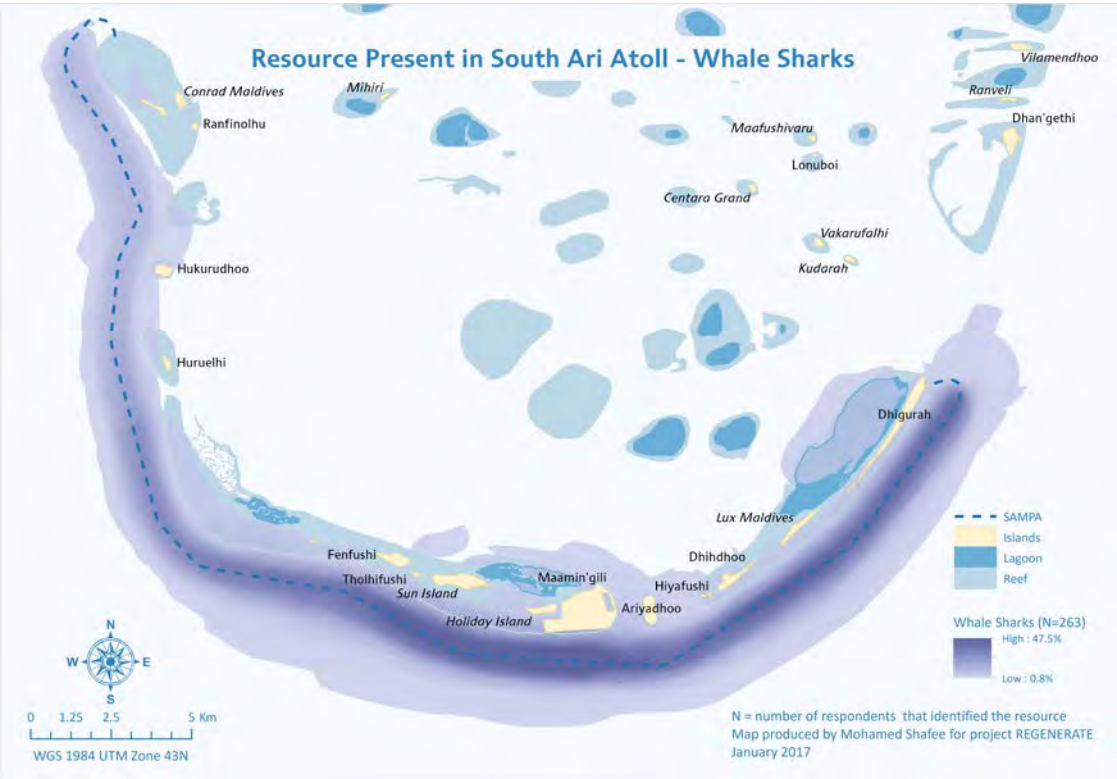
Focus group discussion in SAMPA
5 October 2017
ADh. Dhidhoo

