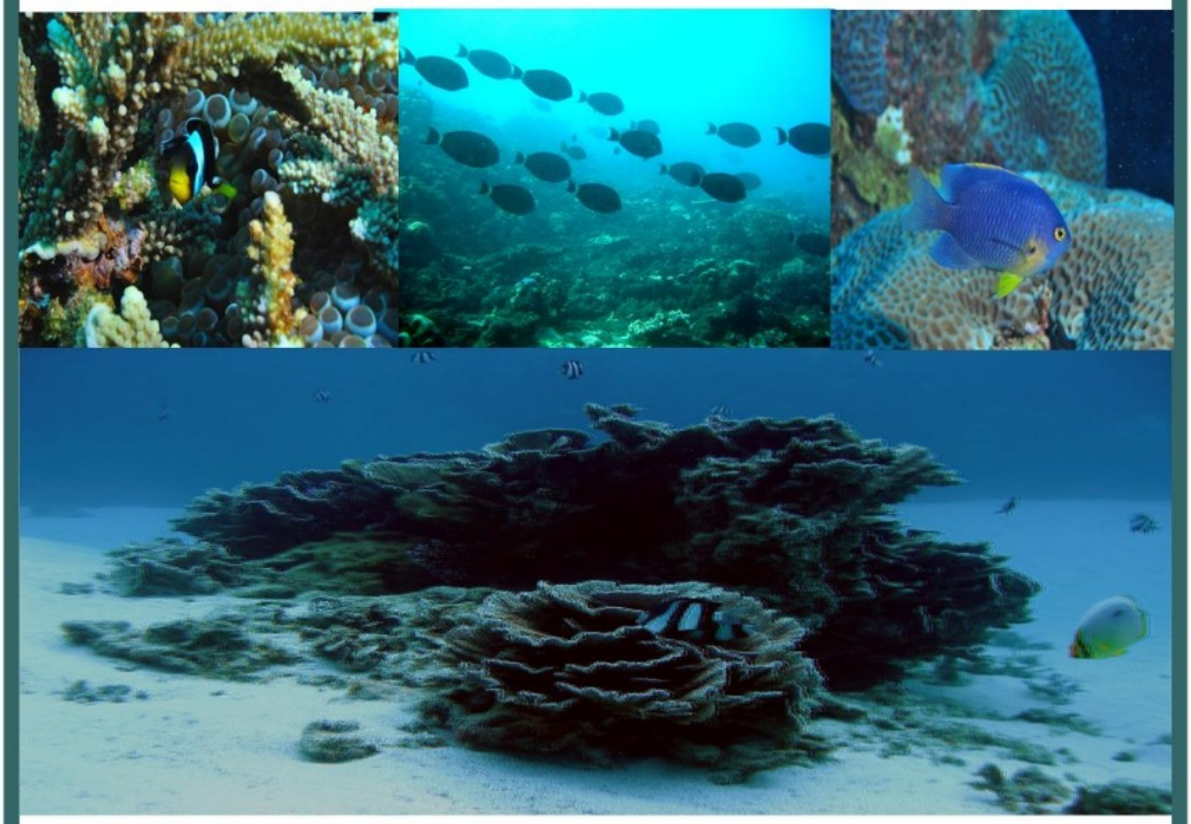
Northern Marine Reserves
(Rivière Banane, Anse Aux Anglais, Grand Bassin and Passe Demi)
Rodrigues Island



Draft Management Plan
2011-2016

1 Executive Summary

[To be completed]

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2 Prologue

A long time ago, during cyclones, we loved listening to grandma telling stories about the life of her time. She talked about her way of life and most of all about the method of fishing they used.

One of her tales was about 'net fishing'. Back in her day, a throw of the net was enough to fill a boat. There were so many fish that they even had to free some. Apparently, fish was worth only 25 cents and without the introduction of refrigeration, there was no reason to keep the excess fishes.

She used to say that when they did not have food, they use to go to the shore, with only one fishing line and a hook and come back an hour later with fish enough to feed the family for the whole week.

Her stories taught us that in her time people cared about the future of the sea. They never went for the small fish and always took the right amount. They knew that by keeping the sea healthy today the sea would look after them tomorrow.

Nowadays, it has all changed.

If you ask someone to release the small fish the answer you'll get back is "If I don't have it my friend next door will". Moreover, people's attitude has changed. Fishing used to be just for consumption, but now it is more about business. Yes, they are now money minded.

Now, if you ask a fisherman about his fishing, the answer you will obtain is as follows "Mate, it is so hard. It is a struggle to make living". But ask him what we should do to remedy the situation, you'll make him speechless. Complaining seems to be the way to go. But things have to change.

We have to start looking for a solution. The more you think about it the more obvious it gets. One of the most effective ways to sustain our sea is to build marine reserves. To repopulate our sea, we will have to give it a safe place to reproduce and grow strong. The marine reserve will provide such a safe place away from any harmful human activity.

Looking at our sea today does not give us any hope for its future. That is why the Marine Reserves are of the upmost importance for the times ahead. Without the marine reserves there is no chance of restoring and maintaining our marine diversity.

Today, right now, is the time to act. Today is the time to act for a sustainable sea and also for a sustainable life for our next generation. How many of our youth have left? How many are going to leave? We should never forget how important the sea is to our country. A sustainable sea will be fruitful for both fishing and tourism. An improvement to tourism and fishing gives the youth a reason to stay and gives us the hope to see a happy grandchild in the coming years.

Right now my thought is just about one thing: give the marine reserves a go.

Written by a member of the Technical Sub-Committee, a young Rodriguan fisher, who was fishing simply because he could not find another form of employment.

3 Acknowledgements

The preparation of the draft Management Plan for the Northern Marine Reserves was supported by the Rodrigues Regional Assembly (RRA), the Global Environment Facility (GEF) Small Grants Programme implemented by the UNDP and the Regional Programme for the Sustainable Management of the Coastal Zones of the Countries of the Indian Ocean (ReCoMaP), financed by the European Union.

Special thanks also to the Technical Sub-Committee (TSC) for drafting the Management Plan for the Northern Marine Reserves: Louisette Cupidon (Fisher), Kennedy Lisette (Fisher), Garry Perrine (Fisheries Protection Service - FPS), Francisco Milazar (FPS), Jean Cliff Tolbize (Tourism), Jowetson Casimir (Organisation Pecheurs Professionel de Rodrigues), Marie Paule Sakoury (Discovery Rodirgues), Jean Bernardin Meunier (Rodrigues Fishermen's Welfare Fund), Eric Blais (Shoals Rodrigues), and Reshad Jhangheer-Khan (South East Marine Protected Area - SEMPA).

The preparation of the plan followed several rounds of community consultations with 17 villages and with 9 tour operators. Many thanks to the Shoals Rodrigues team for all of their hard work on the consultations, coordinating the project, organising the workshops and facilitating: Sabrina Desiré, Runolph Raffaut, Sydney Perrine, Jovani Raffin, Linsley Francois, and Cecilia.

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4 Background

4.1 Justification for the Marine Reserves

Fisheries are a vital source of employment, income and subsistence livelihoods in Rodrigues and have an important role in the local culture and traditions. Their sustainable management must be a priority. All fishers acknowledge that fisheries in Rodrigues are declining and that action is needed to improve their catches. The geographic location of Rodrigues means that it is particularly important that the island does all it can to maintain marine biodiversity and maintain sustainable fisheries. The reefs of Rodrigues are very remote from sources of larvae and cannot necessarily rely on external sources for recruitment. Some important commercial species could become rare or even locally extinct if they don't get protected. The isolation of Rodrigues also contributes to unusual and perhaps unique marine assemblages, and supports at least one and probably many more endemic fish species. Rodrigues has a duty to protect its unique lagoon and outer reef habitats.

The fisheries of Rodrigues are highly multi-species with over 100 fish species from a diverse range of families recorded from fisheries sampling so far, and a variety of invertebrate species are also exploited. No-take marine reserves are the ideal management tool for highly multi-species fisheries. Consultation meetings and informal discussions with a wide number of fishers around the island revealed strong support for the idea of no-take marine reserves to promote sustainable fisheries but they need to feed their family while waiting for the reserves to be productive.

The need for well-enforced fully protected marine reserves where no fishing or damaging activities of any sort are allowed cannot be emphasised enough. It has been repeatedly demonstrated around the world that areas which have been protected from only some forms of fishing, or inefficient approaches to full protection will not sustain fisheries. On the other hand, effectively enforced marine reserves with strong community and government support have transformed reef fisheries in many places and have ensured their sustainability, and brought additional economic benefits to coastal communities. Fully-protected areas could begin to contribute to fisheries sustainability within 2 - 3 years and tangible increases in fish catches and therefore fisher incomes could be seen within 5 years but only if the areas are well-managed and not fished illegally. Maintaining minimal levels of illegal fishing and developing a conspicuous, trust-worthy and well-respected fisheries enforcement team, preferably through a collaboration between the government enforcement staff and members of the fishing community themselves would be the ideal way of achieving this (Gell et al., 2003).

A management plan is a fundamental tool to ensure the long term survival of Marine Protected Areas (MPAs). It is designed to provide guidance to the management team through the identification of the key goals and objectives of the MPA in both time and space. It helps to answer the following questions:

4.1.1 Where were we?

Thirty years ago, at the time when there were not many fishers, the fisheries were very different from what they are today. One octopus fisher would go out in his boat and come back with 40 to 50 kg of octopus per day. The fishers would not target an octopus of 1 kg because no one would buy it.

In those days, there were no fridges and to dry a small octopus would not be profitable. During the rainy season, fishers would not go out to catch octopus because they would not be able to dry them and this gave time for the fishery to recover. Nowadays with fridges, they catch octopus all the time and any size. With an increase in the number of fishers and constant fishing, the octopus fishery is in a decline and numbers have drastically gone down.

4.1.2 Where are we?

Our Marine Reserves have already been set up but they are not yet effective. The aim of this management plan is to make these Marine Reserves more effective together with the community, fishers and stakeholders. Marine resources are declining and some species are endangered, leading fishers' incomes to get lower at the same time. In making these Marine Reserves effective, the resources will regenerate and hence the community will benefit. Our aim is to put emphasis on the best governance in the local context to increase effectiveness.

4.1.3 Where do we want to go?

In the next 5 years the aim is to: Ensure that everybody knows the importance of the Marine Reserves and how they work. The reserves are respected and the authorities follow the management plan guidelines properly and professionally. Marine habitats and biodiversity inside the reserves are protected from human impacts both from inside and outside the reserves and we can already see the signs of recovery. Through coral reef monitoring surveys, we can see that our reef has regenerated, fish have become more abundant and diverse, and there are wider varieties of invertebrates and benthos. Following numerous surveys and meetings with the population at large we can see that they have a better standard of living. Structural changes in the FPS have brought a better work standard; they are more effective and successful. An emergency communication system has been established and is working effectively.

4.1.4 What is the best way to do what we need to do?

The best way to progress is through consultation with all stakeholders and all sea users. If everybody understands the process and accepts the plan there will be a greater sense of ownership of this document by the local community. An effective management body should be established to implement the management plan. Good enforcement will be needed in collaboration of FPS, the National Coast Guard, and through Community Rangers and the wider community. A good monitoring and education plan will be set up where the data is used to further improve the management plan.

4.2 History of the Marine Reserves

In 2000, when Shoals Rodrigues were doing octopus surveys at 14 of the Fish Landing Stations, as part of the Shoals of Capricorn programme, fishers started complaining about their catches getting less and smaller. Informal discussions with a wide cross section of fishers around the island revealed strong support for the idea of developing no-take marine reserves to promote sustainable fisheries.

During 2002, Shoals Rodrigues secured funding from the GEF Small Grants Programme implemented by the UNDP, the Christensen Fund and the British High Commission in Mauritius to establish pilot marine reserves in the lagoon. As part of the project, consultation meetings were held at 18 villages (with over 400 fishers attending) to discuss the concept of marine reserves and their benefits to the ecosystem and fisheries. Village groups nominated areas within their local fishing grounds that they

wished to see protected, and made suggestions for management and enforcement of reserve areas. Five potential reserve areas were proposed and the villages closest to these reserve sites were visited again to ensure that they were still supportive of the reserves.

In early 2003, Shoals Rodrigues and the experts contracted under the project submitted a report to the Rodrigues Regional Assembly proposing a network of reserve sites around the lagoon and offering recommendations for the management strategies (Gell et al., 2003). Four of the sites were selected as reserves by the Co-ordinating Committee for Fisheries and Marine Resources and regulations were prepared.

A project funded by the Darwin Initiative between 2005 and 2008 supported the development of these reserves through a combination of research, training and education and resulted in the 4 Marine Reserves being gazetted in April 2007. As part of this project a draft management plan was also developed for Riviere Banane (Gell, 2007).

In 2007, funding was obtained by Shoals Rodrigues from Fonds Français pour l'Environnement Mondial (FFEM) through the Indian Ocean Commission's programme "Réseau des Aires Marines Protégées" to demarcate the marine reserve at Rivière Banane and further funding was obtained from the Decentralised Cooperation Programme to demarcate the remaining 3 marine reserves in 2008. Two alternative livelihood projects were also initiated in Riviere Banane with funding from the GEF-SGP implemented by the UNDP.

4.3 Preparation of the Management plan

Since 2008 little has happened in the Marine Reserves. The Marine Reserves fall under the Fisheries and Marine Resources Act (2007) and it seems that those regulations are not being enforced so we are doing this project to seek endorsement by the RRA of this draft management plan. Since nothing has been done for the last three years, fishers are willing to see a change and want to go forward with this project.

The project 'Improving Management Effectiveness for the Marine Protected Areas of Rodrigues' aimed to provide training to facilitate the development of a new management plan and consisted of the drafting of a management plan by Rodriguans for Rodrigues . The project was run by Shoals Rodrigues in collaboration with the RRA with financial support from the GEF Small Grants Programme and the Regional Programme for the Sustainable Management of the Coastal Zones of the Countries of the Indian Ocean (ReCoMaP), financed by European Union.

Four workshops were organised and a Technical Sub-Committee, composed of 10 representatives of local marine community were selected to start drafting the management plan:

- The first workshop was held at the Mont Plaisir Cultural Community Centre, in Malabar, Rodrigues between 7th-10th December 2010 (Klaus et al., 2011a). Workshop 1 was officially opened by the Chief Commissioner, Mr Johnson Roussety, and attended by over 25 participants including fishers, tour operators, staff from the South East Marine Protected Area (SEMPA) and officers from the Fisheries Protection Service (FPS).

- The second workshop was held at the Anse aux Anglais Community Centre, Rodrigues, between 17th-19th January 2011 (Klaus et al., 2011b). Workshop 2 was attended by 32

participants who discussed the outcomes from the 1st round of Community Consultations, and worked together on the goals and objectives for the marine reserves, designed strategies and actions to meet objectives, and identified the Technical Subcommittee (TSC).

- The third workshop was held at the Anse aux Anglais Community Centre, Rodrigues, between 2nd-4th May 2011, followed by a Training workshop between 5th-6th May 2011. The third workshop was attended by the Technical Sub-Committee. The TSC were presented with several different management plans from other MPAs in the region. The contents of these plans were discussed and the TSC were then set the task of defining the draft table of contents for the management plan for the marine reserves. The TSC then also worked towards refining the Goals and Objectives using the results of the second round of Community Consultations, and the specific and general Strategies and Actions. The TSC prepared a powerpoint presentation to summarise the outcomes of Workshop 3 and presented this to the participants of the Training Workshop.

- The fourth workshop was held at the Anse aux Anglais Community Centre, Rodrigues between 25th – 29th July 2011. The workshop was attended by the TSC, who spent 4 days drafting different sections of the management plan. The final day was attended by 29 participants who revisited the objectives and actions for the marine reserves and discussed the budget.

Community consultation meetings have also been organised, before and after each workshop, to inform the fisher community on the progress of this project:

[To be completed]

5 Vision for the Marine Reserves

During the Workshop 1 the community prepared and agreed a slogan for the Marine Reserves:

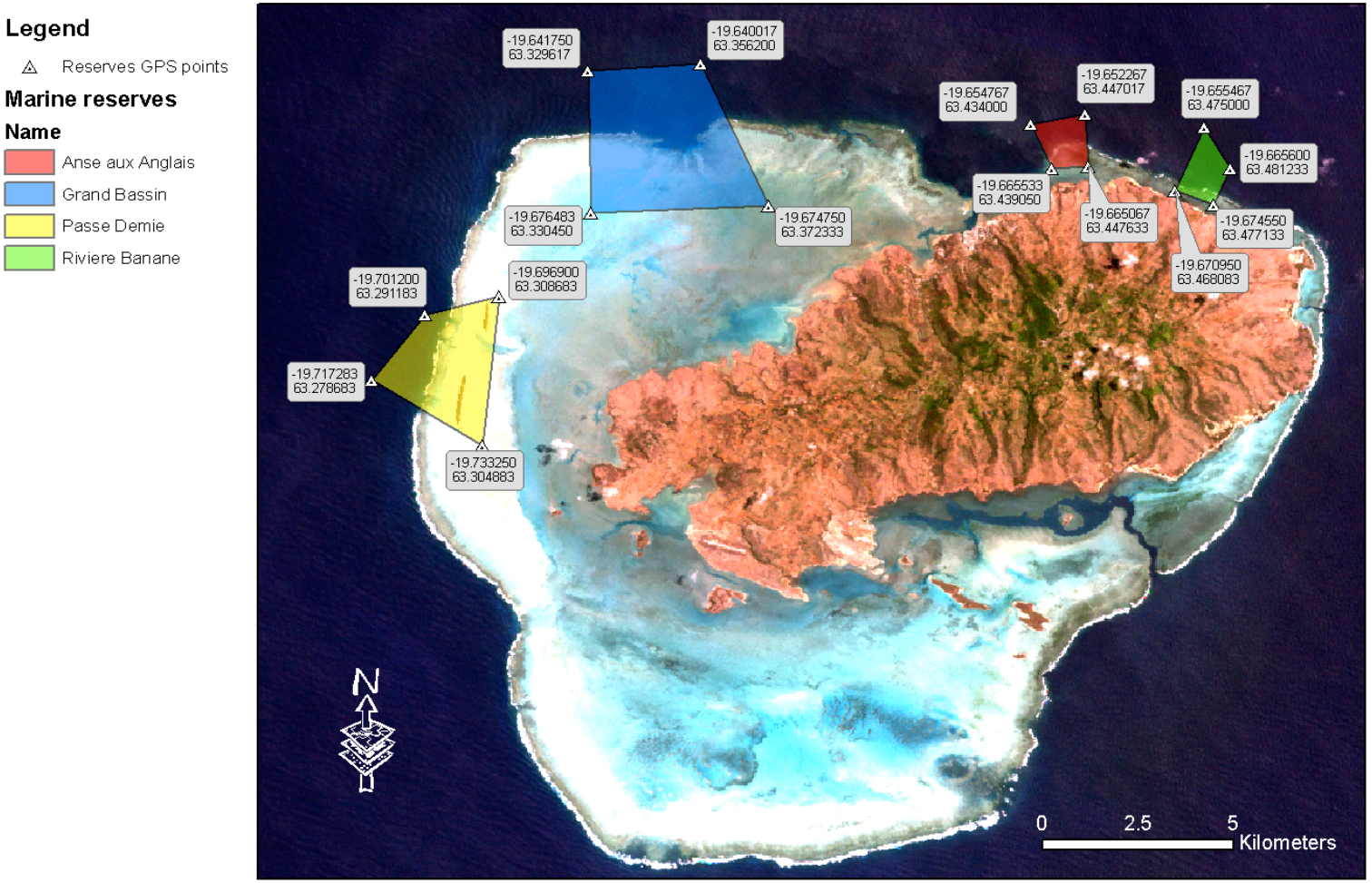
"Bane Reserves Marins: Retourn lamer couma avant, couma dan letan nou bane gran parents".

(Marine Reserves: let the sea return to how it used to be in the time of our grandparents).

"*But bane reserve c'est ameliore lapeche ek regenere nou lamer ek bane resource, protege tou bane different lespece ki trouve dan lamer, pou nou kapav continue gagne produits lamer pou nou manze dan le futur ek ene meilleur fason vive dan ene fason ekitable a travers ene bon gestion kot nou implik tou ban dimoune ki servi lagon*".

(The goal of the marine reserves is to sustain and restore marine resources and protect biodiversity and habitats in order to equitably enhance food security and livelihoods, through effective management with the active involvement of marine resource users).

Rodrigues lagoon and the four northern marine reserves



Data Source: Landsat 7 ETM+ Map Credit: Shoals Rodrigues (2010)

6 Introduction

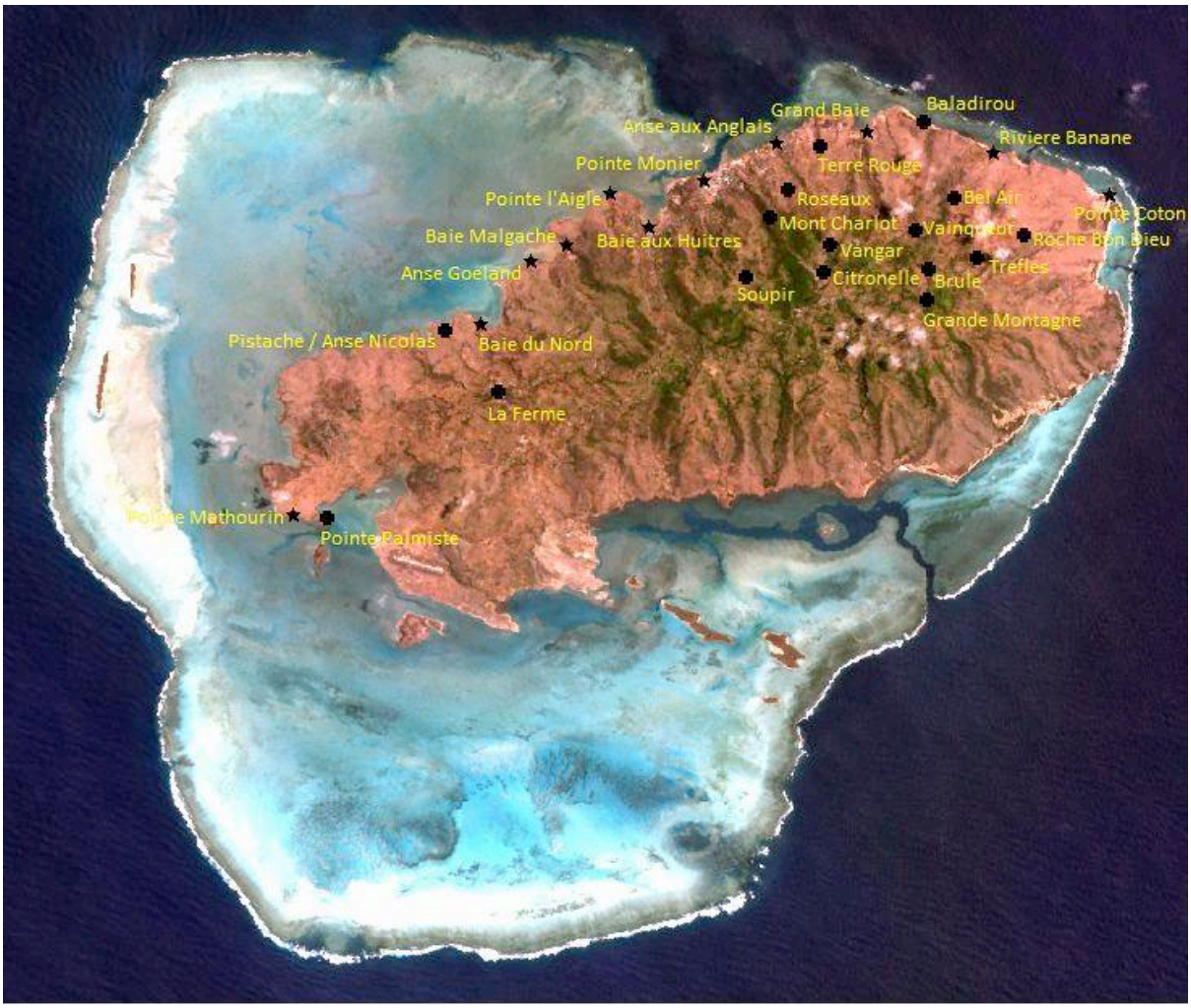
6.1.1 General Introduction Rodrigues

[To include a general description of Rodrigues and the coastal zone].

Rodrigues is semi-autonomous island forming part of the Republic of Mauritius, situated at 19 ^{o} 42' S and 63 ^{o} 25' E, 570 km north east of the main island. The island is 18 km at its longest and 8 km at its widest with an area of 109 km^2. Rodrigues is of volcanic origin with an estimated age of 8 – 10 million years (Giorgi and Borchiellin, 1998) and rises to a height of 393 m. Human activity has significantly changed the island's terrestrial environment. Today, no primary forest remains and Rodrigues is considered one of the most degraded tropical islands in the world (Republic of Mauritius, 2006).

Rodrigues is situated on an elliptical submarine platform, with a width of 30 km and a length of 55 km. The platform slopes gently outwards to the 100 m contour, beyond which there is a marked increase in slope, and depths increase rapidly to over 2,000 m (McDougall *et al*., 1965). The island is surrounded by 90 km of fringing coral reef, which creates a shallow lagoon (<2 m depth) of 240 km^2. One hundred and sixty species of coral have been recorded (Fenner et al., 2004). The lagoon is dominated by macro-algae and there are small beds of dense seagrass (Republic of Mauritius, 2006).

Rodrigues supports a population of 37,774 with a density of 363 inhabitants per km^2. Rodrigues remains undeveloped and the economy is based mainly on agriculture, livestock and fisheries with 35% of the workforce employed in these sectors (Republic of Mauritius, 2010).



6.1.2 Name of Area and Location

[To include the specific information on the geographic location; latitudes and longitudes (map); surface area (square kilometres, hectares or other units of area) for each marine reserve].

6.1.2.1 Rivière Banane

The Riviere Banane Marine Reserve is bounded as follows:

- Towards the East, starting from a point having coordinate S19º40.257, E63º28.085 in the sea, the boundary runs along an imaginary line towards the east to a point having coordinate S19º40.473, E63º28.628
- Towards the North East, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction to a point having coordinate S19º39.936, E63º28.874
- Towards the North, from the last mentioned point the boundary runs along an imaginary line towards north to a point having coordinate S19º39.328, E63º28.500

- Toward the South, from the last mentioned point runs along an imaginary line up to the coral reef, thence to the same direction up to the starting point.

Area (km^2)	Perimeter (km)	Boundaries			
		Outside lagoon		Inside lagoon	
1.5	5.3	19° 39.936 63° 28.874	19° 39.328 63° 28.500	19° 40.473 63° 28.628	19° 40.257 63° 28.085

6.1.2.2 Anse aux Anglais

The English Bay Marine Reserve is bounded as follows:

- Towards the North East, starting from a point having coordinate S19º39.932, E63º26.443' in the sea, the boundary runs along an imaginary line towards the east up to a point having coordinate S19º39.904', E63º26.858'
- Towards the North, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction to a point having coordinate S19º39.136', E63º26.821
- Towards the West, from the last mentioned point, the boundary runs along an imaginary line to a point having coordinate S19º39.286', E63º26.040'
- Towards the South, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction towards the south up starting point.

Area (km^2)	Perimeter (km)	Boundaries			
		Outside lagoon		Inside lagoon	
1.5	5.0	19º 39.286 63º 26.040	19º 39.136 63º 26.821	19º 39.932 63º 26.343	19º 39.904 63º 26.858

6.1.2.3 Grand Bassin

The Grand Bassin Marine Reserve is bounded as follows:

- Towards the North West, starting from a point having coordinates S19º40.589', E63º19.827' in the sea, the boundary runs along an imaginary line towards the east to a point having coordinates S19º40.485', E63º22.340'
- Towards the North, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction to a point having coordinate S19º38.401', E63º26.343'
- Towards the West, from the last mentioned point, the boundary runs along an imaginary line to a point having coordinates S19º38.805', E63º19.777'

- Towards the South, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction up starting point.

Area (Km^2)	Perimeter (Km)	Boundaries			
		Outside lagoon		Inside lagoon	
14.1	15.3	19º 38.401 63º 21.372	19º 38.505 63º 19.777	19º 40.589 63º 19.827	19º 40.485 63º 22.340

6.1.2.4 Passe Demi

The Passe Demi Marine Reserve excludes the nature reserve of Ile aux Cocos and Ile aux Sables as from their high water mark and is bounded as follows:

- Towards the West, starting from a point having coordinates S19º43.995', E63º18.293' in the sea, the boundary runs generally north along an imaginary line to a point having coordinates S19º41.814', E63º18.521'
- Towards the North, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction up to a point having coordinates S19º38.401', E63º26.343'
- Towards the South West, from the last mentioned point, the boundary runs along an imaginary line up to a point having coordinate S19º43.037', E63º16.721'
- Towards the south East, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction up to the starting point.

Area (km^2)	Perimeter (km)	Boundaries			
		Outside lagoon		Inside lagoon	
7.2	11.4	19º 42.072 63º 17.471	19º 43.037 63º 16.721	19º 41.814 63º 18.521	19º 43.995 63º 18.293

6.1.3 Geographic and Habitat Classification

[Different habitats and substrate types found within each of the marine reserves should be described using the status reports and the biotope mapping and MSc theses which include a habitat map for each marine reserve].

6.1.3.1 Riviere Banane

The Riviere Banane Marine Reserve includes an area of the lagoon extending out towards the reef flat and the shallow fore-reef slope to a depth of 20m. The lagoon habitat is composed mostly of sand and coral rubble, overlying a coralline platform. The reef flat consists of a coralline platform covered with turf algae and small compact coral colonies. The reef slope is a gently sloping spur and groove formation, with the spurs dominated by branching coral colonies.

6.1.3.2 Anse aux Anglais

The Anse aux Anglais Marine Reserve includes an area of the lagoon extending out towards the reef flat and the shallow fore-reef slope to a depth of 20m.Two main habitats occur within the lagoon. The east side of the lagoon consists of continuous limestone pavement whilst the majority of the substrate in the west side of the marine reserve is dominated by consolidated rubble. The reef flat is characterised by a limestone pavement. The reef slope has a gently sloping spur and groove structure. The grooves are approximately 5 m wide and filled with coarse rubble and sand; the spurs are dominated by branching coral colonies (Jacob, 2005).

6.1.3.3 Grand Bassin

The Grand Bassin Marine Reserve includes an area of the lagoon extending out towards the reef flat and the shallow fore-reef slope to a depth of 30m. Sand is the dominant substrate in the lagoon, with macroalgae and rubble (Winton, 2006). The dominant substrate on the reef flat is rubble with small coral colonies and sand. The reef slope is a gently sloping spur and groove formation, with the spurs dominated by branching coral colonies.

6.1.3.4 Passe Demi

The Passe Demi Marine Reserve includes an area of the lagoon extending out towards the reef flat and the shallow fore-reef slope to a depth of 25m. In general, the lagoon habitat is composed of a sand and coral substrate interspersed with coral colonies. The reef slope has high habitat complexity and abundant massive corals (Orr, 2008).

6.1.4 Conservation Status

[This section could include a short description of why the areas are important, and why were they chosen to be marine reserves. The rationale for the selection is included in the Fiona Gell 2003 report].

6.1.4.1 Riviere Banane

In the Riviere Banane lagoon we have the 'Aquarium'. It is a very beautiful area within the lagoon where there are a lot of fish, anemones and live corals. It is a jewel which is much appreciated by tourists and it is very important to protect that beautiful resource. It is also important because octopus and fish come to lay their eggs in the lagoon side. Outside the lagoon, humpback whales are seen every winter together with their young.

The marine reserve was originally suggested by fishers from Riviere Banane because it included badly degraded regions requiring rehabilitation (on the lagoon flats) and a relatively pristine area of high potential for tourism activities such as snorkelling (in 'Aquarium') (Gell et al., 2003).

In our village we have regrouped under a fishermen's association where we meet each month to discuss about fisheries issues and fishermen situation. What comes out of these meetings are 'there's nothing in the sea, our resources are declining, octopus is becoming rare, corals are dying. We need to find a solution to regenerate our resources.' We have agreed with the idea of setting up marine reserves because we believe that the resources will come back. It started coming back when Riviere Banane Marine Reserve was set up for a trial. For one whole year no one entered the reserve and we started to see big fish coming close to the shore and we caught big octopus outside the reserve and then before the elections people were allowed to fish inside and all the resources were

gone again. The Riviere Banane community believe they need let their resources regenerate so that the fishers and their families get a better living

6.1.4.2 Anse aux Anglais

The majority of fishers believe the area at Anse aux Anglais is important for juvenile fish although seven of the octopus fishers also stated that there were not so many as in previous years (Jacob, 2005). Fishers from Baladirou suggested Grand Baie and the areas of reef in front of it, extending to the east to include Passe Cabri (an interesting site with large numbers of commercial fish and extensive coral cover). They viewed the channel at Passe Cabri as the source of fish for areas to the east towards Riviere Banane. The Anse aux Anglais area was suggested as the habitats are badly degraded and protection would allow them to recover. There are also excellent snorkelling and diving opportunities around Totor, and so tourism potential is also a consideration here (Gell et al., 2003). The area is also important because of the presence of the fish *Pomacentrus rodriguesensis*, which is endemic to the republic of Mauritius. Coral cover is high, ranging from 51-75% according to surveys undertaken by Shoals Rodrigues. Underwater visual censuses by Shoals Rodrigues show a predominance of smaller fish that could be juveniles. Humpback whales and their young are known to pass in the off lagoon section of the reserve.

6.1.4.3 Grand Bassin

The area is important because a lot of fish and octopus come into the lagoon through Grand Bassin. Turtles come to feed there and fish and octopus breed and lay their eggs in Grand Bassin. A lot of juveniles find their food and grow there. There are around eight creeks which allow fish to come in whatever the tide. There are a lot of different fish species in that particular area.

The area was suggested by fishers from Anse Goeland, Baie Du Nord and Baie Malgache. The fishers felt that the passes are likely to be important for fish spawning and also have a role in the movement of fish between the outer reef and the lagoon. The reef slope and outer reef areas at Grand Bassin are healthy environments with a high coverage and diversity of coral and plentiful reef fish, giving the site tourism potential for recreational diving trips. The site can also be accessed through the lagoon, so can be reached in most weather conditions, although underwater visibility can be restricted (Gell et al., 2003).

6.1.4.4 Passe Demi

Passe Demi is a site of marine interest in the marine reserve area, located near the pass through the reef, which had a high habitat complexity and abundant massive corals. Near Passe Demi, lie two sandy islands namely Ile aux Cocos and Ile aux Sables. These islands are nature reserves since 1983 and are two nesting sites for about 25,000 marine birds including Brown and Lesser Noddies, Fairy and Sooty Terns. For effective protection and conservation, Sandy Island is a restricted Nature Reserve. Cocos Island is divided into one restricted part and another leisure part for tourists (but still protected).

The area was chosen because large groupers are seen frequently at Passe Demi and the site has well developed and diverse coral, large sea fans, and unusual echinoderm communities compared with other reef areas. Reserves for seabirds already exist around Ile Cocos and Ile aux Sables, and the

former islet is a popular tourist destination. Expansion of the reserve to include a greater area of the marine environment would further increase the tourism potential of the site (Gell et al., 2003).

6.1.5 Access and Jurisdiction

In this section describe the shipping routes, and access via land and sea. Also include information on the jurisdiction and present ownership.

6.1.5.1 Riviere Banane

Riviere Banane is accessed by walking or by boat. The main passes used by the fishers include Passe Grenade and Roche Plate.

6.1.5.2 Anse aux Anglais

Access to the marine reserve of Anse aux Anglais from land is possible by small boat from the beaches of Anse aux Anglais, Caverne Provert or Grand Baie. Access to the outside is possible by small and larger embarcations from all places via open sea and through the Eastern Pass. La Passe Cabri is the only pass used by fishers from Cavern Provert to directly access the off lagoon section of the reserve from inside the lagoon. Fishers from Grand Baie may access the off lagoon are of the reserve from the following passes…… Fishers from Anse aux Anglais may access the off lagoon area of the reserve via the Totor reef pass. The main shipping channel is less than 2km from the reserve…Refer to GIS for an exact distance to the reserve boundary.

The reserve of Anse aux Anglais falls under the jurisdiction of the Mauritius Port Authority since it is within the MPA control area and in close proximity of the shipping channel.

6.1.5.3 Grand Bassin

Access to Grand Bassin is by boat. There are several small passes in this area but the main passes that are used by the fishers to access off lagoon are “La Passe La Haut” and “Grand La Passe”. The one which is mostly used is “La Passe La Haut”. Fishermen use it, especially on low tides, to go in and out of the lagoon as the water is deeper there than in the other small passes. Grand Bassin is approximately 8 km from the main shipping channel.

6.1.5.4 Passe Demi

Access to Passe Demi is by boat (motorboat or sailing boat). The organisations responsible for access into these areas include Forestry Department who are responsible for maintenance and surveillance of Ile aux Cocos; Mauritian Wildlife Foundation who are engaged in conservation, protection and rehabilitation and; Discovery Rodrigues who manage visitor’s access. Fishers use Passe Demi, Passe Mamou, Passe Ile aux Cocos, and Passe Pierre Louis. Passe Demi marine reserve is approximately 18 km to the main shipping channel. Access channel used by tour operators to get to Ile aux Cocos.

6.1.6 History

[This section contains a summary account of direct and indirect human involvement in the area. This section may be divided into several sub-sections e.g.: Historical description of the area (e.g. descriptions from the old books about Rodrigues about what the sea was like before)]

6.1.6.1 Riviere Banane

Riviere Banane used to have many more fish, the area known as "Aquarium" was deeper. Many fish species that used to be found have now disappeared but also the abundance of octopus has now diminished. There were more corals in Riviere Banane but now some have died.

6.1.6.2 Anse aux Anglais

Anse aux Anglais used to have higher cover of live healthy corals, larger carnivorous fish were found in greater abundance and diversity, and large invertebrates were common.

6.1.6.3 Grand Bassin

Twenty to thirty years ago, big turtles (around 100kg to 150 kg) used to come into Grand Bassin on high tides and get stuck when the tide went out and they would be caught by fishermen. It was the same for rays as well (eagle rays etc.). In the past the area was cleaner and there were lots of healthy corals everywhere. There was a lot of seagrass around the area which attracted a lot of fish. Seagrass is very scarce in that area nowadays.

Grand Bassin has always been a very important point of safe access into the lagoon. In the past, when off lagoon fishermen went fishing in the south, they would use Grand Bassin when storm swells blocked the other passes. This included the fishermen from Plaine Corail to Port Mathurin. This is still true today.

6.1.6.4 Passe Demi

Before 1950, Ile aux Cocos and Ile aux Sables were used for plantation of acacia and coconut as well as extraction of guanos. Large colonies of seabirds (brown and lesser noddies and white and sooty terns) nest on both islets. There was an abundance of marine life, with corals and fishes. Due to a lack of control over activities on these islets, excessive poaching took place leading to a decrease in bird populations. After 1950, government took over these two islets. For better protection and conservation both were declared as nature reserves in 1983. Sand Island being restricted completely as well as a specified area on Cocos Island (500 metres)

6.1.7 Socio-economics and Livelihoods

[This section should contain at a description of the characteristics of the communities surrounding the marine reserves and the socio-economics, population structure (ages, gender, religion, level of education etc, material style of life), livelihood pattern (% of population earning a living from fishing, other sources of income (planting, livestock etc), level of unemployment) etc. The Shoals Rodrigues SocMon report and Selina Stead's report should provide some useful background material.]

Current human use: In this section write a description about fishing and recreational activities for each marine reserve. For the fisheries section this should include: Numbers of fishers using the reserve, Fishing methods, Species fished, Seasonality, Catches (CPUE), Where the fish are sold. For recreation, this should include: The different types tourism activities (kite surfing, diving, surfing, island visits), The numbers of visitors (if this information is available), The numbers of operators and who these operators are (e.g. are they Rodriguan or other]

6.1.7.1 Riviere Banane

The Riviere Banane Marine Reserve is used by the local fishing community and the tourism community. There are 115 families in Riviere Banane village and they all depend on the fisheries,

farming and agriculture for their survival. The people also earn a livelihood from planting, and private businesses like retailer shops, rearing and artisanal works. Officially, there are 39 registered fishers at the Riviere Banane Fish Landing Station (FPS, unpublished data) but about 150 fishers use the reserve. From Riviere Banane these include about 50 fishers who have their permits and around 20 who don't have but they still fish for their household or as we say in Creole "pou rod kari". People from other villages Brûlé, Tréfles, Roche Bon Dieu, Bel Air, Grande Montagne, Baladirou, Pointe Coton, Dans Bébé, Vainqueur, Lor Borne and Montagne Goyave also fish in the reserve.

Socio-economic surveys show that fishing is the primary source of income for 30% of households in Riviere Banane, and 63% of households are dependent on fishing as either their primary or secondary source of income. All households plant vegetables or raise livestock to supplement their income; no households are involved in tourism activities. Produce are both consumed and sold at a local market. The community is young, with 80% aged less than 50 years, and 50% aged less than 30 years. The majority have received less than 9 years of schooling and only speak Creole. Only 10% speak French and 5% speak English and French; unemployment is high. Nearly everyone in the community have their own house with concrete roofs and walls, glass windows and cement floors, piped water and mains electricity. Only 13% of respondents own a boat, 60% are wood and 40% fibreglass, and only 20% have an engine (Hardman et al., 2006c). In Baladirou, 81% of households surveyed included fishers and fishing constituted 51% of the employment activities. Households supplement their income and on average there are 2.44 occupations per household. Other employment activities included planting vegetables and raising livestock. The average amount of schooling is 5.98 years. The majority of people have their own house. Households have an average of 3.68 rooms; over half have concrete roofs and walls and almost all have electricity and piped water; only 3% own a vehicle (Stead et al., 2009).

Fishing methods used in the reserve include harpoon fishing, line fishing, squid fishing, seine net fishing and basket trap fishing. The fishers mainly use line and basket traps to catch fish and harpoons to catch octopus. Seine net fishing was undertaken by the team from Pointe l'Aigle (0.7% of hauls between 2002 and 2006), targeting mainly rabbitfish (*Siganus sutor;* cordonnier), however this team has now relinquished their nets; the team from Pointe Coton continues to fish in the area. Illegal seine net fishing also occurs day and night (all year round) targeting jacks, unicornfish, rabbitfish, goatfish. This is sometimes on foot and by boat during low and high tide respectively. 'Batatran' is another illegal fishing method used to catch small fish.

The main target species are octopus, fish and squid. The main species caught include: cordonnier, capitaine, lorsan, licorn, sarde, congo, vielle (rouge / gris), rouget, cateau, sirigiens, ripé, squid, octopus, carolisse, madame tombé, lichien. Some of the fisheries are seasonal: in winter fishers target squid, licorn, and cordonnier, whereas rouget is targeted more in summer. Fishers typically land 100 kg per week of fish and 35 kg of octopus per tide. The fish and octopus are sold in the village itself and sometimes outside in other villages.

Tourism activities that take place in the reserve include snorkelling, diving, glass bottom boats and swimming. It is not known how many visitors come to the area per year, however there are at least 6 tour operators that offer snorkelling and diving. Snorkelling takes place at 'Aquarium' organised by hotels and tour operators from Port Mathurin, Anse aux Anglais and Grand Baie. Three dive

operators (Pointe Venus Hotel, Cotton Bay Hotel, Rodriguez Diving Pointe Monier) operate within the Marine Reserve. There two guest houses in Riviere Banane, one in Brûlé and one in Grande Montagne.

6.1.7.2 Anse aux Anglais

The Anse aux Anglais Marine Reserve is predominantly used by the fisher community; however, the tourism sector also uses the area for snorkeling and diving, as well as for recreational fishing. Officially, there are 144 registered fishers at the Grand Baie and Anse aux Anglais Fish Landing Stations (FPS, unpublished data). According to fishers, there are around 100 traps around Passé Cabris (Blais et al., 2011) and during August 2005, up to 63 octopus fishers were counted on the lowest tide of the month (tidal height, 90 cm) (Jacob, 2005). The reserve is mainly used by members of the villages of Roseaux, Vangar, Baie Lascar, Creve Coeur, Anse aux Anglais, Caverne Provert, Terre Rouge, Jeantac, Grand Baie, Riviere Trouloulou and Baladirou. These communities also engage in agriculture and planting, farming to earn a living, a growing number of ex- fishers also offer boat tours within the reserve for snorkeling and recreational fishing. The majority of remaining part of the community is employed in the public sector.