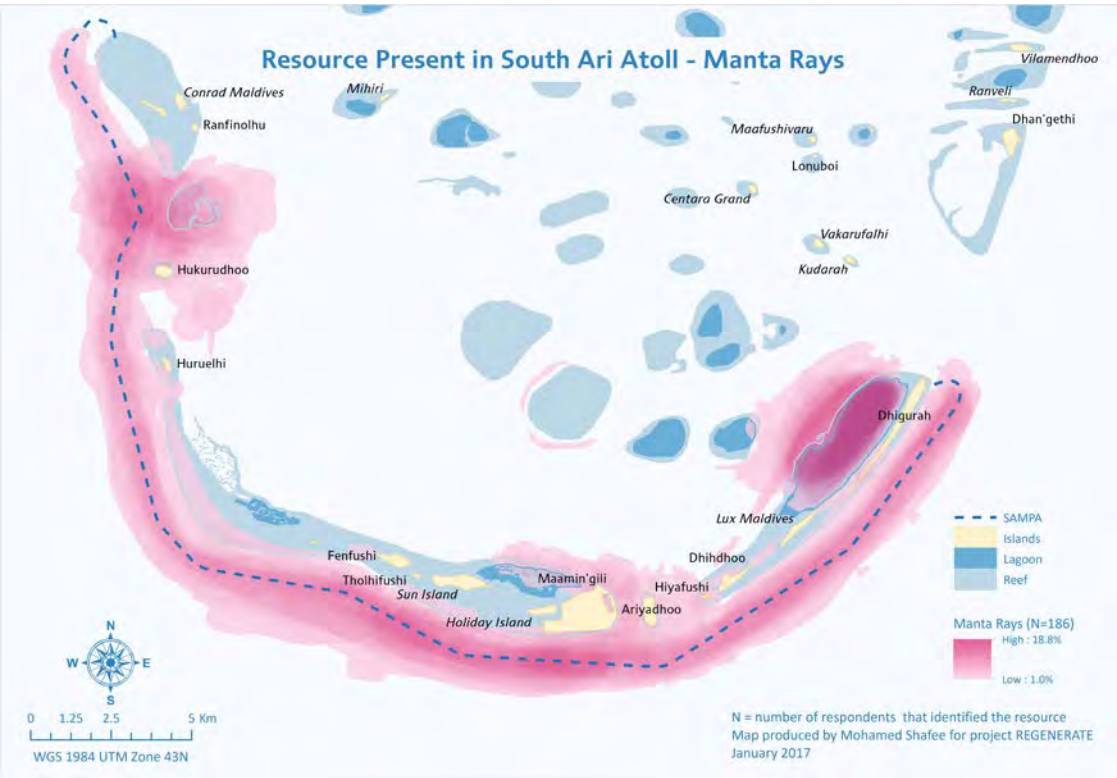
#	Name	Gender	Age	Profession	Contact	Email	Signature
1	Ahmed Abdulla	M	31	Fisher man	7895010	–	[illegible]
2	Ibrahim Hussain	M	42	”	7961895	–	[illegible]
3	Mohamed Adam	M	52	”	–	–	[illegible]
4	Rilwan Mohamed	M	30	”	7878961	–	[illegible]
5	Abdul Azeez Ibrahim	M	55	”	–	–	[illegible]
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

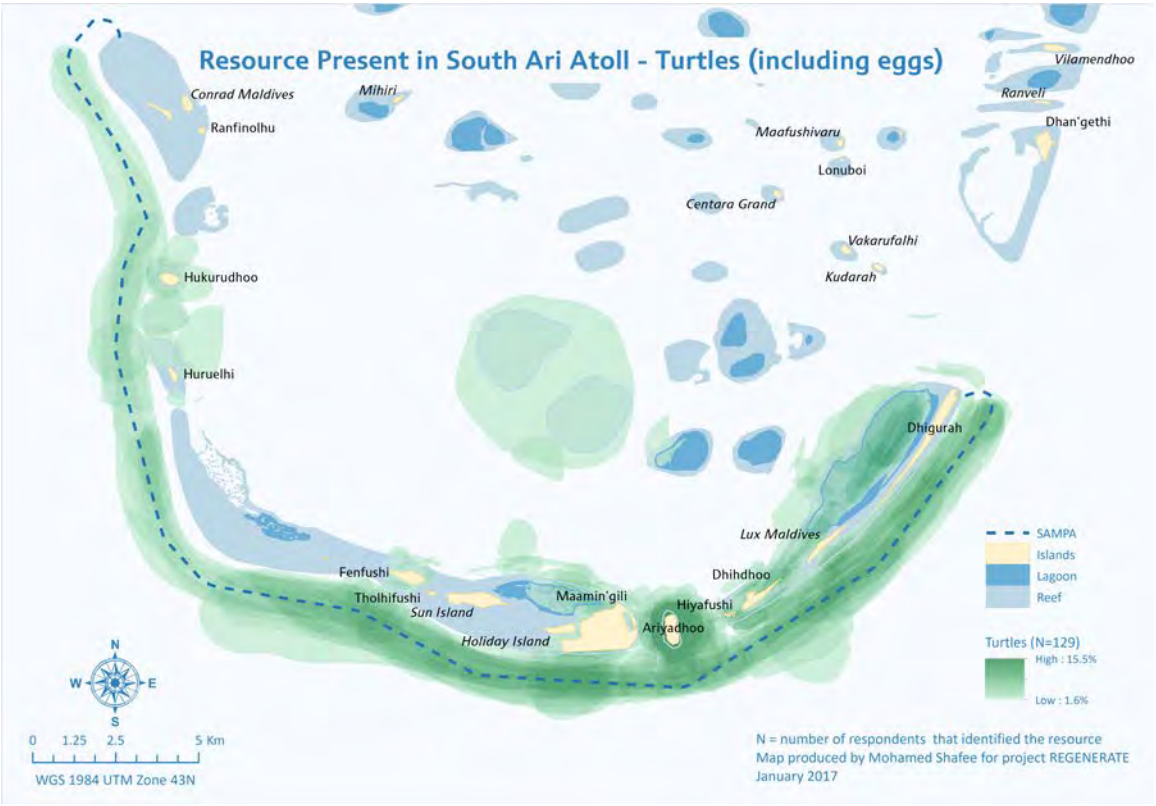
Focus group discussion in SAMPA
5 October 2017
ADh. Dhigurah