Socio-economic surveys show that fishing is less important in the villages of Grand Baie, Terre Rouge and Roseaux with only 18% of households including fishers in Grand Baie, 12% in Terre Rouge and 8% in Roseaux and the majority of people involved in other employment activities. The average number of occupations per household ranges from 1.03 in Grand Baie to 1.47 in Roseaux. The majority of people have their own house. Households have an average of between 4.34 (Grand Baie)and 4.67 (Terre Rouge) rooms; the majority have concrete roofs and walls and almost all have electricity and piped water; 12% own a vehicle in Terre Rouge, however this is less in Grand Baie (5%) and Roseaux (3%)(Stead et al., 2009).

Fishing methods used in the reserve include harpoon, line fishing, basket trap fishing and seine net fishing. The seine net fishing team from Pointe l'Aigle used to fish along the reef edge within the reserve targeting jacks, rabbitfish, unicornfish and emperors, but this team has now relinquished their nets. Trolling is undertaken in the off lagoon section of the reserve but the number of fishers engaged in this practice is not known. There is also an active squid fishery that operates during winter, the number of fishers is not known. For octopus, fishers use harpoons and metal spikes; for fish they use lines and basket traps; for squid they use lures. There is also illegal fishing where fishers use oil to facilitate catching octopus and snorkel to fish octopus outside of spring tides. The illegal fin-fishery is very active and includes the use of small nets, 'Batatran' and spear fishing.

The main species of fish targeted include: Rabbitfish (*Siganus sutor* and *S. argentus*), Groupers (*Epinephelus* spp), Parrotfish *(Scarus ghobban, Hipposcarus harrid* and *Scarus scaber*), Surgeonfish (*Acanthurus triostegus*, and other *Acanthurus* spp.), Giant clams (*Tridacna* spp), Unicornfish (*Naso unicornis*), Goatfish (*Mulloidichthys flavolineatus*, *M. vanicolensis*), Emperors (*Lethrinus nebulosus, N. harak, L. mahsena*), Eels, Trevally (*Caranx melaphygus*), Breton (*Gerres longirostris*), squid, common octopus (*Octopus cyanea*) and sand octopus (*Octopus vulgaris*). Squid, goatfish, unicornfish are targeted in winter and Breton in summer; all the other fish occur all year round. The fish should be sold at the fish landing stations of Anse aux Anglais and Grand Baie, however fish are most often

sold wherever the fishers land their boats, i.e. Baie Lascar jetty, Anse aux Anglais beach, Cavern Provert beach and Grand Baie beach.

What are the catches? (amounts of fish)

There are five tour operators offer diving and snorkelling outside the reef and inside the reserve. Diving is undertaken in the reserves by three operators: one from Point Monier (Eco Evasion), one from Les Cocotiers Hotel at Anse Aux Anglais (Rodriguez Diving), and the last from Grand Baie (L'amphore) These operators also offer snorkeling facilities. A growing number of ex-fishers also offer tours within the reserve predominantly for snorkeling and recreational fishing. There is also a very small group of people that surf la Passe Cabri waves. Tourists also visit the reserve for snorkeling by their own means, swimming to the reserve from the shore. Tourists that use the area often come from three hotels two in Anse aux Anglais (Les Cocotiers, Le Recif) and one at Mont Venus (Pointe Venus). There are eight guest houses: two in Jeantac (Le Konokono and Le Ravenal), two in Anse aux Anglais, (Auberge Anse aux Anglais, Les Filaos), three at Caverne Provert (Lagon Bleu, Le Dhalia and Le Recif), and one at Creve Coeur (Belle Vue). Tourists also come from the following 13 small establishments located at Grand Baie (Le Cactus, Villa Pendanus, Hugette Bague), Anse aux Anglais (Le Limonier, Ti Pavillon, Chez Madam Prudence, La Case Creole, Villa Mon Tresor), Jeantac (Residence Foulsafat), Terre Rouge (Residence Esplanade, Chez Claude et Benett), and Caverne Provert (Rod Evasion, Coco Villa, Le Manoir).

6.1.7.3 Grand Bassin

The area is used by the fisher community, sports fishers and leisure (recreational) fishers (includes both the fonctionaires, some of whom go out regularly and other occasional fishers that might target a particular species). Offically, there are 320 registered fishers at the 6 Fish Landing Stations between Pointe Monier and Baie du Nord (FPS, unpublished data). Estimates for the number of fishers fishing within the Marine Reserve range from 80 registered fishers (plus non-registered fishers and pleasure fishers) to up to 700 fishers (Blais et al., 2011; Perrine et al., 2011). The people that use the area come from Anse Nicolas, Pistache, Camp Pintade, Baie du Nord, Montagne du Sable, Montagne Charlot, Soupir, Baie Malgache, Anse Goeland, Pointe L'Aigle, Montagne Fanal, Pointe la Gueule, Baie aux Huitres, Pointe Monier, Mangues, Grand la Fouche Corail and Quatre Vents. Data collected on the number of fishing boats within Grand Bassin during July and August 2006 showed that there were up to 18 boats in the reserve at any one time (1.75 boats per km^2) (Winton, 2006).

Socio-economic surveys show that fishing is most important in Anse Goeland and Baie du Nord where 63% and 61% of households surveyed included fishers and fishing constituted 53% and 42% of the employment activities. Fishing is less important tin Baie Malagache (31% of households include fishers) and Baie aux Huitres (18%) and planting vegetables and other employment activities are more important in these villages. Households have lower diversity in their income and the average number of occupations per household ranges from 0.86 in Baie du Nord to 1.38 in Anse Goeland. The average amount of schooling ranges from 4.68 years in Baie du Nord to 9.76 years in Baie Malgache. Baie Malgache has a relatively high level of immigration with 19% of households from Mauritius. The majority of people have their own house. Households have an average of between 4.48 (Anse Goeland) and 5.57 (Baie Malgache) rooms; most have concrete roofs and walls and

almost all have electricity and piped water. Only 7% of households in Baie du Nord own a vehicle, however this increases to 38% of households in Baie Malgache (Stead et al., 2009).

The gear types used include seine net, line fishing, trolling (la traine), basket traps, casting (from boats), spear and harpoons for octopus. The seine net teams from Baie du Nord and Pointe l'Aigle fish within the Grand Bassin Marine Reserve, catching 10% and 9% by weight of their fish respectively and targeting *Gerres longirostris, Siganus sutor, Lethrinus nebulosus, Naso unicornis, Caranx melampygus* and *Acanthurus triostegus*. Illegal fishing also takes place using net and spears targeting all type of fish and shells using boat (all year round, day and night).

The main species targeted include, parrot fish, rabbit fish, jacks, goat fish, unicorn fishes, emperors, mullets, snappers, groupers, breams, wrasses, *Octopus cyanea* and squid. In the winter the main species targeted are parrot fishes, unicorn fishes, goat fish, squid and rabbit fish. In the summer the main species targeted include jacks, emperors, snappers, mullets, groupers, and breams. Shark and jack fishing occurs off lagoon by boat from April to October. Octopus is caught all year round. The fish are sold at the fish landing station to the general public and to the fish mongers.

What are the catches? (amounts of fish)

There are currently no tourism activities on offer in Grand Bassin.

6.1.7.4 Passe Demi

The Passe Demi Marine Reserve is used by fishers and tour operators. Officially, there are 197 registered fishers at the Baie Malgache, Baie du Nord and Pointe Mathourin Fish Landing Stations (FPS, unpublished data). Fishers come from Pointe Palmiste, Baie du Nord, Baie Malgache, Montagne du Sable (50) and Pistache (40-50), however the majority of fishers are government officials and not registered fishers (Blais et al., 2011; Perrine et al., 2011).

Socio-economic surveys show that in Pointe Palmiste, 43% of households surveyed included fishers. Households supplement their income and on average there are 2.14 occupations per household. Other employment activities included planting vegetables, raising livestock and other employment activities. The average amount of schooling is 4.25 years. The majority of people have their own house. Households have an average of 4.20 rooms; the majority have concrete roofs and walls and all have electricity and piped water; none own a vehicle (Stead et al., 2009).

The fishing methods used in Passe Demie include seine net fishing, line fishing, basket trap fishing, octopus fishing, prawn net fishing, and spear fishing. The seine net team from Baie du Nord fishes within the Passe Demi Marine Reserve, catching 12% by weight of their fish respectively and targeting *Gerres longirostris, Mulloidichthys flavolineatus, Caranx melampygus* and *Acanthurus triostegus*. On the sandy patches in the reserve area they target prawn (crevettes) using nets and fish on foot (all year round) on low tide and at night only.

The species targeted include capitaine, rouget, vieil, carangue, beri, empereur, mullet, crevette, kono kono, ourite and cordonier. Mullet are targeted between March to September (open season) and Carangue are targeted during summer. Fish are sold at the landing stations at Baie du Nord , Port Mathurin and Baie Malgache.

What are the catches? (amounts of fish)

There are various different types of tourism activities that take place in the reserve, including kite surfing, from boats deployed from Baie du Nord and Mourouk throughout the year depending on the tide (high water). There is also surfing in the channel depending on the tide and weather (high tide and windy), diving (2 operators), snorkelling, island visits and swimming. There are 11 tour operators who bring tourists to Ile aux Cocos, departing from Baie du Nord or Port Mathurin. On average, there are 4-7 boats per day each with a maximum of 10 people on board and there are usually 30 – 40 visitors to the island each day; the peak seasons for visitors are in the holidays (November, December, January, February, April, July and August).

The tourists are mainly from Europe (France, Italy, Germany), Mauritius, Reunion and South Africa. The peak season for tourism are from December to February, April to May, July to August and October to November. The visitor numbers to the islands within Passe Demi in 2010 are shown below:

Month	Number of Tourists
January	804
February	403
March	650
April	959
May	434
June	224
July	1082
August	635
September	291
October	681
November	635
December	731

During low season (March, June, September) approximately 300 tourists per month visit the island and in peak season approximately 800 visit. Having Passe Demi as an effective MPA will lead these tourists to an extra attraction and activity by discovering endemic and very rich marine environment for community an extra income.

6.1.8 Physical features

[In this section we do not have a lot of this information for each reserve so this will be a general description for **all** marine reserves. If there are maps these can also be included].

6.1.8.1 Coastal landforms

[Nearby land forms should be described together with islets. There might be more information available from Cadastre and Forestry].

The Rivière Banane reserve is located opposite to a rocky and an organic sand beach, and steeply sloping basaltic prominences. The beach area is the termination of a valley that reaches all the way

inland. The main coastal prominences in the area are Pointe du Blanc and Roche Rouge, both are basaltic formations. There are no islets in the vicinity of the reserve.

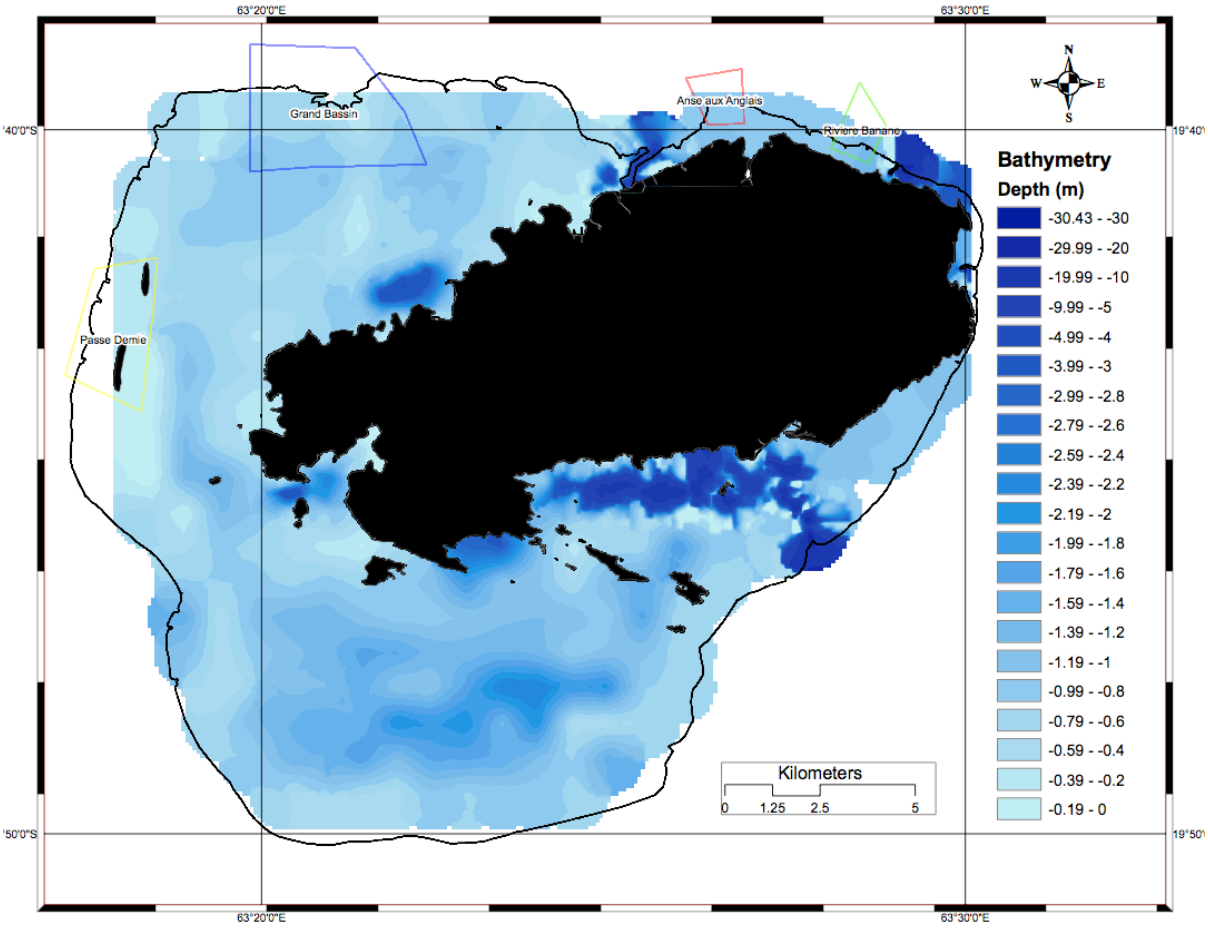
The Anse aux Anglais reserve is located opposite predominantly rocky beaches with the exception of a small organic sand beach in the centre, cut out of the basalt by a currently ephemeral river. This beach is the termination of a minor valley. The only notable coastal prominence is that of Pointe Grand Baie, located near the eastern most corner of the reserve, immediately before Grand Baie. There are no islets in the vicinity of the reserve.

The Grand Bassin reserve is located 2.5km from the coast to the north west of mainland Rodrigues. A small basaltic islet, Ile aux Fous, is located 2.0 km to the east of the reserve and a dynamic sand cay, l'ile aux Sable is located 3.5 km to the southwest of the reserve. The coast adjacent to the reserve is composed of a large number of embayments and mainly rocky with a few interspersed organic sand beaches.

Passe Demi……

6.1.8.2 Bathymetry

[A map showing isobaths is needed. The depth of water can provide an important insight into the dynamics of the system. Major trenches, canyons and shallows should be described in as much detail as is available].



6.1.8.3 Tides and Currents

[A description of the tidal regime and resultant currents and water movements associated with phases of the tidal cycle. A description of physical oceanographic features of the area, wind-driven, tidal and residual currents, on a seasonal basis.]

MAURITIUS METEOROLOGICAL SERVICES

Mean sea level(cm) Above Tide Staff Zero for Rodrigues (Port Mathurin) Period(1987-2005)

	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	MLY MEAN
JAN	203	*	201	196	194	198	204	191	194	187	*	194	192	*	204	209	210	195	*	200	198.1
FEB	207	194	201	201	196	196	200	195	197	196	*	205	184	*	214	194	213	189	214	206	200.1
MAR	205	198	206	*	201	183	201	205	191	199	*	197	189	*	190	197	187	197	210	207	197.8
APR	212	193	194	*	180	172	187	207	184	183	*	195	*	*	*	192	201	192	188		191.6
MAY	206	*	182	*	182	172	193	196	184	184	*	184	*	185	*	181	207	192	186		188.2
JUN	199	183	173	188	187	177	197	191	181	182	*	180	*	179	183	191	194	179	192		185.7
JUL	184	188	177	181	192	177	185	195	187	*	*	190	*	175	178	188	190	184	193		185.1
AUG	*	185	182	173	148	182	173	192	174	194	*	184	*	181	182	180	184	187	190		180.7
SEP	*	180	187	180	174	185	164	191	178	194	*	187	*	173	190	186	180	190	196		183.4
OCT	191	*	189	191	188	189	181	*	181	190	189	183	*	183	189	185	190	181	196		187.2
NOV	189	188	*	191	182	199	183	194	189	200	186	183	*	199	196	189	188	189	194		190.5
DEC	184	*	193	189	191	199	180	194	189	195	185	197	*	198	204	200	204	200	197		194.1
YRLY MEAN	198.1	188.4	189.5	187.8	184.5	185.7	187.2	195.4	185.7	191.4	186.7	189.8	188.4	184.0	193.0	191.0	195.6	189.6	196.0		189.9

* DATA NOT AVBL.

N.B Heights are measured above a reference level

6.1.8.4 Salinity and Water Quality

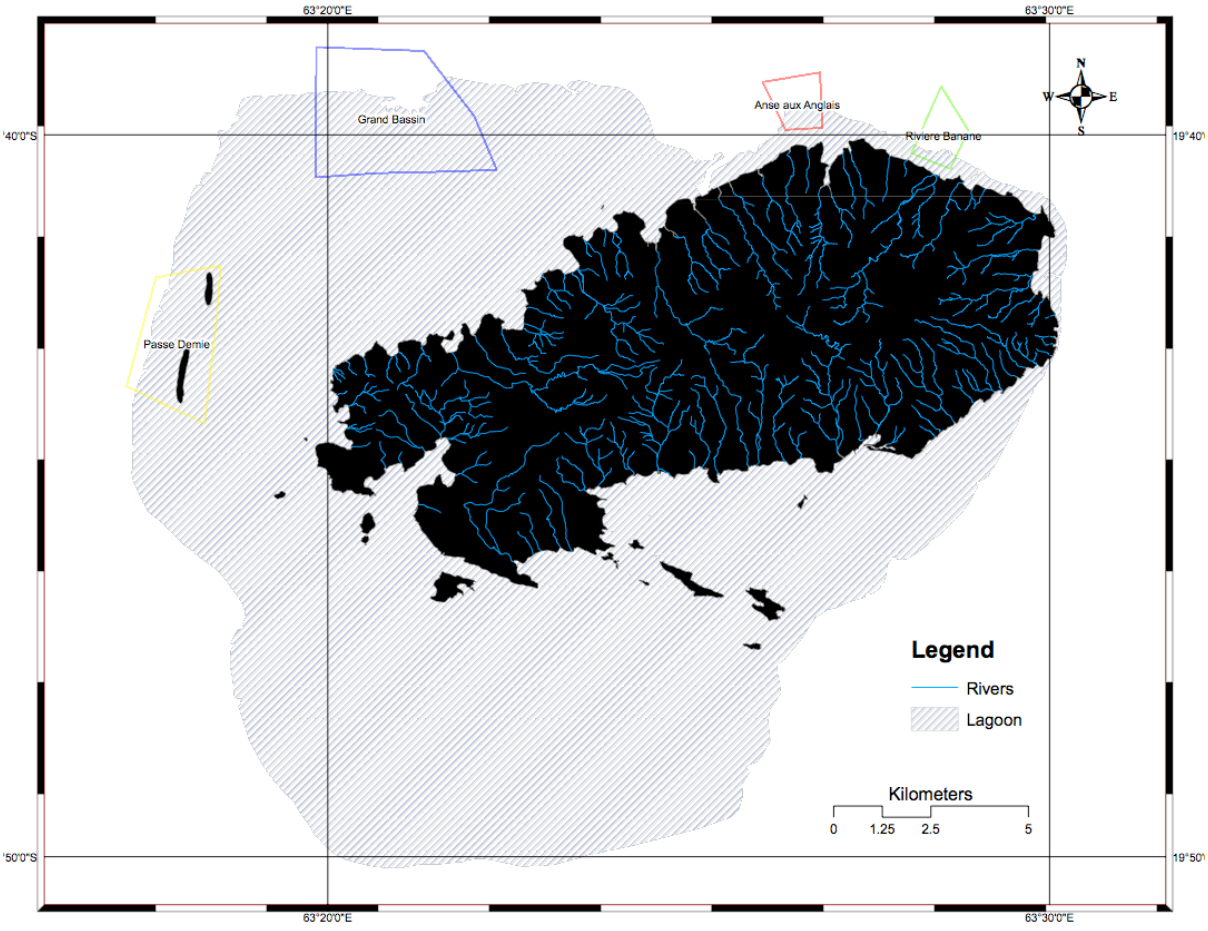
[Measurements of salinity in all seasons are desirable and any other water quality data for each marine reserve if available or just general trends / data for the north coast area (Data from Shoals Rodrigues – coral reef monitoring).]

6.1.8.5 Geology

[A description in geological terms about how the area was formed and how that process is continuing with the deposition of present day substrates and by erosion processes observable in the area. There is some information from Chris Perry's work and there might be more information available from Cadastre and Foresty.]

6.1.8.6 Freshwater inputs

[Major river and estuarine areas should be noted. Are the rivers permanent or only run after heavy rainfall?]

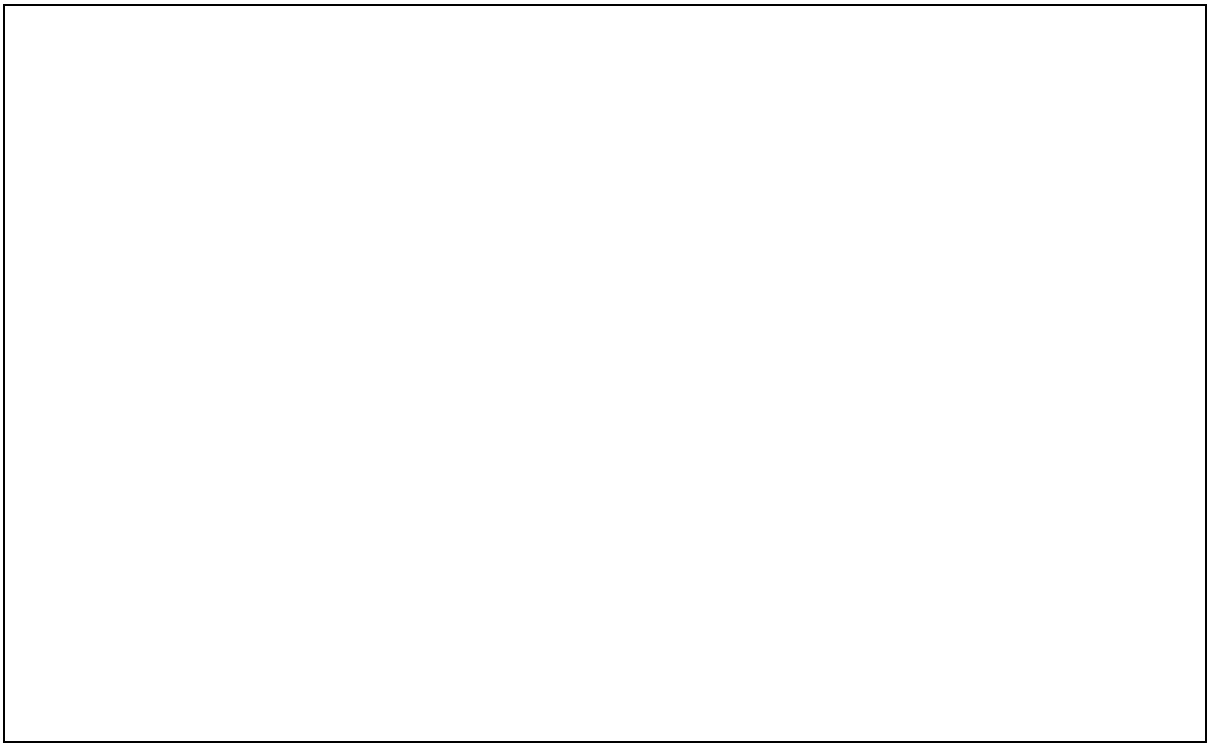


6.1.9 Climate (all data available from Meteo)

6.1.9.1 Precipitation

[Total annual rainfall patterns and a diagram to indicate average monthly rainfall.]

January to April are typically the wettest months of the year with mean rainfall exceeding 100mm per month. February is on average the wettest month of the year with precipitation greater than 180mm. August through October have the lowest rainfall, below 60mm per month. October is the driest month of the year with precipitation slightly above 40mm. The remaining months have rainfall between 100 and 60 mm per month.



6.1.9.2 Temperature

[Monthly charts for maximum and minimum air temperatures and sea temperature (surface and at given depth).]

Air temperatures are recorded at the Pointe Canon meteorological station. The tables below show the long term mean air temperature between 1971 and 2000 and the extreme air temperature values.

Long term mean air temperature values 1971-2000 (Degrees Centigrade)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum	29.2	29	29	29	27	26.0	25.0	25	25	26.3	27	29
Minimum	23.6	24	24	23.0	22	20	19	19	19	20.1	21	23

Extreme air temperature values (1931-2005) (Degrees Centigrade)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max	33.9	34.0	33.9	33.0	30.9	30.9	30.4	31.2	30.7	30.9	30.9	33.1
Min	18.4	19.8	19.4	18.4	18.1	16.5	14.5	15.2	15.8	16.5	17.2	19.2

6.1.9.3 Wind Speed

[Monthly charts of wind rose diagrams (if available) or wind speeds and directions. Include a description of any unusual features of the local winds.]

[To be completed]

6.1.9.4 Wind Speed

[Frequency of cyclones / tropical storms to hit Rodrigues.]

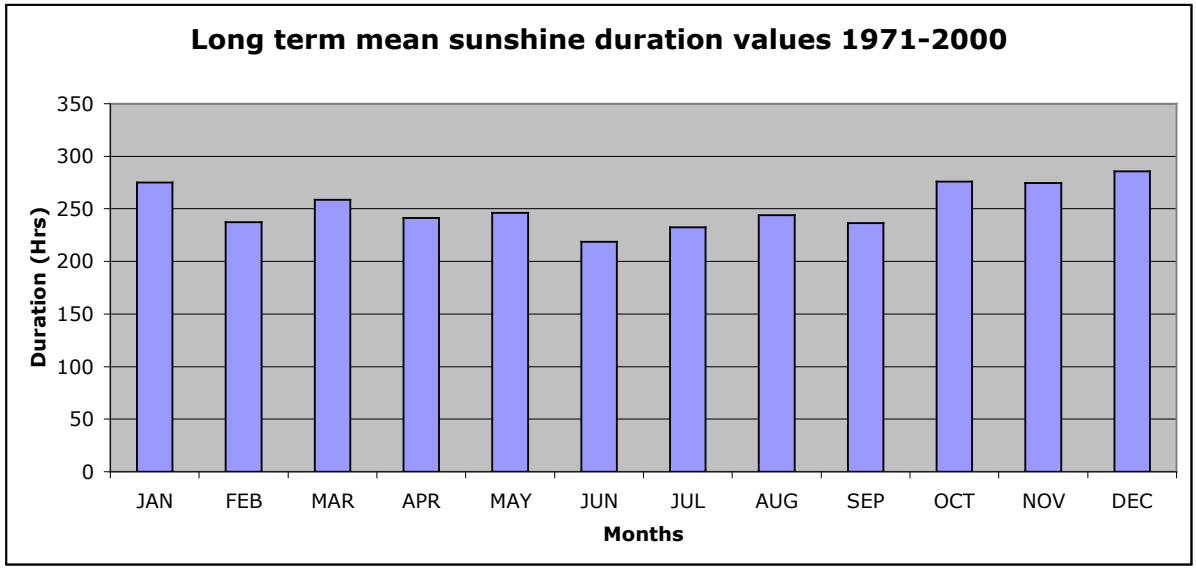
[To be completed]

6.1.9.5 Hours of Sunshine

[This information is important for photosynthetic organisms.]

Long term mean sunshine duration values 1971-2000 (Hours)

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
275.1	237.3	258.5	241.5	246.4	218.9	232.3	244.0	236.3	275.7	274.5	285.8



Long term sunshine duration extreme values 1931-2005 (Hours)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Max	333.7	306.5	296.0	283.0	280.4	256.4	258.7	280.1	270.7	316.9	315.5	336.3
Min	219.5	138.2	199.7	168.2	189.6	164.0	195.8	199.6	204.0	235.2	223.1	210.7

6.1.10 Biodiversity

[This section should contain a description of dominant marine plant life and fauna, and wherever possible a comprehensive summary of the marine communities and related environmental factors

such as the depth of occurrence, together with any features that may have special scientific, recreational or other interest for each marine reserve.

So for each reserve, include information on mammals, reptiles, fish, birds, invertebrates, and flora (macroalgae, seagrass, mangroves, phytoplankton). Include information on the number of species (for each group per reserve) and the status of communities (benthic cover (e.g. percent live coral cover, dead coral cover, macroalgae, seagrass), fish communities (.e.g. lack of large predatory fish, and high abundance of damsel fishes), low densities of invertebrates).

Make sure to highlight endemic or other focal species; migratory animals that periodically or occasionally visit its territory; and such other animals and plants, not being domesticated animals or cultivated plants, as are prescribed by legislation.

The information should be available from the Status Reports, from the Shoals Rodrigues monitoring reports on coral reef and lagoon habitats, Shoals Rodrigues Endemic species surveys, bleaching surveys, MSc thesis, Shoals of Capricorn biodiversity workshops, Shoals of Capricorn plankton surveys, Local ecological knowledge mapping from workshop 1.

A separate appendix should list the species].

6.1.11 Biodiversity

6.1.11.1 Riviere Banane

The dominant biological cover within the lagoon area is brown and green macroalgae (50 % cover); coral colonies occur in the lagoon habitat as small isolated blocks on the sand and coral rubble substrate (Orr, 2008). Coral cover is high on the edges of 'Aquarium', however the area appears to be impacted by fishing activities (discarded and broken basket traps, fishing line).

The reef flat is degraded with low live coral cover (19% cover in 2010) and high turf algae (66%) (Shoals Rodrigues, unpublished data). Changes have occurred over time, with high macro-algal cover recorded in March 2003 (17%) and high turf algae (>70%) in October 2003, March 2006 and March 2007 (Hardman et al., 2008). The macro-invertebrate community on the reef flat is dominated by *Echinometra mathaei*, which is very abundant (>600 individuals per 100m^2) (Shoals Rodrigues, unpublished data); this species has increased in abundance from October 2005 onwards (Hardman et al., 2008). Fish are neither abundant nor diverse on the reef flat, with Parrotfish, Wrasse, Damselfish and Surgeonfish most commonly observed; large predatory fish are rare, indicating overfishing.

The shallow reef slope is healthy with 69% coral cover, which is dominated by branching *Acropora* (*Acropora abrotanoides*). (Shoals Rodrigues, unpublished data). There have been changes over time due to very high macro-algal cover in October 2004 (40%) and increased turf algal cover from March 2006 onwards (>20%) (Hardman et al., 2008). Invertebrates are less common on the reef slope, with *E. mathaei* and *Echinothrix diadema* most commonly recorded (Shoals Rodrigues, unpublished data). Fish are more common on the reef slope, but the community is still dominated by Surgeonfish and Damselfish and large predatory fish are rare.

Although corals have bleached in other parts of Rodrigues during 2002, 2005 the corals within the Riviere Banane Marine Reserve have not been affected by bleaching and remain healthy (Hardman et al., 2007). The coral disease, white syndrome, was observed within the 'Aquarium' during 2010 (Vaughan, 2010).

The endemic coral, *Acropora rodriguensis* is found on the reef flat. The damselfish, *Pomacentrus rodriguesensis* which is found only in Mauritius and Rodrigues, is common on the shallow reef slope (5 – 10m depth) (Hardman et al., 2006). The anemonefish, *Amphiprion chysogaster* which is found only in Mauritius and Rodrigues, occurs within 'Aquarium'.

6.1.11.2 Anse aux Anglais

The east side of the lagoon consists of continuous limestone pavement with macroalgae and rubble. Coral gardens, dominated by *Porites rus* and the branching corals, *Acropora formosa* and *Acropora digitifera* also occur. The majority of the substrate in the west side of the marine reserve is dominated by consolidated rubble (Jacob, 2005). The sea cucumbers *Synapta maculata* and *Holothuria atra* are abundant in the lagoon (Knott, 2010). The abundance of fish is greatest in the east side of the lagoon, with Pomacentrids being the most abundant family and a lack of large predators at all sites. Fish in the lagoon are smaller (majority between 0 - 10 cm) than those on the reef slope, possibly due to over-fishing or to the presence of juveniles (Jacob, 2005).

Live coral cover on the reef flat is low (18%), with the benthic cover dominated by turf algae (42%). Macro-invertebrates are dominated by *Echinometra mathaei* and the gastropod *Trochus maculatus* (Shoals Rodrigues, unpublished data); the abundance of *E. mathaei* has increased since October 2005 (Hardman et al., 2008). The most common fish families on the reef flat are Parrotfish, Surgeonfish and Damselfish and large predatory fish are rare, indicating overfishing (Shoals Rodrigues, unpublished data).

On the shallow reef slope (8m depth), rapid assessment surveys indicated that coral cover ranges from 51 – 75 % and is dominated by *Acropora abrotanoides*, *Acropora austera* (31-50%) and *Platygyra daedalea,* (11-30%) with soft coral *Sinularia* sp. (11-30%). At deeper depths (16m), live coral cover is between 51 – 75 % on the spurs and is dominated by diverse massive, submassive and encrusting species with some tabular *Acropora* colonies and soft corals. Members of the Pomacentridae family dominate the fish communities on the reef slope; small (<20 cm) and large (20 - 40 cm) dark Acanthuridae sp. are also abundant (Jacob, 2005).

Coral bleaching occurred on the shallow reef flat during 2005 when 11 - 30% of coral colonies bleached (Hardman et al., 2007). Further bleaching was observed during 2010 at Passe Cabri (6% of coral colonies bleached) and corals showed signs of recent mortality at Passe Cabri (16% of coral colonies) and Grand Baie (10% of coral colonies). The coral disease, white syndrome was observed at both Passe Cabri and Grand Baie (Vaughan, 2010).

The damselfish, *Pomacentrus rodriguesensis*, which is found only in Mauritius and Rodrigues, is very abundant at depth of 3m - 20m, while the endemic coral, *Acropora rodriguensis* is occasionally observed on the reef crest (Hardman et al 2006).

6.1.11.3 Grand Bassin

Live coral cover on the reef flat is low (12%) and the benthic cover is dominated by coralline algae (60%). Macro-invertebrates are dominated by *Echinometra mathaei* (Shoals Rodrigues, unpublished data). Changes in the benthos have been observed in recent years, with a high cover of dead coral (26%) in March 2002 and high turf algae (>25%) from March 2006 onwards; there was also an increase in the abundance of *Echinometra mathaei* from October 2005 onwards (Hardman et al., 2008).

Mean live coral cover on the fore reef slope is high (60%) and the dominant coral species are *Acropora abrotanoides, A. nobilis* and *A. cytherea.* Macro-invertebrates are rare. Twenty-one species of fish have been observed and the fish community is dominated by the Acanthuridae; large predatory species are rare, indicating overfishing (Shoals Rodrigues, unpublished data).

Coral bleaching occurred in 2002, resulting in mortality of 30 - 40% of coral colonies (Hardman *et al*., 2004) and this is likely to explain the high dead coral cover recorded by the coral reef monitoring surveys during this year. Coral bleaching also occurred in 2005 when 11 - 30% of coral colonies bleached, however <1% of corals died (Hardman *et al*., 2007). Further bleaching was observed in 2010 when 14% of coral colonies exhibited partial bleaching and 15% of colonies showed signs of recent mortality. The coral disease, atrementous necrosis was observed within the marine reserve (Vaughan, 2010).

Occasional colonies of the endemic coral, *Acropora rodriguensis* occur within the marine reserve. A high abundance of the damselfish, *Pomacentrus rodriguesensis* and the anemonefish, *Amphiprion chrysogaster* which are found only in Mauritius and Rodrigues have also been observed (Hardman et al., 2006; Winton, 2006). A humpback whale was observed within the reserve boundaries and turtles have also been recorded (Winton, 2006).

6.1.11.4 Passe Demi

Habitat degradation is widespread within the lagoon; dead overturned tabular corals are common and cyanobacteria were noted at several sites (Orr, 2008). Live coral cover on the reef slope is lower than within the other marine reserves (<40%) and the substrate is colonised by coralline and turf algae (Hardman et al., 2008). Invertebrate species of interest include the nudibranch *Phyllidia arabica* and the featherduster worm *Sabellastarte sanctijosephi* (Orr, 2008).

During 2005, coral bleaching occurred at Passe Demi and Ile aux Cocos. Patchy bleaching occurred at Ile aux Cocos at a depth of 1.5m, affecting 75% of tabular *Acropora* colonies (*A. cytherea* and *A. clathrata*), At Passe Demi 75% of *A. valida* and *A. humilis* colonies and 30% of *A. cytherea* and *A. muricata* colonies were affected (Hardman et al., 2005). Surveys in 2006 and 2007 showed that coral colonies had recovered (Stampfli, 2006; Thoma, 2007) and no bleaching was observed in 2010 (Vaughan, 2010).

Within the Passe Demie Marine Reserve lie two nature reserves which consist of two islets, Ile aux Cocos and Ile aux Sables, managed to protect their unique flora and sea bird colonies. Large colonies of brown noddies (*Anous stolidus*), lesser noddies (*A. tenuirostris*) and white terns (*Gygis alba*) are found on both islands (Alemu, 2008). Spinner dolphins and Bottlenose dolphins have been observed within the marine reserve boundaries (Shoals Rodrigues, 2010). The damselfish *Pomacentrus*

rodriguesensis, found only in Mauritius and Rodrigues and the endemic coral *Acropora rodriguensis* have been recorded within the marine reserve (Hardman et al., 2006).

6.1.12 Legislation

6.1.12.1 International

[Highlight the relevant international legislation]

Mauritius is a party to the **International Convention on Biological Diversity** (CBD). The COP X Decisions in 2010 of relevance to the northern Marine Reserves include:

- **Target 6** *"By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits".*

- **Target 10**: "*By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning."*

- **Target 11**: *"By 2020, at least 17 per cent of terrestrial and inland-water areas and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscape and seascape."*

Mauritius has ratified the **United Nations Framework Convention on Climate Change** (UNFCCC) and acceded to the Kyoto Protocol.

[To be completed]

6.1.12.2 Regional

[Highlight the relevant regional legislation]

Nairobi Convention

[To be completed]

6.1.12.3 National

[In this section include a description of the existing marine regulations (e.g. existing regulations that affect the whole lagoon – closed seasons etc.) and the Marine Reserves regulations (which should also be included in the Annexes). List the relevant Mauritian and Rodriguan legislation for the lagoon / fishery / marine environment].

The legislation relevant for the northern marine reserves includes:

- Fisheries and Marine Resources Act of 2007 (Act No. 27)
- Fisheries and Marine Resources Regulation 2007.
- Maritime Zones Act 2005
- Tourism Act 2002
- Beach Authority Act 2002

The two most important pieces of national legislation includes **the Fisheries and Marine Resources Act 2007** and **Fisheries and Marine Resources Regulation 2007**.

According to the Fisheries and Marine Resources Act of 2007 only The Minister and Chief Commissioner has the power to declare, by regulations, an area in the maritime zone (including the seabed underlying such zones, any land associated with the maritime zones or any wetland) to be a Marine Protected Area.

There are three categories of Marine Protected Area designation which includes a Fishing Reserve, Marine Park or Marine Reserve. These are all a part of the sea, including any land found within that part of the sea.

In Rodrigues there Fisheries Reserve (which cover all bays), the four northern proclaimed Marine Reserves and a Marine Park (South East Marine Protected Area – SEMPA). SEMPA is a multiple-use marine protected area with a surface area of 43.7 km^2 including general use, conservation and seasonal use zones. It is enforced by nine rangers and managed both by the fisher community and the Rodrigues Regional Assembly.

The National Assembly and the Rodrigues Regional Assembly are the responsible for creating the legislation. The Fisheries Protection Service, National Coast Guard and Forest Services are the mandated authorities responsible for enforcing the legislation. There may be Field Rangers ######## as defined per laws and regulations.

There is currently a closed season for large net fishing, the fishery is open from 1st March to the 30th September every year. There several fisheries that are controlled by a permit system these include the seine net fishery (7 permits of which 6 are cooperatives and 1 individual), crevette fishery (13 permits of which 5 are cooperatives and 8 individuals), and the bait fishery (XXXXXXX).

According to the fisheries and Marine Resources Regulations 2007:

- No person shall carry out any fishing activities in a Marine Reserve or Fishing Reserve or a Marine Protected Area unless authorized in writing by the Departmental Head responsible for the subject of Fisheries.

- The different fishing methods and other activities to be authorized within the Maine Reserves shall be prescribed by the Commissioner responsible for the subject of Fisheries.

According to the Government Notice of 2001:

- General provision for the preservation of marine protected areas;

- Interference in Marine Protected Areas e.g no person shall place a mooring device or remove sand or interfere with any object o archaeological or historical interest

In a Marine Reserve unless he holds a permit.

- No person shall in any Marine Reserve or Marine Park engage in commercial activity unless he holds a permit.
- Referred to government notice No 172 of 2001
- [To be completed]

7 Management Issues/Threats

[This could include a summary of past, present and possible future issues/ threats and potential conflicts that are common to all the reserves. There is material available in the Status Reports, from the Workshop 1 report, including the annexes and from Community Consultation 1 report. Other sources of information include material from MSc projects.]

7.1 Common Issues

7.1.1 Overexploitation

Some fishers think that they do not catch too many fish because the general population don't have enough fish to eat. They do however feel that too many octopus are caught because they catch too many young ones which is not good. They used to catch species such as Vielle platte, Vielle voleuse, Banane, Madras and Giblo but they don't find them anymore. Fish catches have declined. Ten to fifteen years ago, when cast net were still allowed, you would throw it once and catch 15 kg of rabbit fish. Nowadays you throw it and you catch 2kg or less. Before you could catch capitaine of 6 - 7kg on a line in the lagoon and now you only catch capitaine of 1kg or less at the same fishing sites. Other species have also declined: kono kono don't have time to grow as people collect them too small and fishers say that all of the sea cucumbers have been collected.

Socio-economic surveys in 9 villages indicate that the majority of fishers think that their catches of fish and octopus have declined in the past 5 years, responses range from 70% at Baie du Nord to 94% at Baie aux Huitres and Baie Malgache (Stead et al. 2009). These results are supported by the Community Consultations during which most villages consulted also felt that catches have declined; only Baladirou thought that catches had increased, whilst Pistache said that they were the same (Blais et al., 2011; Perrine et al., 2011). Interviews with fishers show that 13 species are perceived to have been depleted over a 25 year period with large groupers being the most frequently cited. The white-blotched grouper (*Epinephelus multinotatus*; Vielle Plate) was cited more than any other species as depleted and many young fishers did not recognise it at all. Fishers also noted a gradual absence of sharks in the lagoon and older fishers remembered days when large fish and sharks could be hunted down by harpoon on foot or from pirogues (Bunce *et al*. 2008). Data from the Fisheries Research and Training Unit indicate that lagoon fish catches have declined significantly from 1,240 t in 1999 to 641 t in 2006, with on average 75 tonnes less caught each year. Octopus catches have declined from 775 t in 1994 to 266 t in 2006 (FRTU, unpublished data).