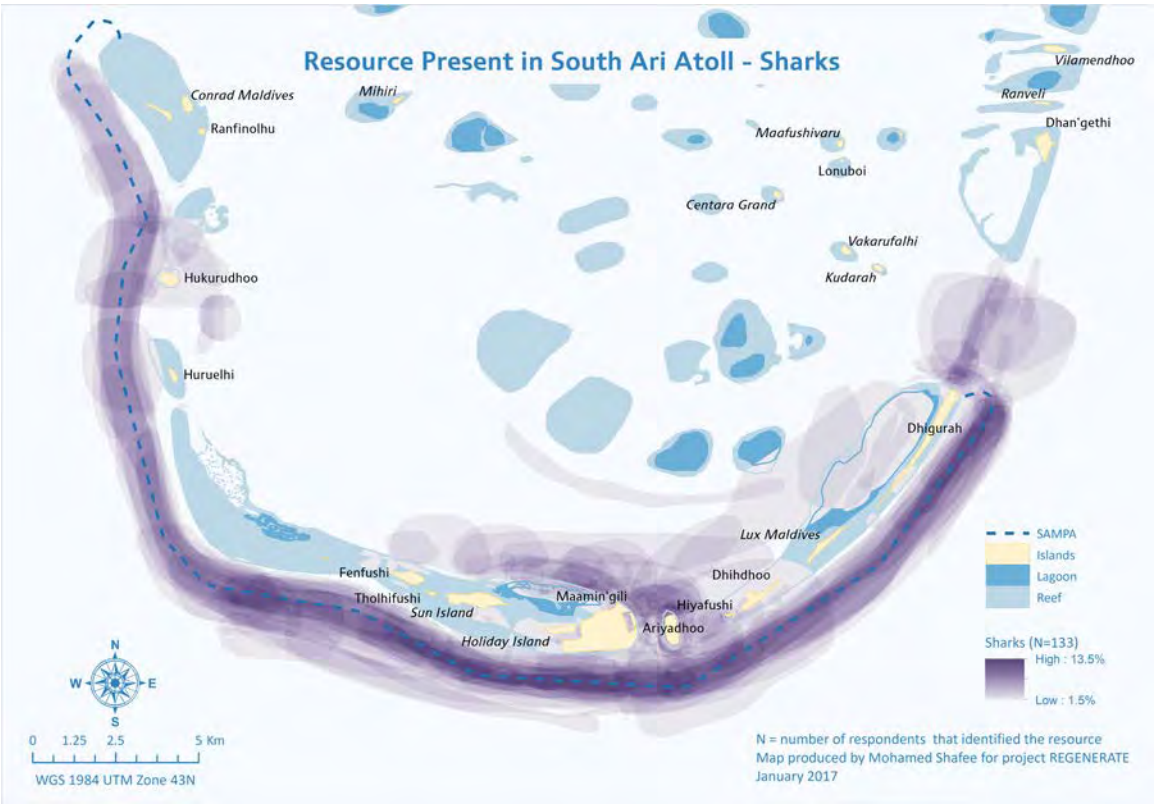
#	Name	Gender	Age	Profession	Contact	Email	Signature
1	ADAM SOLIH		57	[illegible]	7858723		[illegible]
2	[illegible]		43	[illegible]	[illegible]		[illegible]
3	[illegible]		44	[illegible]	[illegible]		[illegible]
4	Abdul Hanaan Hussain		51	[illegible]	7570951		[illegible]
5	[illegible]		49	[illegible]	[illegible]		[illegible]
6	Ahmed [illegible]		34	[illegible]	[illegible]		[illegible]
7	Sunnee Mohamed		19	Diving	[illegible]	[illegible]	[illegible]
8	[illegible]		53	[illegible]	[illegible]		[illegible]
9	[illegible]		65	[illegible]	[illegible]		[illegible]
10	[illegible]		60	[illegible]	[illegible]		[illegible]
11	[illegible]			[illegible]	[illegible]		[illegible]
12							
13	Mohamed Usman		30	Guest house	9646609		[illegible]
14	Ali Sobah		66	diver	7911295		[illegible]
15	Abdul Nashid		69		[illegible]		[illegible]
16	Ali Naju		28	Diving	[illegible]		[illegible]
17	Afzal Adam		32	council Mem.	9799643		[illegible]
18	Ilyas Ibrahim		41	General Manager	[illegible]	[illegible]	[illegible]
19	Ahmed Faiz		45	Manager	[illegible]	[illegible]@gmail.com	[illegible]
20	Ibrahim Adam		38	council	[illegible]	[illegible]	[illegible]
21	Mohamed Shiyadhan	M	26	Councilor	7659219		[illegible]
22	Ibrahim Ali	M	30	Manager	[illegible]		
23							
24							
25							