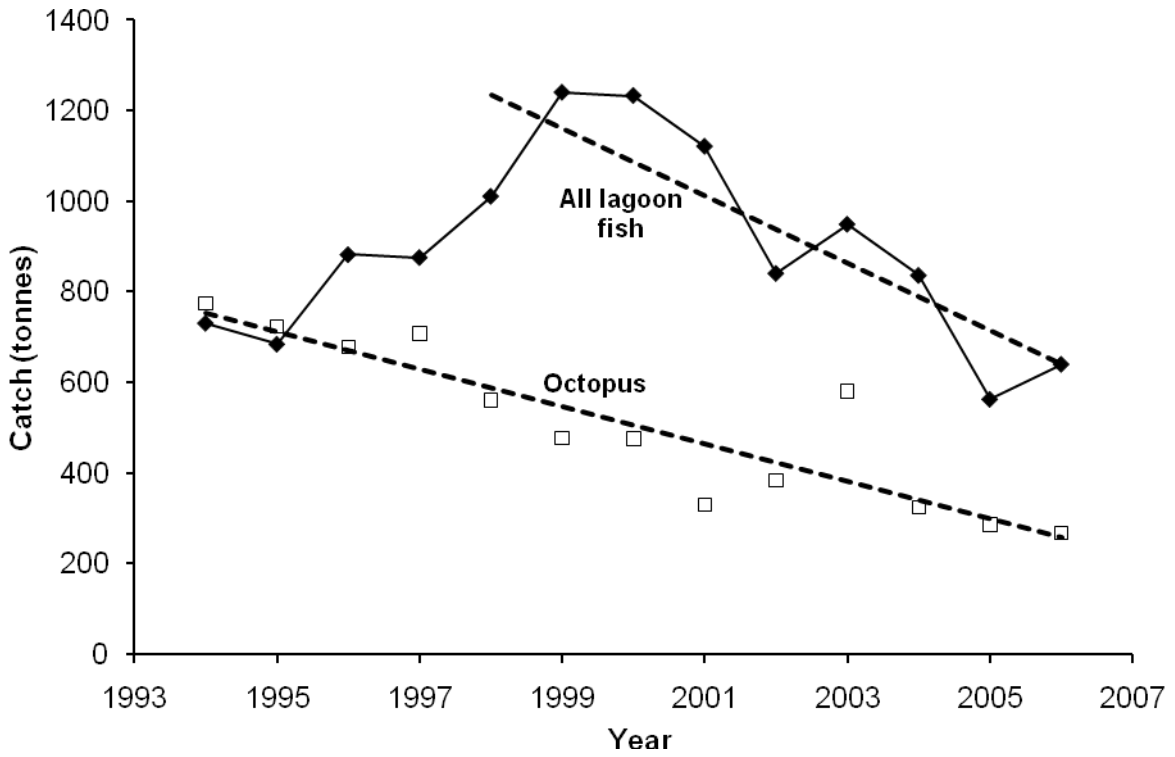


Figure ? Annual catch (tonnes) for lagoon fish and octopus between 1994 and 2006 (FRTU annual statistics).

7.1.2 Habitat Damage and Destructive Fishing Techniques

Fishers use many different types of bad practices: illegal net fishing, 'batatran' fishing, illegal basket trap fishing, 'epervier', spears, underwater fishing, oil spill, fishing with artificial light and parcs. These destroy corals, the abundance of fish diminishes and they catch spawning fish and juvenile octopus and fish. Fishers use these techniques as the abundance of fish has diminished. They help them to get the needed amount of fish.

7.1.3 Octopus Fishing

Octopus are caught all year round, but in winter they get the biggest. Fishers think the big ones come in the lagoon because the water is cooler. The octopus are sold to buyers and fishers are paid Rs 100 per kg. They make a lot of money from octopus as they can process them to make 'piment ourite', 'ourite grillé' and 'vindaille ourite'.

Some fishers spill motor oil in the lagoon to improve water clarity and ease location of the octopus. When they spread oil in the sea it gets deposited on algae and corals, which fish eat. People are reluctant to buy fish from a basket fisherman for example, because the fish has a bad taste. Illegal fishing activity takes place through the use of unauthorised implements, this provokes damage of the coral reef, degradation of the marine ecosystem and decline in fisheries. Octopus fishes trample on corals and while doing this, they overturn corals heads in search of octopus. This leads to substantial degradation of the marine environment. In the old days people were catching octopus

from their boat, not walking everywhere. The fishes hunt down small size octopus with their spikes, thus depriving the species to mature and spawn at least once in its lifetime, perpetuating the next generation.

Octopus catches have declined in recent years because there is so much illegal fishing; because there's an increase of octopus fishers in the sea; fishers don't give time for octopus to grow big and reproduce and also climate change. Fishers never get big octopus as we used to, "my biggest octopus I ever caught in 1984 weighed 8.5kg". During surveys undertaken in 2000, more than 40% of fishers reported a decline in octopus numbers with excessive fishing pressure being the most common reason cited for this change. The study showed that the octopus fishing grounds supported an average of 13 - 94 fishers who fish for 2 to 8 hours each fishing day. Mean catches ranged from 0 kg fisher^{-1} day^{-1} at Petite Butte and Riviere Coco to 3.5 kg fisher^{-1} day^{-1} at Baie du Nord. Seventy five percent of octopus caught weighed less than 800g, with fishers at 5 landing stations catching octopus weighing less than 100g (Lynch et al., 2001). Surveys undertaken during 2004 – 2005 and 2008 - 2009, also indicate that the majority of female octopus are being caught before they reach maturity (Jhangeer-Khan, 2010; Lynch et al., 2005).

Statistics collected by FRTU also show catches of octopus from the Rodrigues lagoon are still decreasing. This is a constant annual decline and the size of octopus is becoming smaller.

Annual catches of octopus within the lagoon

Year	Octopus (t)
2000	475.2
2001	328.7
2002	382.8
2003	580.2
2004	323.8
2005	285.0
2006	266.1
2007	254.1
2008	281.3
2009	278.4
2010	268.7

7.1.4 Seine net fishing

Seine net fishing takes place during the open season between 1st March and 30th September. The biggest catches are landed in March on the opening because the fishery has been given five months to recover. The fish are sold at the fish landing stations to the general public and buyers. The fishers do not make a lot of money but the owner of the nets does because he is the biggest investor, with boats and nets. There are currently 7 licences for seine net fishing in Rodrigues.

Data from the Fisheries Research and Training Unit suggests that catches from the seine net fishery have remained relatively stable, fluctuating about a mean of 224 tonnes per year between 1994 and 2006. In contrast, data collected by Shoals Rodrigues shows that Catch per Unit Effort for 4 of the

seine net teams declined significantly between 2002 and 2006 from 5.9 kg fisher^{-1} net. h^{-1} to 3.1 kg fisher^{-1} net. h^{-1} and this was accompanied by an almost 60% decline in fisher's earnings. Within the fishery, 51% of the catch consisted of herbivorous fishes and only 7% were piscivores. The majority of the species also tended to have a small maximum size (<50 cm TL) and a short lifespan (<10 years). Several of the most important species showed signs of serve overexploitation. The modal length of *Siganus sutor* ('cordonnier') decreased from 25-25.9cm in 2002 to 19-19.9cm in 2006 and 66% of landed fish were below the length of maturity. Only 9% of *Lethrinus nebulosus* ('captaine) and 4% of *Caranx melampygus* ('carangue') had reached maturity and both species showed declines in their modal length from 33-33.9cm in 2002 to <21.9cm in 2006. The composition of the catch has also changed in recent years. The relative importance of several locally favoured species (*Rhabdosargus sarba*, *Lethrinus harak*, *Chanos chanos*, *Kyphosus* spp. and *Polydactylus plebeius*) have declined more than tenfold in a decade and the emperor *Lethrinus mahsena* appears to have declined from a major constituent of the lagoon fishery in the 1970s to <1% of the seine net catch (Hardman et al, in prep).

Seine net fishery catches have declined because fishermen have increased and illegal fishing has increased as well. Too many juveniles are caught and corruption is a big issue. Seine net fishing also causes damage to corals and sea grass beds. It also affects species caught in line fishing because the techniques they use scare the rest of the fish away.

7.1.5 Basket trap fishing

Basket trap fishing takes place all year round. The biggest catches are in winter because that is the season you get the most unicornfish, rabbitfish and parrotfish and those fish are the ones you would catch the most in basket traps. The fish are sold at the fish landing stations to the general public and buyers. The fishers make a lot of money because most of the time there is just one owner, but it's seasonal.

Basket trap fishermen sometimes break corals to hold their traps in place. This affects the species of fish that don't get in basket traps because if corals are broken and that is their habitats, then they will leave. Catches have declined in recent years; with the general decline in fisheries all catches have gone down. This is because fishermen have increased and illegal fishing has increased as well. Too many juveniles are caught and corruption is a big issue. Thus basket trap fishermen suffer as their main targets are fished seasonally though they fish all year round.

7.1.6 Sea cucumbers

In April 2006, a 15 day permit for sea cucumber fishing within the lagoon was granted by the Mauritian government. At first, *Actinopyga* spp. was the only species exploited from the lagoon and fishing sites were concentrated in the south, accessed by boat or on foot at low tide. Catches were brought ashore to a makeshift processing station near Petite Butte and the dried product was exported to Mauritius. Sea cucumber collection continued beyond the 15 day period and other species such as *Holothuria* spp were also collected throughout the lagoon. Between April and August 2006, 86,300 sea cucumbers were collected in the south of Rodrigues and surveys by Shoals Rodrigues also showed that the number of sea cucumbers in the northern lagoon fell by 65% (from 667 to 234) at 1 site and by 90% at another (from 1,933 to 197) between 2006 and 2007. The fishery

was closed in 2008, however, as with the other fisheries in the Rodrigues lagoon, there has been a lack of enforcement and fishing for holothurians has continued (Jhangeer-Khan, 2010). The FPS has been unable to ensure full enforcement of the closed fishery, although confiscation of caught sea cucumber data has been reported since 1st July 2008 and 30th June 2009. Surveys show that the total number of sea cucumbers in the lagoon declined by 38% from 48.3 million in 2006 to 30.1 million in 2010 (Knott, 2010; Mrowicki, 2006).

Fishers think that people catch too many sea cucumbers and that they have been removing all species for three years. This affects other species because sea cucumbers are cleaners. Predators like 'capitaine' feed on juvenile sea cucumbers and if there is not enough food they won't stay in the lagoon.

[To be completed]

7.1.7 Coral 'parc' fishing

Parcs are built to catch fish when the tide goes out but when fish come in with high tide, they come across the parc and turn back. Parcs are used all year round on low tides. Catches are biggest in winter because that's when the water is cooler and more fish come into the lagoon. The fish caught are sometimes sold on the fish landing station and sometimes sold in their villages. Fishers can make a lot of money, depending on their catch which can be big.

To build the parcs the fishers move rocks and dead corals and sometimes they break live corals to suite the trajectory of the parc, which can be 100m long. This technique destroys the habitat. Long ago, they got more as there were not many people doing it and there were many more fish. Nowadays, there are less fish and many parcs.

7.1.8 Illegal fishing and lack of enforcement

Many types of illegal fishing take place in Rodrigues: underwater fishing, fishing without permit (shrimp net, large net), oil spill, 'batatran' creepers, seine net/basket traps with undersize mesh, fishing with artificial lights, collection of sea cucumber and shells. At low tide (on the reef, sand banks), they spread nets on the channel border. Underwater fishing (outside the lagoon near he reef, in passes, inside the lagoon) happens "kan gagne code ek fisheries".

Difficulties enforcing the existing fisheries regulations occur due to: inadequate laws, political interferences, corruption, not well equipped, not enough training for FPS officers. FPS Officers also face challenges due to arrogant higher officers.

Participants from the 1st workshop list up the following reason why they think that there is illegal fishing.

Why is there illegal fishing?

Lack of education and training	**Lack of enforcements/Governances (i.e. The law isn't strict enough)**
Way of thinking	Easy money
Lack of training	Corruption
Corruption in fisheries	Need an increase salary for civil servants
Lack of work on land	Arrogant higher officers
Poverty	Permit systems
A system which has been in place for a long time	Not enough patrol
Education - A way of living	Political backing
It's a vicious cycle	Too much of the attitude of letting things pass
They fish illegally before everything finish	

7.1.9 Bad weather allowance

The Bad Weather Allowance is the money given to registered fishers when they are not able to go out at sea because of bad weather and also because of storm swells. They receive Rs 215 per day, which is paid monthly. The Bad Weather Allowance was introduced because less fish is obtained therefore fishers need to go fishing more regularly but also to diminish the number of accidents at sea occurring during bad weather. The amount of money allocated has increased from Rs 30 in 1994 to Rs 215 in 2011 daily. In 2005, the lagoon was split into four zones, fishers from different zones get their allowance depending on the weather in that zone, so fishers in the north get less than the fishers in the south.

7.1.10 Erosion

[Areas where there is beach erosion is taking place and sand banks that are eroding. Use the local ecological knowledge maps from Workshop 1.]

[To be completed]

7.1.11 Climate Change and Natural Hazards

[Damage from tropical storms, cyclones and coral bleaching. Could use the Shoals Rodrigues coral bleaching reports and papers. Natural hazards such as cyclones and tsunamis with little communication system]

[To be completed]

7.1.12 Marine-based sources of pollution and litter

[Here you would describe any types of pollution (e.g. fishers spilling oil) and risks of oil spill from shipping. Also describe the issues associated with litter at sea sources from land and fishers throwing litter overboard, visitors to the islands dropping litter and litter transported from Rodrigues island.]

[To be completed]

7.1.13 Land-based sources of pollution

[Discuss issues in the land that affect the sea, such as run-off from farming areas, and river inputs that increase sedimentation. Sewage inputs? Desalination?]

[To be completed]

7.1.14 Infrastructure

Lack of suitable infrastructure is a particular concern at Riviere Banane. Suggestions of infrastructure needed include: rebuild the road from Brûlé to Riviere Banane; build a green space for tourists and villagers to rest; increase bus traffic on the road to Riviere Banane; build a corner shop on the beach; build a kiosque, tables, chairs, toilets, and bathroom for the public on the beach.

[To be completed]

7.2 Specific Issues

7.2.1 Easy Access (Rivere Banane and Anse aux Anglais)

[Easy access to the marine reserve both from land and sea]

[To be completed]

7.2.2 Difficult Access and Navigation (Grand Bassin and Passe Demi)

[Difficult to enforce in Grand Bassin because the area dries out and because there is a complicated channels which are difficult to navigate. At Passe Demi there is a need for channel markers.]

[To be completed]

7.2.3 Sand mining (Passe Demi)

[To be completed]

7.2.4 Squid fishing (Rivere Banane and Anse aux Anglais)

Any fisherman who has a boat and engine can go fishing for squid when the season comes (April to the end of winter). They catch the squid by trolling a lure especially for squid. Squid are caught on the reef flat and the immediate outer reef slope. Squid can be caught everywhere around Rodrigues but fishers catch them mainly where the reef is protected from strong winds. The biggest catches are landed around June. They are sold at Rs 250 per kg to hotels and restaurants and some to the general public. Fishers make a lot of money when their catch is good.

Catches of squid have declined in recent years because the number of people targeting squid has gone up; people get easier access to boats and engines and gears compared to 15 - 20 years ago. It is also because they are fished even during reproduction season. Squid fishing does not cause any damage at all to the habitat and does not impact other species.

7.2.5 Crevette fishing (Passe Demi)

Thirteen fishers have permits for crevette fishing but there are others without permits going out. To catch the prawns, they walk in the shallow sandy areas and use a shrimp net and torch. Fishing takes place all year round but in winter the tides are better. The crevette are sold to buyers, restaurants

and hotels and the fishers get Rs 300 per kg. They are consumed locally but some Mauritian tourists buy some to take back with them. The fishers can make a lot of money when their catches are big, however catches have declined in recent years. This may be because they are removing too many and they don't have time to reproduce. It may also be because of habitat damage. No study has been done on this fishery.

7.3 Future Demand

[Estimate future demand for recreational and other uses, and if applicable, future pollution loading and proposed developments. What are the future potential threats to these areas? You could include a short description here about potential future developments].

7.3.1 Conversion of in-lagoon fishers to off-lagoon fishers

The Government of Mauritius, in recognition of the degraded state of lagoon habitats and reduction in fish catches, has recently been encouraging the conversion of in-lagoon fishers to off-lagoon fishers. Over the past 20 years there has been a reduction in the landed catches from the lagoon. With the poor productivity of the lagoon, Government has been promoting both off-lagoon and fishing around Fish Aggregating Devices (FADs).

7.3.2 Port Extension

Every 5 years there is an update of the Port Master Plan, with the last one was done in 2009. The consultants have not recommended the enlargement of the port; they consider it necessary to enlarge the port. Pointe Monier is a safe berthing area and in the port plan Pointe L'Herbe (Baie Aux Huitres) is seen to become a fishing port in the future.

7.3.3 Cruise ships

There has been a proposal to put a cruise port in Port Mathurin in front of the Millennium Square. Some fishers are concerned that there are not enough facilities and activities for the potential increase in tourist population.

[To be completed]

7.3.4 Mari-culture of algae

There has been a proposal from Mauritius Research Council and the Rodrigues Regional Assembly for the development of seaweed farming within the Rodrigues lagoon.

[To be completed]

7.3.5 Mari-culture of sea cucumbers

There has been a proposal from the Mauritius Research Council and the Rodrigues Regional Assembly for the development of sea cucumber farming within the Rodrigues lagoon.

[To be completed]

7.3.6 Closed season for octopus fishery

[To be completed]

7.3.7 Octopus pot fishery

FRTU and FPS has done a trial octopus pot fishery study in 1998, there was no results as fishermen stole the pots. The reason why this might have happened is because that no sensitisation was done. Shoals Rodrigues also secured funding to undertake a pilot octopus trap project during 2004 - 2005. Octopus traps were placed at 5 locations in the north of Rodrigues (Totor, Passe Cabris, Passe Cocos, Grand Bassin and Dan Coude) and pots consisted of PVC tubes, clay and plastic pots. The traps were placed on the seabed on sand/rubble at 5-14m depth. Only 1 octopus was however caught in the traps during the study period, and so the project was not continued (Lynch et al., 2005).

[To be completed]

7.3.8 Proposal to increase the number of tourist visitors

There is a proposal to increase the number of tourist visitors to Rodrigues to 100,000. Some fishers think that it will be good for the community as it will promote the construction of hotels, guesthouse thus increasing work for the population; alongside this they recognise that activities must be created for the tourists which may create additional livelihoods and income generating activities.

At present tourists come to Rodrigues for the green destination (our natural biodiversity is still our strength), the welcoming kind-hearted population, for rest and calm, cheap living costs, the local products (handicrafts, food), and cultural events (e.g Festival Creole). The types of activities currently on offer include: hiking, cave visits, visits to the tortoise park, the beaches and scenery, boating, fishing, diving, snorkelling, kite surfing, visits to the islets, visits to the nature reserve (Solitude, Anse Quitor, Ile aux Cocos, and Grande Montagne), glass bottom boat trips and visits to SEMPA.

During peak season, however, there is not enough capacity on the island to accommodate the existing number of tourist visitors and rental facilities (e.g. car, bike etc.). The development of the tourism sector is constrained by a lack of accommodation, hospitality training and other tourism training, poor communication tools (e.g. poor internet connection), difficult access to the island, a boycott on selling Rodrigues by Mauritian agencies, limited funding for promotional events, and limited availability of land suitable for development and the high cost of air tickets.

The further development of tourism will increase the demand on natural resources (food, space) and may result in overuse. If more tourists arrive, and it is not well managed, there may be problems with pollution or heavy traffic. The local population may not be ready to cope with the situation, or prepared to alter our cultural values and habits. Many tourists means major development and it may not always be favourable for the population.

There is however the potential to develop tourism activities in a more sensitive manner. The Marine Reserves and SEMPA present a potential opportunity for tourism, for diving, snorkelling, kite surfing, surfing, islet visits, glass bottom boat tours and regattas. There are also opportunities outside the reserves that could be further developed associated with deep sea fishing and sailing. There are also other opportunities that could be developed on land such as hiking trails, mountain biking, visits to the nature reserves and caves.

The development of tourism may be threatened by a lack of information about the destination, high tickets costs, lack of accommodation, not enough flights and the fact that bigger ships cannot enter the port (e.g. cruise ships)

7.3.9 Land based development

- Cutting of trees will cause soil erosion.

- Too much building near the coast will lead to sea pollution if wastes are directed to the sea.

7.4 Conflicts

7.4.1 Current conflicts

There are a number of current concerns related to tourism: Kite surfing may disturb fishes and birds causing them to move from their habitats; Some tour operators fish in the marine reserve while diving; Too much diving on the same spots, causing tourist overload and disturbing marine life; Some divers sometimes walk on and break corals; Operators sometimes catch small fishes.

There are current conflicts between tour operators and fishers because some tour operators practice both tourist activities and fishing and also because fisherman have to go further due to tourist activities in the lagoon causing fish to move away.

7.4.2 Future conflicts

7.4.2.1 Carrying capacity of the marine reserves

There are plans to increase the number of tourist visitors coming to Rodrigues in future years. The government is targeting 100,000 tourists in the next three years. Some people think that this is too many tourists. Already, during the peak tourist season, there is always the problem of accommodating all the tourists on the island. So there may need to be additional controls put in place to minimise the impact of tourism on the marine environment. These might include: Controlling and managing the number of visitors in the reserve; Controlling time for access; Imposing rules and regulations for tourism operations in the reserve; Encouraging tour operators to do some activities outside the reserve.

7.4.2.2 Equitable access to the benefits of marine reserves

With the increase in tourist numbers, fishers are concerned about whether they will benefit from the tourism potential of the marine reserves when other non-fishers and possibly non-Rodriguans may have more money available to them to be able to buy boats.

Not all fishers will directly benefit from the marine reserves, but there can be other indirect opportunities resulting from the activities in the reserve. In order to try to ensure that the fishers benefit from the tourism fishers can be encouraged to turn to tourism activities in the reserve and mainly fishers can be recruited to work in the reserves (e.g. rangers, souvenir shops etc.)

7.4.2.3 Impact of recreational activities

Recreational activities could provide other sources of revenue for the fishers. However, there could be too much pressure in the reserve if number of visitors is not controlled. This means that the reserve might not be able to reach its main goal if there are too many activities inside the reserve. This might lead to conflicts between tour operators (kite surfers and divers).

7.4.2.4 Squid fishing

[To be completed]

7.4.2.5 Crevettes fishing

[To be completed]

7.4.2.6 Aquaculture

[To be completed]

7.4.2.7 Port development

Future port developments will result in bigger ships that would come docking, bringing different kinds of tourism like cruise ships, yacht sailors, and tourists coming for long-term holidays. This would bring more benefits to the community. However, there might be more pollution due to more traffic in the port. There might also be overexploitation of our resources to satisfy tourist demand leading for example to overfishing. This might be worst for the lagoon environment.

8 Management Strategies & Actions

8.1 Governance

BUT 1: Meilleur control ek respe plan gestion par ban dimounes qui servi ek protégé la mer

1.1 L'autorité de gestion pou ban réserve gagne établi ek respecté dans prochaine 5 ans (decision-making and management authority established, respected and accountable within 5 years).

- **1.1.1** Faire l'autorité la vine officielle ek plan gestion implemente et processus effective dan prochaine 5 ans (make the management authority official and the management plan implemented and process effective in the next 5 years).
- **1.1.2** Sa l'autorité ena pouvoir pou capave gere ban reserves (an authority with power to be able to manage the reserves).
- **1.1.3** Sa l'autorité la li bizin capave continue travail avek n'importe ki government (the authority needs to be able to continue to work regardless of who is in government).
- **1.1.4** Sa l'autorité bizin enan ene head office (the authority needs to have a head office).

1.2 Capacité sa l'autorité ki pou veille banne réserves la, li augmenté dan prochain 5 ans.

- **1.2.1** Watch tower (tour de control pou chaque reserve) (watch/control tower for each reserve)
- **1.2.2** Restructure of FPS – need continuous learning to go through the steps of promotion
- **1.2.3** Augment ek finance formasion pou officiers Fisheries (Improve and finance training for FPS officers)
- **1.2.4** Ene echange avek d'autre pays (an exchange with other countries)
- **1.2.5** Bizin trouve financement pou formation et ekipment pou bane ki veille reserve (Need to find funding for training and equipment for surveillance for the reserves).
- **1.2.6** Surveyans 24/24 → 7/7 (Surveillance 24hours/24 hours, 7 days a week)
- **1.2.7** Develop banne les autres techniques surveillance (camera etc) (Develop other surveillance techniques)
- **1.2.8** Plis dimoun pou vey bane reserves lizour ek asoir; bizin search lights puissant; bizin lekipman special kouma GPS, camera photo, radar (Need more people for surveillance during the day and at night (2 boats during the day. 3 boats at night); need powerful search lights; need special equipment such as GPS, camera, radar)

1.3 Participation tous dimoun ki servi lamer dans gestion ek surveillance ban reserves marins renforci ek ameliorer dans prochain 5 ans (Community and resource user participation in management and surveillance of the marine reserves strengthened and enhanced within 5 years).

- **1.3.1** Ene echange avek d'autre pays pou ban rangers (an exchange with other countries)
- **1.3.2** Hotline anonyme (anonymous hotline)
- **1.3.3** Servi ban fradeur ek pecheur pou travail avek lotorité couma rangers ou boatmen (Use illegal fishers and fishers to work with the authority as rangers or boatmen).
- **1.3.4** Rangers bizin ena pouvoir (rangers must have power)
- **1.3.5** Form ban dimoun ki ena volonter pou partisipe dan gestion (train people who have volunteered to participate in the management).

1.3.6 Joint patrol: FPS ek ban rangers (pas lor meme bato mais ene sel communication) (Joint patrol: FPS with fishers (not on the same boat but in communication with each other)).

1.4 Conflits avec tous bane dimoun ki servi la mer dimunié ek gere dans prochain 1ans (Conflicts between all resource users mitigated and managed in 1 year).

1.4.1 Autorise la peche crevette mais avec controlle et sepcifie: temps, no. permits, amount, place; (ii) close and open season; (iii) fer monitoring: quantité, reproduire (Allow prawn fishing but with control: specified time, number of permits, amount, place; (ii) closed and open season; (iii) undertake monitoring: amount of prawns, reproduction).

1.4.2 Bizin enn pasaz spesifik pou bato ki al lapes endehor (renter ek sorti) pou reserve Grand Bassin (need a specific passage for boats who fish off lagoon (enter and leave the lagoon) for Grand Bassin Marine Reserve).

1.4.3 Code de conduit pou ban tourists (Code of conduct for tourists)

1.4.4 Encourage ban tour operateurs ek pecheur travail ensemble (Encourage tour operators and fishers to work together).

1.4.5 Speed limit in the reserve.

1.4.6 Tickets pou banne operateurs pou renter dan reserves (Permit for tour operators to enter the reserves).

1.5 Banne structures legal ek strategie de gestion maintenu (effective legal structures and management strategies maintained)

1.5.1 Amende ban reglements (amend the regulations).

1.5.2 Ban la lois ban reserves marin implementer ek appliquer efficacement (Marine reserves regulations implemented and effectively enforced)

1.5.3 Renforcement bane la lois (Fisheries & Marine Resources Act) déjà existants endehors bane reserves (Existing fisheries regulations outside of the Reserves reinforced).

1.5.4 Renforci et plis transparence lor EIA lors ban projet qui touché ban reserves (Enhancement and more transparency for EIAs).

1.5.5 Structure en place bizin fonctionne dans transparence (the structure in place needs to function with transparency).

1.5.6 Ene la loi specifique qui plis severe quand enan corruption par ban dimounes qui veille reserves (a specific law which is more severe when there is corruption by those who are responsible for surveillance of the reserves).

1.6 Linkages & Partnerships

1.6.1 Lien ek ban comité qui ena ene role a joué dans l'établissement ban reserve, par exemple ICZM committee, oil spill committee (linkages with committees who have a role to play in the establishments of the reserves, for example the ICZM committee, oil spill committee).

1.6.2 Travail ek echange avec ban organisations locals ek internationals qui enan lien avec ban zones protégé (work together and exchange with local and international organisations who have links with protected areas).

1.7 Evaluation ek reguet plan gestion (Evaluation and revision of management plan)

1.7.1 Suivi de ban activités qui énan dans plan gestion (assessment of the activities included in the management plan).

1.7.2 Assurer qui tous ban partenaires au courant qui pe passé a travers distribution ban rapports (ensure that all partners are kept up to date through the dissemination of reports).

1.8 Financement ban reserves (Funding of the reserves)

1.81 Ene compte pou structure de gestion (An account for the management structure)
1.82 Fees from entering the reserves go to the account.
1.83 Bizin faire tout pou qui ban reserves la li vine financierement soustenable (need to do everything to ensure that the reserves are financially sustainable).
1.84 Transparence dans comptabilité (transparency in accounting).

8.2 Livelihoods

BUT 2: Bane resource vine soutenable pou ki securité alimentaire amelioré ek ene meilleur qualité la vie (Resources are sustained so that food security improves and livelihoods are enhanced).

2.1 Suffisament produits la mer de qualiter, variete, endan ek autour bane reserves ameliore ek soutenable dan prochain 5 ans (Availability of a variety of high quality locally caught seafood inside and outside of the Reserves improves and is sustained in the next 5 years).

2.1.1 Development hors lagon dan ene fason soutenable (Development of off-lagoon fishing in a sustainable way).
2.1.2 Creé ene bazarre poisson pou donne valeur bane produit sa bane pecheurs enregistré (Create a fish market to give more value to the fish of registered fishers)

2.2 Plusieurs source revenue pou bane fami augmenté ek stabilisé dan prochain 5 ans (Diversification of household income increases and [revenue] stabilises within 5 years).

2.2.1 Cree lemplwa avek miz en plas bann reserve (rangers, boatman, watchmen, plis bokou ofisie FPS, plis staff Shoals etc) (create jobs by establishing the reserves (rangers, boatmen, watchmen, more FPS officers, more staff at Shoals Rodrigues)).
2.2.2 Cree lezot travay pou peser a ter ek dan lamer (plant gomon, transformasion poisson, plant lor later etc) (create other jobs for fishers to do on the land and in the sea (seaweed farming, fish processing, planting on the land)).
2.2.3 Forme bann dimoun pou fer sa bann nouvo travay (train people to do the new jobs)
2.2.4 Asire ki ena finansman pou soutenir developman sa bann travay la (ensure there is financial support for the development of alternative livelihoods).
2.2.5 Bizin donne l'importance ek acheter nou bane produit locale (Should market and buy our local products).
2.2.7 Faire bane activité dans village pou attire touriste ek RRA bizin ameliore ek develop infrastructure pou support sa bane activité la (Do activities in the villages to attract tourists and the RRA should improve and develop the infrastructure to support these activities).
2.2.9 Suivi lors depans ek revenue ban fami ek ban zenfan dans lecol (surveys of household spending and income and of school children).

2.3 Distribution equitable bane benefices reserves pou bane villages cotiers dan prochain 5 ans (benefits from the marine reserves distributed equitably to and through coastal villages within 5 years).

2.3.1 Etude socio economique (socio-economic study)

2.3.2 Donne priorité ban villageois pou develop bane activités qui amen revenue autour ban reserves (Give priority to villagers to develop income-generating activities around the reserves).

2.3.3 Develop bane activité touristique ki assuré ki bane pecheurs implik la dan avek zotte propre moyen (zot ti pirogue) (Develop tourist activities with assurance that fishers will be invovled with their own means).

2.3.4 Bane tour operateurs bizin employe bane pecheur qui ti servi reserve la (Tour operators should employ fishers who used to fish in the reserves).

2.4 Renforcement capacité local pou servi zot ban resources de ene façon durable (Local capacity built to use resources sustainably increased).

2.4.1 Developpement ek facilite pou la peche dehors/ et development ban bon techniques la peche dans lagon ek dehors (development of and facilities for off-lagoon fishing/ and development of good fishing techniques in the lagoon and off-lagoon).

2.4.2 Formation dans ban techniques monitoring, other training that have to do with marine reserves/ for every stakeholders (training in monitoring techniques…)

2.4.3 Consientize ban pecheur pou servi banne bon method la peche ek sanz mentalité (Sensitise fishers to use non-damaging fishing techniques and to change their way of thinking).

8.3 Biology & Conservation

BUT 3: Fond marine ek biodiversité protegé (Marine habitats and biodiversity protected)

3.1 Fonds marins ek biodiversité dans reserve li gagne protégé contre banne impacts humain endans ek dehors reserve et qui zot montre banne signe regeneration dans prochaine 5 ans (Marine habitats and biodiversity inside the reserve are protected from human impacts inside and outside the reserves and show signs of recovery within 5 years).

3.1.1 Permet seulement passage ek observation dan reserves (refer to legal supplement) (permit only passage and observation in the reserves).

3.1.2 Met mouyaz pou ban bato tourist pa met lank (put permanent moorings so that tourist boats don't use anchors)

3.1.3 Met ene limitation vittesse dans reserve (establish a speed limit in the reserve).

3.1.4 Met ene place et maintenir bane buoys demarcation (put in place and maintain demarcation buoys).

3.1.5 Plis buoys demarkasion pou Grand Bassin (more demarcation buoys for Grand Bassin)

3.1.6 Controlle invasion bane organism envahissant (control introduction of invasive species).

3.1.7 Consulte bane expert national ek international kan neccessaire (consult national and international experts when necessary).

3.2 Met en place ek implement ene plan de suivi pou prochaine 5 ans (Set-up and implement a monitoring plan for the next 5 years).

3.2.1 Faire suivi lor bane prise dehors bane reserves (Undertake catch surveys outside of the reserves).

3.2.2 Faire suivi lor fond marin endans et dehors bane reserves (Undertake surveys of the marine habitats inside and outside of the reserves).

3.2.3 Faire suivi lor abundance, diversité ek grosseur bane poisson endans et dehors bane reserves (Undertake surveys of the abundance, diversity and size of fish inside and outside of the reserves).

3.2.4 Faire suivi lor ban l'espece rare, endemique ek important (Undertake surveys of rare, endemic and important species).

3.2.5 Faire ene suivi lor qualité delo endans ek endehors reserves pou detecté pollution (Undertake water quality surveys inside and outside of the reserves to detect pollution).

3.2.6 Ene suivi l'erosion ek pollution lor la cote (a study of erosion and polluaiton on the coast).

3.2.7 Met en place ene plan de reaction rapid en cas de desastre naturel e.g. blanchissement de corail, tsunami etc (Set-up a rapid response plan in case of natural impacts e.g. coral bleaching, tsunami).

3.2.8 Met en place ene system suivi kot ranger ek communauté pou participe dan ban suivi mené par ene officier scientifique (Set-up a system whereby rangers and the community will participate in monitoring surveys lead by a scientific officer).

3.3 Encourage tou recherche ki pou support gestion et augment nou connaissance lor bane reserves (Encourage all which will support management and increase our knowledge of the reserves).

3.3.1 Tou recherché dan reserves bizin permit (all research in the reserves needs a permit)

3.3.2 Terms and Conditions pou recherche bizin gagne etabli (Terms and Conditions for research need to be established).

3.3.3 Communique avec lezot ban Parc Marin, ban l'université ek les autres organisations dan le region (Liaise with other MPAs, universities and other organisations in the region).

3.3.4 Bizin met ene l'etude pou cycle crevette et mourgate (need to do a study on the life cycle of the prawns and squid)

3.3.5 Bizin identifier si l'erosion la (i) nature ou (ii) deriver depuis lot development et aussi ki quantité disab pe bouger (need to identify if the erosion is: (i) natural or (ii) arising due to other developments as well as the amount of sand that is moving).

3.3.6 Bizin fer ene l'etude combien touriste capav ena lor Ile aux Cocos a la fois (need to do a study to find out how many tourists can be on Ile aux Cocos at one time).

3.3.7 Encourage recherche lor ban l'espece rare ek endemique et lor ban l'endroit critic (encourage research on rare and endemic species and on critical habitats)

3.4 Bane impact terrestre controlé ek geré dans prochaine 5ans (Land-based impacts managed/mitigated in the next 5 years).

3.4.1 Servi compost (Use compost)
3.4.2 Traitement ban eaux uses – recyclable irrigation (treatment of wastewater; irrigation using grey-water)
3.4.3 Terrace en roche (build rock terraces)
3.4.4 Plant mangliers (plant mangroves)
3.4.5 Reforestation ban la cote, gabions et kot capav planté (Reforestation of the coasts, gabions and areas where trees can be planted).
3.4.6 Reforestation avec banne plantes qui capave enan ene valeur economique – vetiver, artisanat, huile essentielle (Reforest with plants that may have an economic value – 'vetiver' for artisanal products, essential oils).
3.4.7 Banne drain gagne nettoyé plis souvent (the drains are cleaned more often)
3.4.8 Ramassage ek tri des dechets; recyclage; poubelles en place; beach clean-up (collect and separate waste; recycling; bins erected; beach clean-up)
3.4.9 Bizin encourage dimoune servi poubelle (Must encourage people to use bins)
3.4.10 Nou bizin controlle saleté depis la cote et aussi ban bato ki zet saleté dan la mer (We need to control rubbish from the coast as well as boats who throw rubbish into the sea).

8.4 Emergencies

BUT 4 Dezastres, menaces ek urgences (Disasters, threats and emergencies)

4.1 Banne risks qui associé avec banne dézastres ek urgence geré à travers preparation ene plan dans prochaine 5 ans (Risks associated with natural disasters are managed through preparation of plans within 5 years.)

4.1.1 Communique ek bane committee en place pou tsunami, cyclone, erosion, tremblement de terre, oil spill (Communicate with established committees for tsunamis, cyclones, erosion, earthquakes, oil spills).
4.1.2 Aide tou pecheurs en danger san met zot propre la vie en danger (help all fishers in distress without putting their own life in danger).
4.1.3 L'equipe oil spill bizin disponible pou al lor site en cas d'urgence pendant pompage (The oil spill team should be available to go on site in case of emergencies when oil is pumped).
4.1.4 Formation regulier pou l'equipe oil spill pou zot rest up to date (regular training for the oil spill team so they stay up to date).

4.2 **Met en place infrastructure neccessaire et etablir ene systeme communication adequate en cas d'urgence pou donne l'information lors banne reserves dan prochaine 5 ans** (Set up the necessary infrastructure and establish an adequate communication system for the marine reserves in the next 5 years)**.**

4.2.1 Renforce committee (MRCC) pou encharge tout bane reserve (Strengthen the committee (MRCC) to be in charge of all of the reserves)
4.2.2 Forestry service/police l'environnement bizin plis vigilant; carte avec ban numero telephone important; panneau information (no tel) dan village) (Forestry

Service/Environment Police should be more vigilant; need a card with important phone numbers on so people know who to call; information boards (telephone numbers) in the village).

4.2.3 Met en place bane systeme d'alerte pli efficace (establish more effective alert systems)

4.2.4 Servi tou moyen communication ki ena en place pou communik information (use all forms of communication there are in place to communicate the information).

4.2.5 Bizin met ene channel marker pou la Passe Demi et partout kot bizin (need to put a channel marker for Passe Demi and wherever they are needed).

8.5 Sensitisation

BUT 5 Sensibilisation ek connaissance amelioré (Environmental awareness and knowledge enhanced)

5.1 Connaisance ek compréhension lors l'environman marin ek couman servi li, amelioré dan prochaine 5 ans (Public awareness and understanding of marine conservation and resource use issues improved within 5 years).

5.1.1 Etablir ek implement ene program sensibilisation et education ki pou touche tou dimoune dan Rodrigues (establish and implement a sensitisation programme to reach everyone in Rodrigues).

5.1.2 Programme l'education pou tourist (Education programme for tourists)

5.1.3 Programme l'education pou boatmen ek tour operateurs (Education programme for boatmen and tour operators).

5.1.4 Programme l'education pou pecheurs (Education programme for fishers)

5.1.5 Programme l'education pou committee village (Education programme for village committees)

5.1.6 Bizin ene centre information pou bane reserve (Need an information centre for the reserves).

5.1.7 Inclure conservation marine dan program l'ecole (include marine conservation in the school curriculum).

5.1.8 Bizin pran bane pecheur faire zotte ale dan bane pays ki ena reserve pou faire zot trouvé comma reserve marché (should take fishers to other countries that have reserves to show them how marine reserves work).

5.1.9 Bizin inclure bane ti livret dan bane centre communautaire l'emphase lor protection et conservation l'environement (Should include booklets about protection and conservation of the environment in the community centres).

5.1.10 Assuré ki public en general gagne ene bon connaissance lor reglement bane reserve marin (Ensure that the general public has a good understanding of the Marine Reserve regulations).

5.2 Sensibilisation lors banne zefforts conservation marine dans Rodrigues au niveau national, regionale ek internationale augmenté dans prochaine 5 ans (National, regional and

international awareness of the marine conservation efforts on Rodrigues increased within 5 years).

5.2.1 Faire bane magazine, penflet, film ek site internet zis pou Rodrigues lor reserves marin (do a magazine, pamphlets, film and an internet site just for Rodrigues about the marine reserves).

5.2.2 Bon campagne mediatique (posters, flyers, T-shirts) (a good media campaign)

5.2.3 Faire parti reseau Aires Marines Protégé l'Ocean Indien (Become part of the Indian Ocean network of Marine Protected Areas).

5.2.4 Bizin concentre nou bane z'effort lor marketing pou assure ki tou bane visiteur sympathize avek nou bane vision ek objectif et aussi vend nou bane reserve couma ene destination tourist (Need to concentrate our efforts on marketing to assure ensure that all visitors our sympathetic towards our vision and objectives and also market our reserves as a tourist destination).

9 Rules & Regulations

[To be completed]

10 Evaluation and Assessment

[To be completed]

11 Budget

[To be completed]

Goal	Item	Costs (MUR)	Notes
Governance	Head Office & Education Centre	10,000,000	Includes furniture & equipment
	Ranger Stations & Watch Towers (x4)	2,000,000	Rs 500,000 for each
	20 Additional FPS Officers	2,880,000	Salary Rs 12,000/month
	Training courses for FPS Officers:		
	Diploma in Marine Ecology	750,000	150,000 per person - for 5 Officers (Mauritius)
	Dive training for 20 Officers	240,000	12,000 per person for Open Water (Rodrigues)
	Lifesaving & swimming for 20 Officers		With dive training (Rodrigues)
	The law & collecting evidence		20 Officers per year - in collaboration with Police training (Mauritius)
	Refresher course for procedures & the law		All staff every year (Rodrigues)

	Boat handling & maintenance	1,000,000	All staff (Rodrigues - bring instructor from Mauritius)
	Self Defence		All staff (Rodrigues - bring instructor from Mauritius)
	1st Aid		All staff - with Red Cross/St John's Ambulance (Rodrigues)
	Use of equipment		All staff (Rodrigues)
	Management training for higher officers		Mauritius
	An exchange with other countries		
	Equipment for surveillance:		
	2 Boats	2,000,000	1 inboard; 1 outboard
	10 Radios with integrated GPS	200,000	Rs 20,000 each (est)
	20 Binoculars	60,000	Rs 3,000 each (est)
	20 Binoculars (with night vision)	480,000	Rs 24,000 each (est)
	20 Hand-held Search Lights		
	8 GPS	48,000	Rs 6,000 each (est)
	5 Cameras		
	Life jackets (for all staff)		
	Radar		
	Anonymous Hotline	4,300	Rs 3,100 installation costs + Rs 100/month
	6 Boats (2 large boats for off-lagoon; 4 small boats for in-lagoon)	3,000,000	Rs 200,000 for small boat & engine; Rs 1,100,000 for large boat & engines
	2 spare engines	300,000	
	Fuel for boats	2,737,500	150 litres/day at Rs50 per litre
	Vehicles (3 cars)	2,100,000	Rs 700,000 each
	Rangers (4 in RB; 4 in AA; 8 in GB; 8 in PD)	2,592,000	Salary Rs 9,000/month
	Marine Reserve Manager	480,000	Salary Rs 40,000/month
	Science Officer	300,000	Salary Rs 25,000/month
	Education Officer	300,000	Salary Rs 25,000/month
	Administration	240,000	Salary Rs 20,000/month
	Receptionist	120,000	Salary Rs 10,000/month
	Store Man	72,000	Salary Rs 6,000/month
	Driver x 2	240,000	Salary Rs 10,000/month
	Cleaners x 6	468,000	Salary Rs 6,500/month
Livelihoods	Socio-economic monitoring	450,000	
Biology	Monitoring overheads & admin	100,000	
	Scientific equipment:		
	Water Quality kits	400,000	
	Weighing scales	120,000	
	Fisheries survey equipment	50,000	
	4 sets of dive kit	240,000	
	Dive insurance	48,000	Rs 12,000 per person per year
	Measuring tapes	15,000	

	Camera & housing	50,000	
	13 Permanent mooring buoys	390,000	Rs 30,000 each
	Demarcation buoys (8 in RB; 8 in AA; 12 in GB; 10 in PD)	1,140,000	Rs 30,000 each
	Training for participatory monitoring (rangers and community):		
	Theory training for 60 CROs	27,000	Rs 450 per person
	Practical training for 60 CROs	24,000	Rs 400 per person (octopus & fish)
	Workshop fees	15,000	
	Training for 24 rangers	20,400	Rs 850 per person (see above)
	Additional training for Rangers	500,000	
Emergencies	Channel marker		
Sensitisation	Education materials	500,000	
	Marketing	100,000	

12 Bibliography

[To be completed]

Report from Workshop 1 (7th-11th December 2010):

Klaus, R., Hardman, E.R., Desire, S., Blais, E., and Raffaut, R. (2011a). Report on MPA Planning Workshop 1 (7th-11th December 2010, Mont Plaisir, Regional Cultural Community Centre, Malabar, Rodrigues). Improving management effectiveness for the Marine Protected Areas of Rodrigues (Indian Ocean). 45p + annexes.