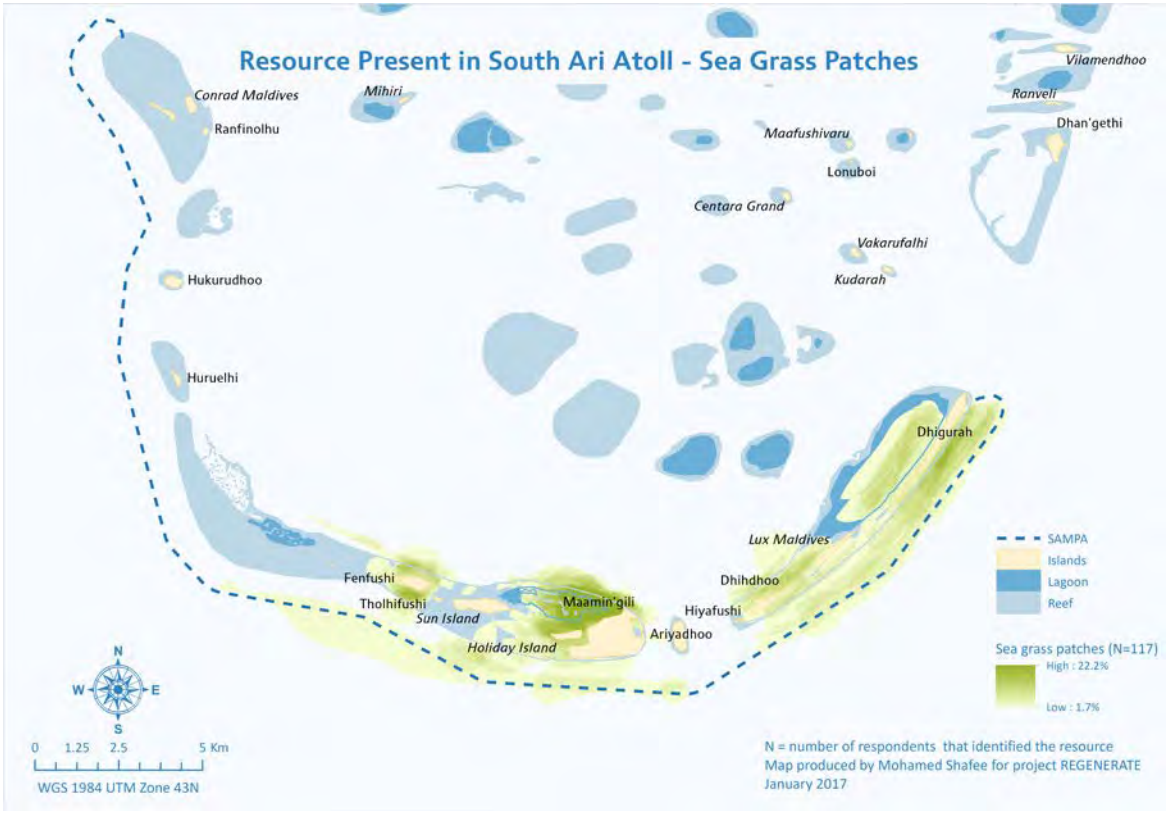
ANNEX 4: RESOURCES FOUND AROUND SAMPA AND ACTIVITIES THAT TAKE PLACE AROUND SAMPA