Report from Workshop 2 (17th-19th January 2011):

Klaus, R., Hardman, E.R., Desire, S., Blais, E., Rafin, J., Perrine, S. and Raffaut, R. (2011b). Report on MPA Planning Workshop 2 (17th-19th January 2011, Anse Aux Anglais Community Centre, Rodrigues). Improving management effectiveness for the Marine Protected Areas of Rodrigues (Indian Ocean). 30p + annexes.

Report from Workshop 3 and Training Workshop (2nd-6th May 2011):

Hardman, E.R., Klaus, R., Desire, S., Blais, E., Rafin, J., Perrine, S. and Raffaut, R. (2011c). Report on MPA Planning Workshop 3 and MPA Training Workshop (2nd-6th May 2011, Anse Aux Anglais Community Centre, Rodrigues). Improving management effectiveness for the Marine Protected Areas of Rodrigues (Indian Ocean). 38p + annexes.

13 Annexes

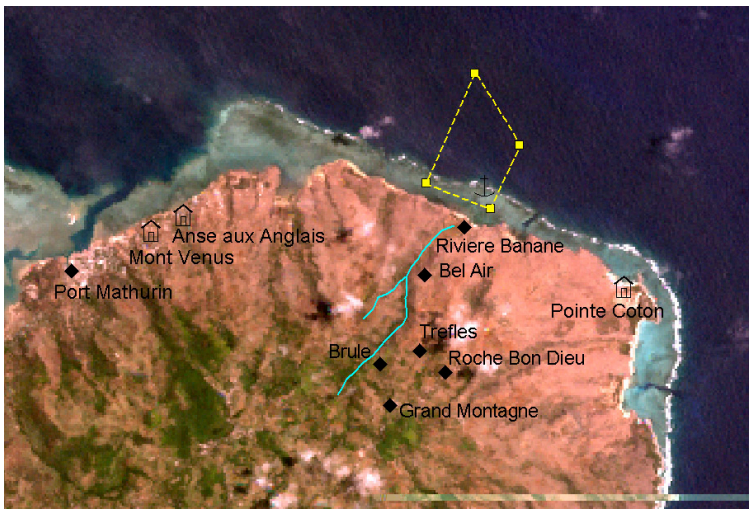
13.1 Status Reports

[To be completed]

Name: Riviere Banane Marine Reserve

Location:

	Area (Km^2)	Perimeter (Km)	Boundaries			
			Outside lagoon		Inside lagoon	
Riviere Banane	1.5	5.3	19° 39.936 63° 28.874	19° 39.328 63° 28.500	19° 40.473 63° 28.628	19° 40.257 63° 28.085



Depth: 0.5 – 20m.

Main habitats: The Riviere Banane Marine Reserve includes an area of the lagoon extending out towards the reef flat and the shallow fore-reef slope to a depth of 20m. The lagoon habitat is composed mostly of sand and coral rubble, overlying a coralline platform (Orr, 2008). The reef flat consists of a coralline platform covered with turf algae and small compact coral colonies. The shallow reef slope is dominated by live coral, consisting of branching *Acropora* (*Acropora abrotanoides*).

Current status: In the lagoon, the dominant biological cover is brown and green macroalgae (50 % cover); coral colonies occur in the lagoon habitat as small isolated blocks on the sand and coral rubble substrate (Orr, 2008). Coral cover is high on the edges of 'Aquarium', however the area appears to be

impacted by fishing activities (discarded and broken basket traps, fishing line).

The reef flat is degraded with low live coral cover (19% cover in 2010) and high turf algae (66%) (Shoals Rodrigues, unpublished data). Changes have occurred over time, with high macro-algal cover recorded in March 2003 (17%) and high turf algae (>70%) in October 2003, March 2006 and March 2007 (Hardman et al., 2008). The macro-invertebrate community on the reef flat is dominated by *Echinometra mathaei*, which is very abundant (>600 individuals per 100m^2) (Shoals Rodrigues, unpublished data); this species has increased in abundance from October 2005 onwards (Hardman et al., 2008). Fish are neither abundant nor diverse on the reef flat, with Parrotfish, Wrasse, Damselfish and Surgeonfish most commonly observed; large predatory fish are rare, indicating overfishing.

The reef slope is healthy with 69% coral cover (Shoals Rodrigues, unpublished data). There have been changes over time due to very high macro-algal cover in October 2004 (40%) and increased turf algal cover from March 2006 onwards (>20%) (Hardman et al., 2008). Invertebrates are less common on the reef slope, with *E. mathaei* and *Echinothrix diadema* most commonly recorded (Shoals Rodrigues, unpublished data). Fish are more common on the reef slope, but the community is still dominated by Surgeonfish and Damselfish and large predatory fish are rare.

Although corals have bleached in other parts of Rodrigues during 2002, 2005 the corals within the Riviere Banane Marine Reserve have not been affected by bleaching and remain healthy (Hardman et al., 2007). Surveys have identified 106 reef fish species, 58 species of coral and 32 species of invertebrates.

Endemic information:

The endemic coral, *Acropora rodriguensis* is found on the reef flat. The damselfish, *Pomacentrus rodriguesensis* which is found only in Mauritius and Rodrigues, is common on the shallow reef slope (5 – 10m depth) (Hardman et al., 2006a). The anemonefish, *Amphiprion chysogaster* which is found only in Mauritius and Rodrigues,occurs within Aquarium.

Survey information:

Shoals Rodrigues has carried out the following surveys:

- Annual monitoring surveys (benthos, reef fish and invertebrates) on the reef flat and reef slope in the Riviere Banane Marine Reserve since 2002 using the Global Coral Reef Monitoring Network methodology (see Coral Reef Monitoring Reports in bibliography).
- Seine net fishery monitoring surveys within the boundaries of Riviere Banane Marine Reserve since 2002 (see Seine Net Fishing Monitoring Reports in bibliography).
- Coral bleaching surveys in 2002, 2005 and 2006 (Hardman et al., 2004; 2007; 2008).
- A socio economic baseline study conducted in May-July 2006 using the Soc-Mon methodology in Riviere Banane, Rodrigues (Hardman et al., 2006b).
- Other surveys have been undertaken within the Riviere Banane Marine Reserve by MSc students (Alemu, 2008; Knott, 2010; Mrowicki, 2006: Orr, 2008).

Main resources uses: 56 registered fishers from Rivière Banane, Brulé, Trefles, Roche Bon Dieu, Bel Air and Grand Montagne fish within the Marine Reserve. Fishing is carried out for octopus using harpoons and fish using basket traps and lines. Seine net fishing is undertaken by the team from Pointe l'Aigle (0.7% of hauls between 2002 and 2006) and the team from Pointe Coton with *Siganus sutor* being the most commonly caught species.

Recreational and tourism uses: There are at least 6 tour operators who offer snorkelling and diving within the Marine Reserve (Blais et al., 2011). Snorkelling takes place at 'Aquarium' organised by hotels and tour operators from Port Mathurin, Anse aux Anglais and Grand Baie. Three dive operators (Pointe Venus Hotel, Cotton Bay Hotel, Rodriguez Diving Pointe Monier) operate within the Marine Reserve.

Conflicts: Fishers believe that tourists destroy traps in 'Aquarium' and release the fish (Hardman et al., 2006b). Seine net fishing (illegal) occurs during both the day and night (all year round)

	targeting jacks, unicornfish, rabbitfish, goatfish. Spear fishing targeting octopus occurs all year round. Some fishers think that the Marine Reserve at Rivière Banane is too large.
Community support:	At community consultation meetings, the fishers from Rivière Banane and Baladirou supported the development of the reserve in general as their catches had declined. They think that the marine reserve will result in more fish and octopus (Blais et al., 2011; Hardman et al., 2006b; 2007; 2008).
Community concerns:	The fishers felt that there needs to be better enforcement with more patrols and patrols at night as there is a lot of illegal fishing (particularly snorkelling for octopus) (Hardman et al., 2006b; 2007b). They are also concerned that the zoning for the bad weather allowance may conflict with the reserve and that there may not be an allowance (Blais et al., 2011).
Reasons for selection:	The marine reserve was suggested by fishers from Riviere Banane as the area includes badly degraded regions requiring rehabilitation (particularly on the lagoon flats) and a relatively pristine area of high potential for tourism activities such as snorkelling (in 'Aquarium') (Gell *et al*., 2003).
Socio-economic information:	Fishing is the primary source of income for 30% of households, and 63% of households are dependent on fishing as either their primary or secondary source of income. All households plant vegetables or raise livestock to supplement their income; no households are involved in tourism activities. Produce are both consumed and sold at a local market. The community is young, with 80% aged less than 50 years, and 50% aged less than 30 years. The majority have received less than 9 years of schooling and only speak Creole. Only 10% speak French and 5% speak English and French; unemployment is high. Nearly everyone in the community have their own house with concrete roofs and walls, glass windows and cement floors, piped water and mains electricity. Only 13% of respondents own a boat, 60% are wood and 40% fibreglass, and only 20% have an engine (Hardman et al., 2006c). A survey in 2000 revealed

that 87% of octopus fishers earned less than 1000MRU (US$30) per month (Lynch et al., 2001).

References:

Blais et al (2011). Report on Community Consultation 1

Fenner, D. et al., (2004). A checklist of the corals of the island state of Rodrigues, Mauritius. *Journal of Natural History* **38***:* 3091-3102.

Gell, F. et al., (2003). Marine reserves for sustainable fisheries and conservation in Rodrigues. Shoals Rodrigues Unpublished Report 32pp.

Hardman et al (2006a). Survey of Endemic Coral & Fish Species on the Coral Reefs of Rodrigues. Shoals Rodrigues Unpublished Report, 8pp.

Hardman et al (2006b). Marine Reserves for Sustainable Fisheries Management in Rodrigues. Shoals Rodrigues Unpublished Report, 7pp.

Hardman et al (2006c). Report of Socio-economic Monitoring in Rivière Banane, Rodrigues. Shoals Rodrigues Unpublished Report, 23pp.

Hardman et al (2007). Marine Reserves for Sustainable Fisheries Management in Rodrigues: Alternative Livelihood Options. Shoals Rodrigues Unpublished Report, 7pp.

Hardman et al (2007a). The impacts of coral bleaching in Rodrigues, western Indian Ocean. *Atoll Research Bulletin* **555**: 1-10.

Hardman et al (2008). Annual Report of Benthos, Reef Fish and Invertebrate Surveys for Reef Slope and Reef Flat Areas in Rodrigues 2007. Shoals Rodrigues Unpublished Report, 40pp.

Name: Anse Aux Anglais Marine Reserve

Location:

	Area (Km^2)	Perimeter (Km)	Boundaries			
			Outside lagoon		Inside lagoon	
Anse aux Anglais	1.5	5.0	19º 39.286 63º 26.040	19º 39.136 63º 26.821	19º 39.932 63º 26.343	19º 39.904 63º 26.858

Depth: 0.5 - 20m

Main Habitats: Two main habitats were observed within the lagoon. The east side of the lagoon consisted of continuous limestone pavement with macroalgae and rubble, whereas the majority of the substrate in the west side of the proposed MPA was dominated by consolidated rubble (Jacob 2005).

The reef flat is characterised by a limestone pavement covered with turf algae and small coral colonies (Shoals Rodrigues, unpublished data).

The reef slope has a gently sloping spur and groove structure. The grooves are approximately 5 m wide and filled with coarse rubble and sand; the spurs are dominated by branching *Acropora* coral colonies (Jacob, 2005).

Current Status: Live coral cover is low on the reef flat (18%), with the benthic cover dominated by turf algae (42%). Macro-

invertebrates on the reef flat are dominated by *Echinometra mathaei* and the gastropod *Trochus maculatus* (Shoals Rodrigues, unpublished data); the abundance of *E. mathaei* has increased since October 2005 (Hardman et al., 2008). The most common fish families on the reef flat are Parrotfish, Surgeonfish and Damselfish and large predatory fish are rare, indicating overfishing (Shoals Rodrigues, unpublished data).

In the lagoon, the eastern area is characterised by coral gardens. The most dominant coral species are *Porites rus* and the branching corals, *Acropora formosa* and *Acropora digitifera* (Jacob, 2005). The sea cucumbers *Synapta maculata* and *Holothuria atra* are abundant in the lagoon (Knott, 2010). The abundance of fish is greatest in the east side of the lagoon, with Pomacentrids being the most abundant family and a lack of large predators at all sites. Fish in the lagoon are smaller (majority between 0 -10 cm) than those on the reef slope, possibly due to over-fishing or to the presence of juveniles (Jacob, 2005).

On the shallow reef slope (8m depth), rapid assessment surveys indicated that coral cover ranges from 51 – 75 % and is dominated by *Acropora abrotanoides*, *Acropora austera* (31-50%) and *Platygyra daedalea,* (11-30%) with soft coral *Sinularia* sp. (11-30%). At deeper depths (16m), live coral cover is between 51 – 75 % on the spurs and is dominated by diverse massive, submassive and encrusting species with some tabular *Acropora* colonies and soft corals. Members of the Pomacentridae family dominate the fish communities on the reef slope; small (<20 cm) and large (20-40 cm) dark Acanthuridae sp. are also abundant (Jacob, 2005).

Coral bleaching occurred on the shallow reef flat during 2005 when 11-30% of coral colonies bleached (Hardman et al., 2007).

Survey Information:

Shoals Rodrigues has carried out the following surveys:

- Annual monitoring surveys (benthos, reef fish and invertebrates) on the reef flat and reef slope in the Riviere Banane Marine Reserve since 2002 using the Global Coral Reef Monitoring Network methodology (see Coral Reef Monitoring Reports in bibliography).

- Seine net fishery monitoring surveys within the boundaries of Riviere Banane Marine Reserve since 2002 (see Seine Net Fishing Monitoring Reports in bibliography).
- Coral bleaching surveys in 2002, 2005 and 2006 (Hardman et al., 2004; 2007; 2008).
- A socio economic baseline study conducted in April 2009 (Stead al, 2009).
- Other surveys have been undertaken within the Anse aux Anglais Marine Reserve by MSc students (Jacob, 2005; Knott, 2010; Mrowicki, 2006).

Endemic information:

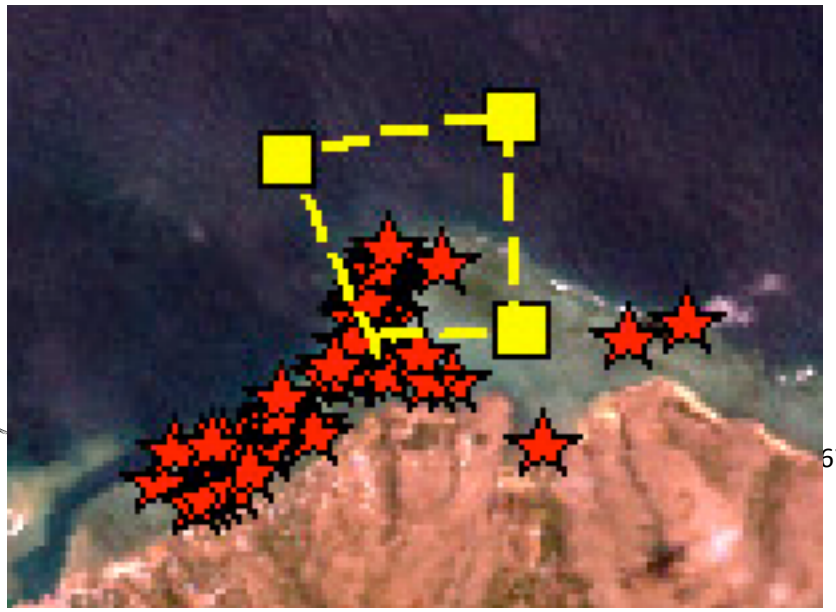
According to the report "Survey of Endemic Coral and Fish Species on the Coral Reefs of Rodrigues" (Hardman et al 2006) the endemic fish *Pomacentrus rodriguesensis* was very abundant at depth of between 3m- 20m within Anse aux Marine Reserve. While *Acropora rodriguensis* were observed in very few colonies on the reef crest.

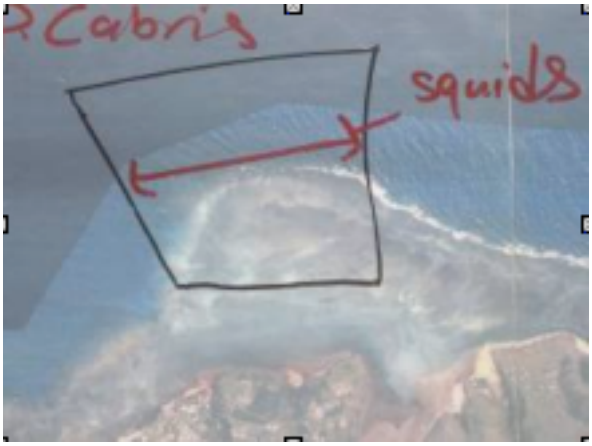
Main Resources Uses:

180 octopus fishers from Anse aux Anglais and Grand Baie fish landing stations. 80 line fishers and basket trap fishers (FRTU unpublished data).

The maximum number of octopus fishers counted was 63 on the lowest tide of the month (90 cm). The maximum number fishers recorded during the first spring tide of the month was 36 when the height of the low tide was 116 cm. (Jacob, 2005)

Map showing the GPS positions of the seine net fishery within the Anse Aux Marine Reserve and second map showing where fishers fish for squid





Recreational and tourism uses: Tourism activities by 5 tour operators who offer diving and snorkelling outside the reef and inside the reserves.

Conflicts: There are always conflicts between the registered fishers and the illegal fishers; sometimes the legal net seine fishers use small size nets as well (Blais et al., 2011).

Community support: In general, the fishers supported the development of marine reserves as their catches had declined, however they were concerned by the location of the reserve as this is where the coral is still healthy and where they catch the most fish and octopus. They asked for 5,000Rs compensation per month, however would consider alternative livelihoods with most keen to clean beaches. (Hardman et al, 2006)

The majority of the octopus fishers (82%) felt that the plan for a marine reserve was a good idea despite the fact that they anticipated that they would catch less octopus/fish as an immediate result of the protection (Jacob, 2005)

Community concerns: In general, the fishers supported the development of marine reserves as their catches had declined, however they were concerned by the location of the reserve as this is where the

coral is still healthy and where they catch the most fish and octopus. They asked for 5,000Rs compensation per month, however would consider alternative livelihoods with most keen to clean beaches (Hardman et al, 2006).

They felt that there is too much illegal fishing and that the marine reserves should be enforced by the FPS and National Coastguard (NCG), although one fisherman said that he would like to work as a ranger. Some said that they only know how to fish and could not do any other jobs; others said that if they were given work by the Government then they would stop fishing, however they would not form an Association or work in a group, they would prefer to set-up individual businesses (Hardman et al, 2008).

Squid fishing, line fishing (trolling - la traine) in the reserves between February to September (Blais et al., 2011).

They feel that the Reserves are a good thing, but they need money to live and they say that fishers are suffering, but they don't like to complain. They said that if there is other work for them to do, then they are ready to do it. They also feel that fishers should be involved in surveillance of the Marine Reserves (Blais et al., 2011).

Reasons for selection:

The majority of the fishers believed the proposed area to be important for juvenile fish although seven of the octopus fishers also stated that there were not so many as in previous years (Jacob, 2005).

Fishers from Baladirou suggested Grand Baie and the areas of reef in front of it, extending to the east to include Passe Cabri (an interesting site with large numbers of commercial fish and extensive coral cover). They viewed the channel at Passe Cabri as the source of fish for areas to the east towards Riviere Banane. The Anse aux Anglais area was suggested as the habitats are badly degraded and protection would allow them to recover. There are also excellent snorkelling and diving opportunities around Totor, and so tourism potential is also a consideration here *(*Gell et al., 2003*).*

Socio-economic information:

Fishing is less important in the villages of Grand Baie, Terre Rouge and Roseaux with only 18% of households including fishers in Grand Baie, 12% in Terre Rouge and 8% in Roseaux

and the majority of people involved in other employment activities. The average number of occupations per household ranges from 1.03 in Grand Baie to 1.47 in Roseaux. The majority of people have their own house. Households have an average of between 4.34 (Grand Baie)and 4.67 (Terre Rouge) rooms; the majority have concrete roofs and walls and almost all have electricity and piped water; 12% own a vehicle in Terre Rouge, however this is less in Grand Baie (5%) and Roseaux (3%)(Stead et al., 2009).

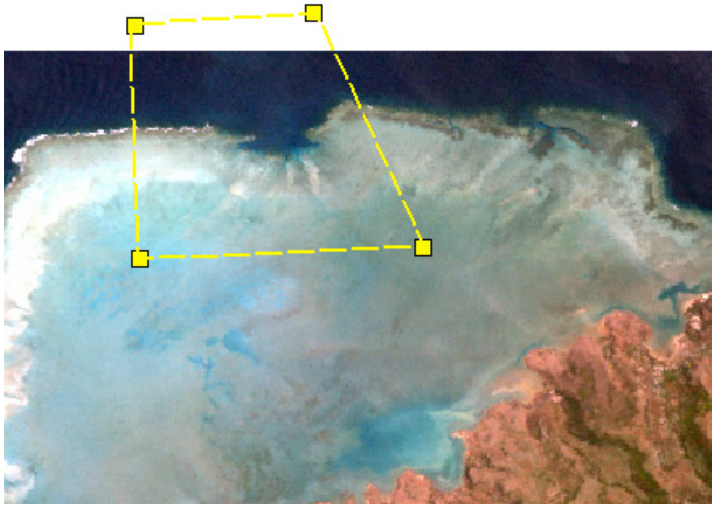
References:

Blais et al (2011) Report on Community Consultation 1
Gell et al (2003); Marine Reserves for Sustainable Fisheries and Conservation in Rodrigues
Hardman et al (2005) Coral Bleaching in Rodrigues
Hardman et al (2006); Survey of Endemic Coral and Fish species on the Coral Reefs of Rodrigues
Hardman et al (2006) Marine Reserves for Sustainable Fisheries and Conservation in Rodrigues
Hardman et al (2008) Marine Reserves for Sustainable Management in Rodrigues: Alternative Livelihood Options
Jacob (2005) A biological and Social Assessment of a proposed Marine Protected Area in Rodrigues, Mauritius
Stead et al (2009); Marine Socio Economic Scoping Study of the North Coast of Rodrigues.