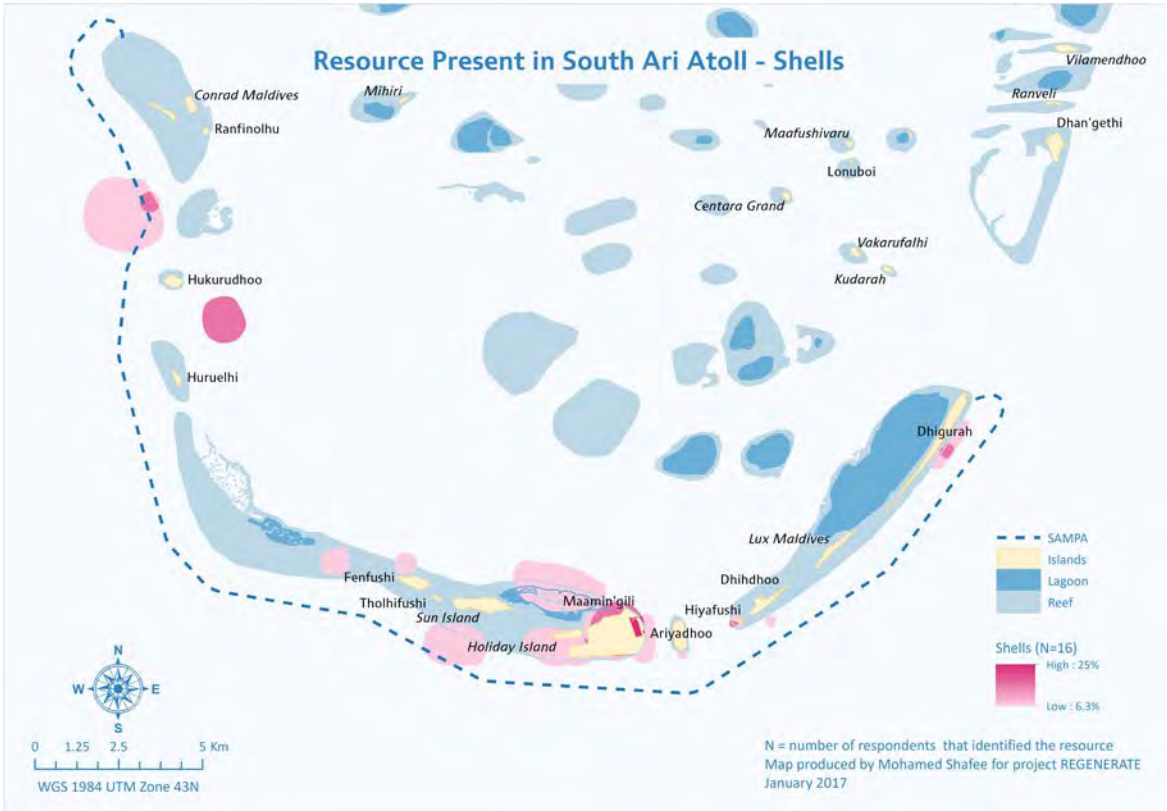


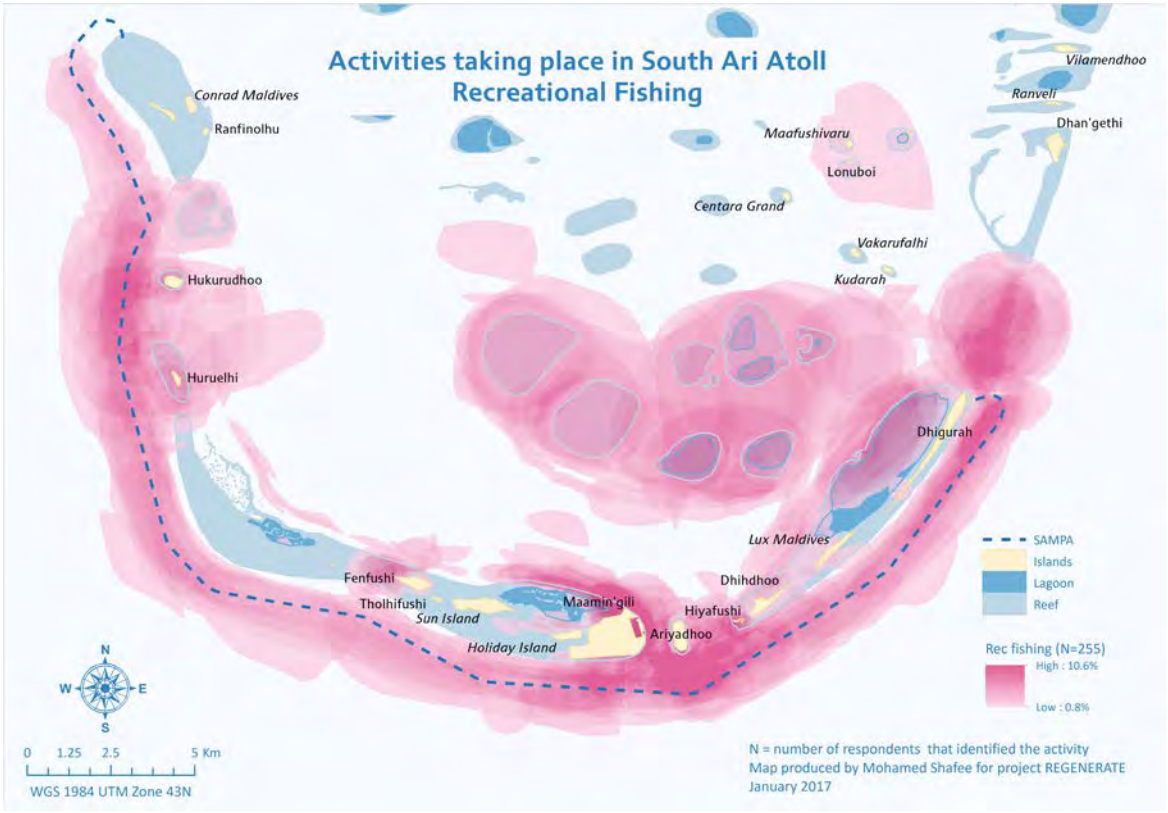


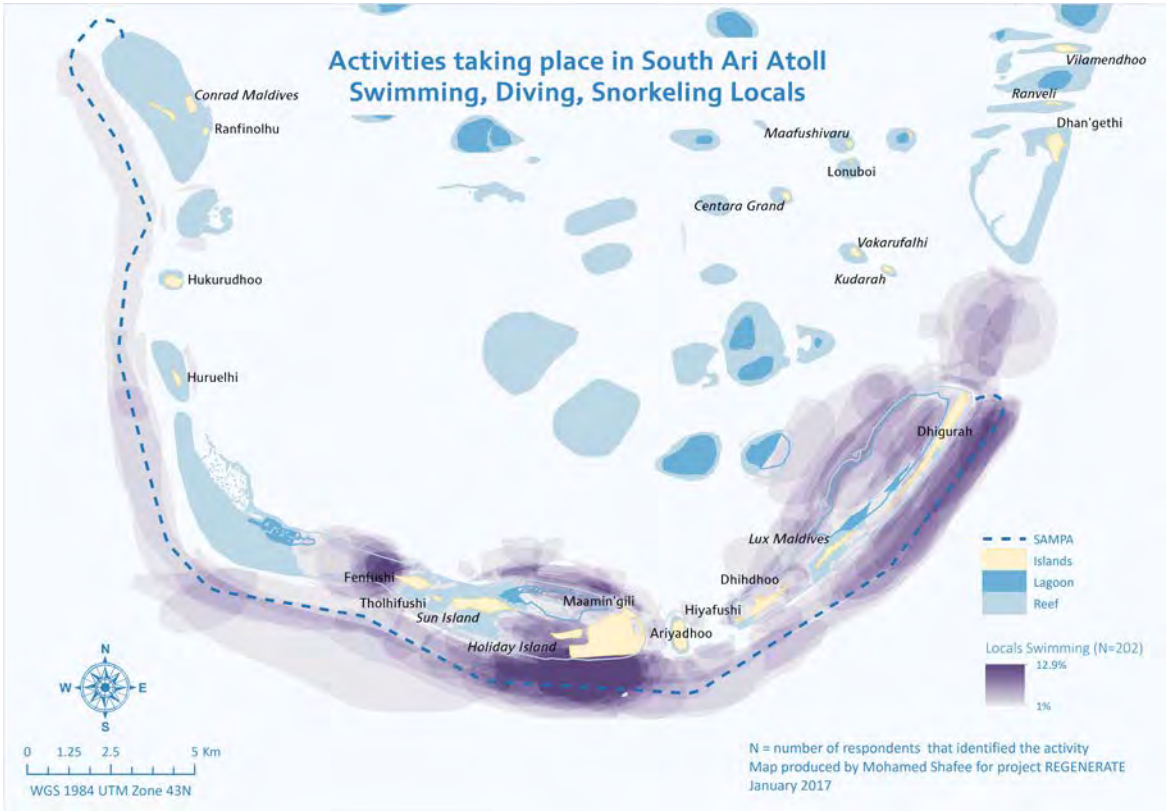

Resource Present in South Ari Atoll - Turtles (including eggs)
Conrad Maldives
Mihiri
Ranfinolhu
Vilamendhoo
Ranveli
Dhan'gethi
Maafushivaru
Lonuboi
Centara Grand
Vakarufalhi
Kudarah
Hukurudhoo
Huruelhi
Dhigurah
Lux Maldives
Fenfushi
Tholhifushi
Sun Island
Holiday Island
Maamin'gili
Dhihdhoo
Hiyafushi
Ariyadhoo
SAMPA
Islands
Lagoon
Reef
Turtles (N=129)
High : 15.5%
Low : 1.6%
N
W
E
S
0 1.25 2.5 5 Km
WGS 1984 UTM Zone 43N
N = number of respondents that identified the resource
Map produced by Mohamed Shafee for project REGENERATE
January 2017


Resource Present in South Ari Atoll - Sharks
Conrad Maldives
Mihiri
Ranfinolhu