Name: Grand Bassin Marine Reserve

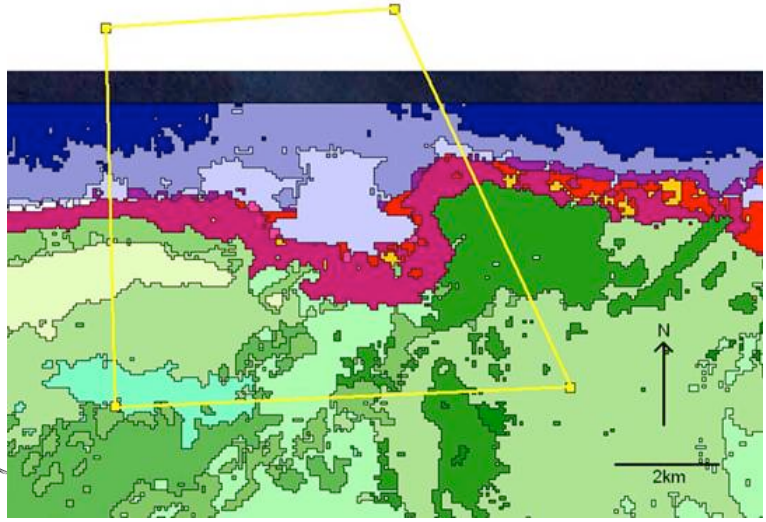
Location:

	Area (Km^2)	Perimeter (Km)	Boundaries			
			Outside lagoon		Inside lagoon	
Grand Bassin	14.1	15.3	19º 38.401 63º 21.372	19º 38.505 63º 19.777	19º 40.589 63º 19.827	19º 40.485 63º 22.340



Depth: 0.5 – 30m.

Main habitats: The dominant substrate on the reef flat was rubble, followed by branching *Acropora* (13.6%) and then sand (13.0%). The reef slope was dominated by branching Acopora (46.3%), followed by coralline algae and then turf algae. Sand was the dominant substrate in the lagoon, followed by macroalgae and rubble (Winton, 2006).



Current status:

Comparison to a previous biotope map produced by Chapman (2000) revealed considerable habitat change in recent years. Coral cover had increased at 10.2% of sites and decreased at 17.5% while vegetation cover had increased at 49.8% of sites and decreased at 24.3%. 500m snorkel transects at sites inside and outside the MPA surveyed fish population and substrate cover in more detail. Coral cover was high on the reef slope (66.3%), fairly low on the reef flat (27.7%) and rare in the lagoon (0.5%). Algae covered ~30% of the whole area. No macroalgae was recorded at any reef site. The reef slope was dominated by branching *Acropora* (46.3%), the reef flat by rubble (29.1%) and the lagoon by sand (59.8%). Branching *Acropora* was the most common coral substrate (7.9% over all sites). Acanthuridae and Mullidae were the most common fish families and *Mulloidichthys flavolineatus* and *Naso unicornis* the most common species at reef sites. Serranidae dominated the lagoon. There is a general lack of large predatory fish in Grand Bassin. Inside the MPA, a humpback whale was spotted outside of the lagoon by the surface cover during surveying, a green turtle (~70cm length) was recorded on the reef flat and another turtle (species unknown) was spotted on the reef slope (Winton, 2006).

Survey information:

Shoals Rodrigues has carried out the following surveys:

- Annual monitoring surveys (benthos, reef fish and invertebrates) on the reef flat and reef slope in the Riviere Banane Marine Reserve since 2002 using the Global Coral Reef Monitoring Network methodology (see Coral Reef Monitoring Reports in bibliography).
- Seine net fishery monitoring surveys within the boundaries of Riviere Banane Marine Reserve since 2002 (see Seine Net Fishing Monitoring Reports in bibliography).
- Coral bleaching surveys in 2002, 2005 and 2006 (Hardman et al., 2004; 2007; 2008).
- A socio economic baseline study conducted in April 2009 (Stead al, 2009).

- A study of the movement of the bluespine unicornfish, *Naso unicornis* using acoustic tags (Hardman et al., 2010).
- Other surveys have been undertaken within the Anse aux Anglais Marine Reserve by MSc students (Alemu, 2008; Knott, 2010; Mrowicki, 2006; Winton, 2006).

Endemic information: Occasional colonies of the endemic coral, *Acropora rodriguensis*; A high abundance of *Pomacentrus rodriguesensis* and *Amphiprion chrysogaster* was also observed (Hardman et al., 2006; Winton, 2006).

Main resources uses: Fishers fishing from Grand Bassin come from Anse Nicholas, Baie du Nord, Baie Malgache, Anse Goeland, Pte L'Aigle, Baie aux Huitres and Accacia. According to fishers personal comment, there are about 140 fishers that fish within Grand Bassin Marine Reserve (Blais et al., 2011).

The data collected on number of fishing boats and basket traps in Grand Bassin during July and August 2006 show that the area is exploited by fishermen, with up to 18 boats in the MPA at any one time. This is a fairly high level of exploitation (1.75 boats per km^2) and may not be sustainable over a long period of time (Winton*, 2006*).

Recreational and tourism uses: None

Conflicts: Fishers from Baie aux Huitres thought the declines were due to there being too many fishers and illegal fishing; they think there needs to be rangers, closed seasons, and that government officials should not be allowed to fish in the lagoon (Blais et al., 2011).

Community support: The fishers from Baie aux Huitres supported the development of marine reserves and thought that the location of the reserve at Grand Bassin was good; one fisher even felt that the area should be larger (Hardman et al., 2006).

Community concerns: Fishers from Baie aux Huitres were very concerned about enforcement of the reserve area and thought that a group of fishers should police the reserve in collaboration with

the NCG and FPS. They were interested in off- lagoon fishing as an alternative livelihood, however stated that they would need proper equipment and training. While fishers from Baie du Nord were also concerned about the number of un- registered fishers and how these would be regulated (Hardman et al., 2006). They said that Carcasses is a big nursery, and they wanted to know why it was not included in the reserves (Blais et al., 2011).

Reasons for selection:

The Carcasse area is a reasonably large area within the northern lagoon. The area is scattered with rocks and small coral areas, where diverse corals and small fishes are found. It suggested due to the depth of water (it is another area that remains reasonably deep even at low tide), the presence of corals within the lagoon and the high numbers of fish. The fishers already believe that the area is a source of fish for a wider region, and it is not heavily fished by them at present. Passes, including that at Grand Bassin, were a popular type of site mentioned by fishers for protection. Passes are likely to be important for fish spawning, as many fishers mentioned and also have a role in the movement of fish between the outer reef and the lagoon (Gell et al; 2003).

The fishers from Baie aux Huitres, Pointe l'Aigle, Baie Malgache and Pointe Palmiste think that the area is important because of the channels, and there are lots of small fish and big fish. One village described Grand Bassin as a train station where all the fish pass through into the lagoon (Blais et al., 2011).

Socio-economic information:

Fishing is most important in Anse Goeland and Baie du Nord where 63% and 61% of households surveyed included fishers and fishing constituted 53% and 42% of the employment activities. Fishing is less important tin Baie Malagache (31% of households include fishers) and Baie aux Huitres (18%) and planting vegetables and other employment activities are more important in these villages. Households have lower diversity in their income and the average number of occupations per household ranges from 0.86 in Baie du Nord to 1.38 in Anse Goeland. The average amount of schooling ranges from 4.68 years in Baie du Nord to 9.76 years in Baie Malgache. Baie Malgache has a

relatively high level of immigration with 19% of households from Mauritius. The majority of people have their own house. Households have an average of between 4.48 (Anse Goeland) and 5.57 (Baie Malgache) rooms; most have concrete roofs and walls and almost all have electricity and piped water. Only 7% of households in Baie du Nord own a vehicle, however this increases to 38% of households in Baie Malgache (Stead et al., 2009).

References:

Blais et al (2011); Report on Community Consultation 1

Chapman, B (2000) Marine Biotope Classification and Mapping of Rodrigues using Landsat 7 Etm + Satellite Imagery

Gell et al (2003); Marine Reserves for Sustainable Fisheries and Conservation in Rodrigues

Hardman et al (2005) Coral Bleaching in Rodrigues

Hardman et al (2006) Marine Reserves for Sustainable Fisheries and Conservation in Rodrigues

Hardman et al (2006); Survey of Endemic Coral and Fish species on the Coral Reefs of Rodrigues

Hardman et al (2008) Marine Reserves for Sustainable Management in Rodrigues: Alternative Livelihood Options

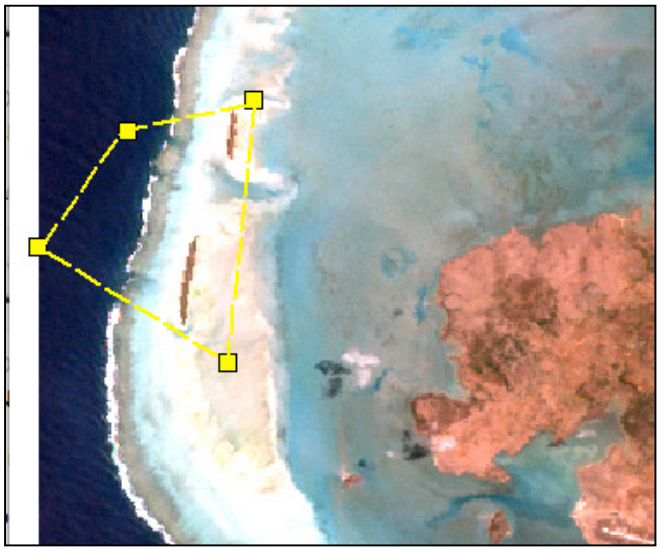
Stead et al (2009); Marine Socio Economic Scoping Study of the North Coast of Rodrigues.

Winton, D (2006) Benthic Habitat And Fish Population Assessment of the Proposed Marine Protected Area (MPA) of Grand Bassin in the Rodrigues Lagoon.

Name: Passe Demie Marine Reserve

Location:

	Area (Km^2)	Perimeter (Km)	Boundaries			
			Outside lagoon		Inside lagoon	
Passe Demie	7.2	11.4	19º 42.072 63º 17.471	19º 43.037 63º 16.721	19º 41.814 63º 18.521	19º 43.995 63º 18.293



Depth: 0.5 – 25m

Main habitats: In general, the habitat within Passe Demie Marine Reserve was composed of a sand and coral substrate interspersed with small and large coral blocks upon which coral colonies were growing. Tabular and branching acroporids usually dominated, and at some of the sites areas of dead overturned tabular corals were to be found, upon which turf and coralline algae were growing cyanobacteria were noted at several sites, generally at those with low live coral cover, low habitat complexity and a more degraded appearance. A site of interest in the marine reserve area, located near the pass through the reef, which had a high habitat complexity and abundant massive corals, *A. cytherea* and *A. Formosa* (Orr, 2008).

Current status: The lagoon habitat at Passe Demie has a very bare and sparse appearance and supports a different suite of

biological cover, cyanobacteria being noticeably more abundant in this habitat. Habitat degradation is widespread and coral bleaching affects 1-10 % of live coral in the Passe Demie vicinity; coral recruitment is high (3.2-16.5 recruits/m²) but patchy (Orr, 2008). The percentage of live hard coral cover on the reef slope is less than 40% and has high percentage of both coralline and turf algae (Hardman et al., 2008). The number of invertebrate species varied from site to site, but some of the highest values were recorded within the Passe Demie reserve boundaries. Species of interest were the nudibranch *Phyllidia arabica* and the colonial zoanthids *Protopalythoa* sp., identified at two and threes sites outside the reserve boundaries respectively, and the featherduster worm *Sabellastarte sanctijosephi*, recorded at only one site within the reserve boundaries. Holothurians were encountered infrequently during the rapid visual assessments conducted at Rivière Banane and Passe Demie, a sign that the holothurian fishery has severely depleted their populations.

Following a period of unusually warm sea temperatures and clear skies in early 2005, *Shoals Rodrigues* conducted a rapid assessment of the degree of bleaching that took place around the island. In the west of the island the most severe bleaching occurred at Passe Demi and Ile aux Cocos. Patchy bleaching occurred at Ile aux Cocos at a depth of 1.5m, affecting 75% of tabular *Acropora* colonies (*A. cytherea* and *A. clathrata*), as well as *A. muricata*, *A. humilis* and *A. valida*. 90% of *Stylophora subseriata* colonies were bleached and 50% of colonies of the anemone, *Heteractis* sp. were also bleached. At Passe Demi 75% of *A. valida* and *A. humilis* colonies and 30% of *A. cytherea* and *A. muricata* colonies were affected. 50% of *Pocillopora verrucosa* colonies and 30% of *Heteractis* sp. were also bleached (Hardman et al., 2005). A follow-up study conducted by Stampfli (2006) using the same methods of assessment recorded an absence of coral bleaching at North Île aux Sables and South Île aux Cocos and bleaching affecting < 1 % of the coral colonies at Passe Demie, representing an apparent decrease in the level of bleaching and recovery of previously affected colonies. This was again apparent following a bleaching event at the start of 2007, when only two sites in the south of the island suffered coral mortality and corals at North Île aux Sables, Passe Demie and South Île aux Cocos appeared to have

recovered with little bleached or dead coral evident (Thoma, 2007).

Within the Passe Demie Marine Reserve there are two nature reserves which consist of two islets Ile aux Cocos and Ile aux Sables managed to 3 protect the unique flora and sea bird colonies. Large colonies of brown noddies (*Anous stolidus*), lesser noddies (*A. tenuirostris*) and white terns (*Gygis alba*) are found on both islands (Alemu, 2008).

Spinner dolphins and Bottle nose dolphins observed within the boundaries outside the reef in Passe Demie Marine Reserve. (Shoals Rodrigues 2010)

Survey information:

Shoals Rodrigues has carried out the following surveys:

- Annual monitoring surveys (benthos, reef fish and invertebrates) on the reef flat and reef slope in the Riviere Banane Marine Reserve since 2002 using the Global Coral Reef Monitoring Network methodology (see Coral Reef Monitoring Reports in bibliography).
- Seine net fishery monitoring surveys within the boundaries of Riviere Banane Marine Reserve since 2002 (see Seine Net Fishing Monitoring Reports in bibliography).
- Coral bleaching surveys in 2002, 2005 and 2006 (Hardman et al., 2004; 2007; 2008).
- A socio economic baseline study conducted in April 2009 (Stead al, 2009).
- Other surveys have been undertaken within the Anse aux Anglais Marine Reserve by MSc students (Alemu, 2008; Knott, 2010; Mrowicki, 2006; Orr, 2008; Stampfli, 2006; Thoma, 2007).

Endemic information:

According to the report "Survey of Endemic Coral and Fish Species on the Coral Reefs of Rodrigues" (Hardman et al 2006) the endemic fish *Pomacentrus rodriguesensis* and the endemic coral Acropora rodriguensis have been recorded on the reef slope of Passe Demie marine reserve.

Main resources uses:

Majority of fishers are government officials and not registered fishers. On the sandy patches in the reserve area fishers target prawn (crevettes) using nets and fishing on

	foot (all year round) on low tide and at night only. Line, octopus, trap, seine net and illegal fishing happen in Passe Demie Marine Reserve (Blais et al., 2011).
Recreational and tourism uses:	Tourism activities inside the reserve include kite surfing, from boats deployed from Baie du Nord and Mourouk throughout the year depending on tide (high water). There is also surfing inside the channel depending on tide and weather (high tide and windy). Tourist trips to Ile aux Cocos on an everyday basis (Blais et al., 2011).
Conflicts:	Fishers spill oil on the sea in order to increase visibility through water to catch octopus and Cono Cono (shells). Prawn fishing occurs primarily within Passe Demie Marine Reserve (Blais et al., 2011).
Community support:	All fishers from Baie du Nord at the meeting fished in the Grand Bassin and Passe Demi marine reserves. They did not support the development of the reserves as their catches had improved in recent years and they felt that reserves were not necessary. They did not want the remaining 3 marine reserves to be demarcated for any types of fishing including sea cucumbers and said that they would fight against it. While fishers from Pointe Palmiste supported the development of marine reserves as their catches had declined. They all felt that the remaining 3 marine reserves should be demarcated for the sea cucumber fishery as there are no sea cucumbers left and it is affecting the health of the lagoon (Hardman et al., 2008).
Community concerns:	Fishers from Baie du Nord felt that there are too many fishers and in particular too many unregistered fishers and that the real fishes should be left to manage the sea themselves. While fishers from Pointe Palmiste felt that there are too many people fishing in the lagoon and that there is a lot of illegal fishing going on; they also felt that sand mining was a serious problem affecting the health of the lagoon and the fish stocks (Hardman et al., 2008).
Reasons for selection:	Large groupers are seen frequently at Passe Demie and the site has well-developed and diverse coral, large sea fans, and unusual echinoderm communities compared with other reef areas. Local fishers felt that closure of the area to fishing activities would lead to an increase in octopus. Reserves for seabirds already exist around Ile Cocos and Ile

aux Sables, and the former islet is a popular tourist destination. Expansion of the reserve to include a greater area of the marine environment would further increase the tourism potential of the site - the presence of large fish is an important consideration in the suitability of a site for diving tourism (Gell et al, 2003).

Socio-economic information:

In Pointe Palmiste, 43% of households surveyed included fishers. Households supplement their income and on average there are 2.14 occupations per household. Other employment activities included planting vegetables, raising livestock and other employment activities. The average amount of schooling is 4.25 years. The majority of people have their own house. Households have an average of 4.20 rooms; the majority have concrete roofs and walls and all have electricity and piped water; none own a vehicle (Stead et al., 2009).

References:

Blais et al (2011); Report on Community Consultation 1
Gell et al (2003); Marine Reserves for Sustainable Fisheries and Conservation in Rodrigues
Hardman et al (2005) Coral Bleaching in Rodrigues
Hardman et al (2006); Survey of Endemic Coral and Fish species on the Coral Reefs of Rodrigues
Hardman et al (2008) Marine Reserves for Sustainable Management in Rodrigues: Alternative Livelihood Options
Orr (2008) The Benthic Coral Reef Community and Species Diversity Represented in Two New Marine Reserves in Rodrigues/ Indian Ocean
Stampfli (2006) Coral Reefs in Rodrigues- An assessment of the Health Status
Stead et al (2009); Marine Socio Economic Scoping Study of the North Coast of Rodrigues.
Thoma (2007) Post Bleaching Coral Mortality in Rodrigues: Assessing the Impact of the Januray/ February 2007 Bleaching Event and the Succession at Previously Affected Sites.

13.2 Maps of Marine Reserves

[To be completed]

13.3 Regulations

FIRST SCHEDULE (regulation 2 (a))

Description of Boundaries of Riviere Banane Marine Reserve

The Riviere Banane Marine Reserve is bounded as follows:

- Towards the East, starting from a point having coordinate S19º40.257, E63º28.085 in the sea, the boundary runs along an imaginary line towards the east to a point having coordinate S19º40.473, E63º28.628
- Towards the North East, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction to a point having coordinate S19º39.936, E63º28.874
- Towards the North, from the last mentioned point the boundary runs along an imaginary line towards north to a point having coordinate S19º39.328, E63º28.500
- Toward the South, from the last mentioned point runs along an imaginary line up to the coral reef, thence to the same direction up to the starting point.

SECOND SCHEDULE (regulation 2 (b))

Description of Boundaries of English Bay Marine Reserve

The English Bay Marine Reserve is bounded as follows:

- Towards the North East, starting from a point having coordinate S19º39.932, E63º26.443' in the sea, the boundary runs along an imaginary line towards the east up to a point having coordinate S19º39.904', E63º26.858'
- Towards the North, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction to a point having coordinate S19º39.136', E63º26.821
- Towards the West, from the last mentioned point, the boundary runs along an imaginary line to a point having coordinate S19º39.286', E63º26.040'
- Towards the South, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction towards the south up starting point.

THIRD SCHEDULE (regulation 2 (c))

Description of Boundaries of Grand Bassin Marine Reserve

The Grand Bassin Marine Reserve is bounded as follows:

- Towards the North West, starting from a point having coordinates S19º40.589', E63º19.827' in the sea, the boundary runs along an imaginary line towards the east to a point having coordinates S19º40.485', E63º22.340'

- Towards the North, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction to a point having coordinate S19º38.401', E63º26.343'

- Towards the West, from the last mentioned point, the boundary runs along an imaginary line to a point having coordinates S19º38.805', E63º19.777'

- Towards the South, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction up starting point.

FOURTH SCHEDULE (regulation 2 (d))

Description of Boundaries of Passe Demie Marine Reserve

The Passe Demie Marine Reserve excludes the nature reserve of Ile aux Cocos and Ile aux Sables as from their high water mark and is bounded as follows:

- Towards the West, starting from a point having coordinates S19º43.995', E63º18.293' in the sea, the boundary runs generally north along an imaginary line to a point having coordinates S19º41.814', E63º18.521'

- Towards the North, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction up to a point having coordinates S19º38.401', E63º26.343'

- Towards the South West, from the last mentioned point, the boundary runs along an imaginary line up to a point having coordinate S19º43.037', E63º16.721'

- Towards the south East, from the last mentioned point, the boundary runs along an imaginary line up to the coral reef, thence in the same direction up to the starting point.

13.4 Species Lists

[To be completed]

13.5 Organogram

[To be completed]

13.6 List of Stakeholders

[To be completed]

13.7 List of Permits

List of Seine Net Fishery Permits

Serial	Name of Large Net	Head Fisher	Address	Number of fishers
1	Individual	Anger Ithier	Pointe Corail	7
2	Rodrigues fisherman Multi-Purpose Cooperative Society Limited	Bruno Capdor	Bangelique	7
3	Rodrigues fisherman Multi-Purpose Cooperative Society Limited	Ignace Speville	Camp Pintade	7
4	Rodrigues fisherman Multi-Purpose Cooperative Society Limited	Wasley Ithier	Dans Coco	9
5	Rodrigues fisherman Multi-Purpose Cooperative Society Limited	Elzer Castel	Pointe Cotton	9
6	Rodrigues fisherman Multi-Purpose Cooperative Society Limited	Donald Felicite	PointePalmiste	9
7	Rodrigues fisherman Multi-Purpose Cooperative Society Limited	Aurelio Speville	Port Sud Est	14

List of Crevette Fishery Permits

Serial	Individual	Rodrigues fisherman Multi-Purpose Cooperative Society Limited
1	Marc Meunier	-
2	Begue Claude Artisus	-
3	Meunier Rommel	-
4	Meunier Jimmy	-
5	Rose jean Lino	-
6	Francois Jean Rex	-
7	Marlin Prudence	-
8	Rose Rex Marie Pierre	-
9		Anse quitor Branch
10		North Bay Branch
11		Good Luck
12		Starlight
13		Rodrigues Shrimp Cooperative Society limited