Vilamendhoo
Ranveli
Dhan'gethi
Maafushivaru
Lonuboi
Centara Grand
Vakarufalhi
Kudarah
Hukurudhoo
Huruelhi
Dhigurah
Lux Maldives
Fenfushi
Tholhifushi
Sun Island
Holiday Island
Maamin'gili
Dhihdhoo
Hiyafushi
Ariyadhoo
SAMPA
Islands
Lagoon
Reef
Sharks (N=133)
High : 13.5%
Low : 1.5%
N
W
E
S
0 1.25 2.5 5 Km
WGS 1984 UTM Zone 43N
N = number of respondents that identified the resource
Map produced by Mohamed Shafee for project REGENERATE
January 2017


Resource Present in South Ari Atoll - Sea Grass Patches
Conrad Maldives
Mihiri
Ranfinolhu
Vilamendhoo
Ranveli
Dhan'gethi
Maafushivaru
Lonuboi
Centara Grand
Vakarufalhi
Kudarah
Hukurudhoo
Huruelhi
Dhigurah
Lux Maldives
Fenfushi
Tholhifushi
Sun Island
Holiday Island
Maamin'gili
Dhihdhoo
Hiyafushi
Ariyadhoo
SAMPA
Islands
Lagoon
Reef
Sea grass patches (N=117)
High : 22.2%
Low : 1.7%
N
W
E
S
0 1.25 2.5 5 Km
WGS 1984 UTM Zone 43N
N = number of respondents that identified the resource
Map produced by Mohamed Shafee for project REGENERATE
January 2017


Resource Present in South Ari Atoll - Shells
Conrad Maldives
Mihiri
Ranfinolhu
Vilamendhoo
Ranveli
Dhan'gethi
Maafushivaru
Lonuboi
Centara Grand
Vakarufalhi
Kudarah
Hukurudhoo
Huruelhi
Dhigurah
Lux Maldives
Fenfushi
Tholhifushi
Sun Island
Holiday Island
Maamin'gili
Dhihdhoo
Hiyafushi
Ariyadhoo
SAMPA
Islands
Lagoon
Reef
Shells (N=16)
High : 25%
Low : 6.3%
N
W
E
S
0 1.25 2.5 5 Km
WGS 1984 UTM Zone 43N
N = number of respondents that identified the resource
Map produced by Mohamed Shafee for project REGENERATE
January 2017


Activities taking place in South Ari Atoll
Recreational Fishing
Conrad Maldives
Ranfinolhu
Hukurudhoo
Huruelhi
Fenfushi
Tholhifushi
Sun Island
Maamin'gili
Holiday Island
Ariyadhoo
Hiyafushi
Dhihdhoo
Lux Maldives
Dhigurah
Centara Grand
Maafushivaru
Lonuboi
Vakarufalhi
Kudarah
Vilamendhoo
Ranveli
Dhan'gethi
SAMPA
Islands
Lagoon
Reef
Rec fishing (N=255)
High : 10.6%
Low : 0.8%
N
W
E
S
0 1.25 2.5 5 Km
WGS 1984 UTM Zone 43N
N = number of respondents that identified the activity
Map produced by Mohamed Shafee for project REGENERATE
January 2017


Activities taking place in South Ari Atoll
Swimming, Diving, Snorkeling Locals
Conrad Maldives
Ranfinolhu
Hukurudhoo
Huruelhi
Fenfushi
Tholhifushi
Sun Island
Maamin'gili
Holiday Island
Ariyadhoo
Hiyafushi
Dhihdhoo
Lux Maldives
Dhigurah
Centara Grand
Maafushivaru
Lonuboi
Vakarufalhi
Kudarah
Vilamendhoo
Ranveli
Dhan'gethi
SAMPA
Islands
Lagoon
Reef
Locals Swimming (N=202)
12.9%
1%
N
W
E
S
0 1.25 2.5 5 Km
WGS 1984 UTM Zone 43N
N = number of respondents that identified the activity
Map produced by Mohamed Shafee for project REGENERATE
January 2017

ANNEX 5: DESCRIPTIONS AND LIST OF MAPS PRODUCED FROM THE SURVEY

Baseline maps

There are 4 sets of baseline maps. A resource map set, an activities map set, one fishing grounds map set, and one most common species harvested map set.

Map legend description

- Each map shows the area of south ari-atoll of Maldives with islands, lagoons and reefs. SAMPA indicates the South Ari Atoll Marine Protected area.
- Value for the heat map indicates number responses for the resource,
- Activity or fishing ground location. For instance, 35 for Manta ray indicates that 35 responses had identified that particular area as a location for Manta rays.
- N = total number of respondents (persons) that identified the resource in the questionnaire.
- In the percentage map version, percentage is (Value/N)*100

List of Baseline maps

Resources present in South Ari Atoll

7 sets of heat maps that shows these resources in South Ari Atoll

- Whale sharks
- Manta rays
- Sea grass patches
- Turtles
- Sharks
- Sea birds
- Shells

Activities taking place in South Ari Atoll

4 sets of heat maps that shows these activities in South Ari Atoll

- Recreational Fishing
- Swimming, snorkeling, diving for locals
- Swimming, snorkeling and diving for tourists
- Whale shark snorkeling
- Fishing grounds in South Ari Atoll

3 sets of heat maps that shows the following fishing grounds

- Reef fishing
- Bait fishing
- Fishing by outside atoll fishers
- Most common species harvested in SAMPA
- Single map that shows the most common species harvested in SAMPA. Extracted from reef fishing data

Analysis Maps

There are 3 sets of analysis maps. A map showing ecologically significant areas in SAMPA, a map set for Multiple use areas and a map set for Potential management areas

Map description

- All the analyses are based on overlapping areas, derived from heat maps of resources, activities or fishing grounds in SAMPA.
- A criterion of using the upper 66% of overlapping areas were agreed upon for the analysis. For example, if the value for sharks are from 1 – 18, only values from 7-18 would be used in further analysis.

List of Analysis maps

Ecologically significant areas in SAMPA

Single map showing where most resources are overlapping. Sea birds and shells were excluded in this analysis.

Multiple use areas

This map shows the overlap of swimming snorkeling and diving area with either Commercial fishing grounds (reef fishing and fishing from outside atolls) or recreational fishing grounds

Potential management areas

A map showing overlap of Multiple use areas and ecologically significant areas with different weights for different factors.

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