



Report of Socio-economic Monitoring in Rivière Banane, Rodrigues

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Executive Summary

In response to the recent decline in fish stocks in Rodrigues 4 marine reserves will be created in the northern lagoon, of which the first at Rivière Banane will be proclaimed in late 2006/early 2007. There is an urgent need for socio-economic monitoring to be carried out in combination with the biological monitoring which has been on-going since 2002. The main objectives of this study therefore were to formalise and add to existing knowledge on fisheries and fishers attitudes and to establish baselines for future monitoring and evaluation. Surveys were undertaken at Rivière Banane during May – July 2006 using a combination of Household Surveys, Key Informant and Focus Group Interviews.

The surveys indicate that fishing and planting are the most important occupations in Rivière Banane, undertaken by 22% and 28% of respondents, respectively, however the majority of the community are unemployed. The community is young, with 50% aged less than 30 years and the majority have received less than 9 years of schooling. The community is Catholic with the majority of respondents speaking only Creole. Households have an average size of 4 persons, consisting of 2 males and 2 females. Most respondents own their houses, have an average of 4 rooms and all have access to piped water and mains electricity. Fishing is the primary source of income for 30% of households, however only 13% of respondents own their own boats, and of these only 20% have an engine. Coastal and marine activities carried out in the area are: fishing for octopus using harpoons, fishing for fish using basket traps and lines, planting fruit and vegetables, raising livestock and tourist snorkelling trips. Goods have a low – medium value and all are sold locally, as well as being used for own consumption. Three formal community organisations were highlighted, however the majority of respondents feel that they have no involvement in coastal management decisions. Respondents highlight illegal fishing, pollution, coastal flooding and soil erosion as threats to the health of coastal resources, with the solutions being better enforcement of fishing regulations and cleaning the beaches and rivers. Major problems facing the community are poor roads/lack of public transport, lack of water and invasive plants. Respondents understand the non-use value of the coastal resources, with the majority wanting future generations to enjoy coral reefs and agreeing that fishing should be restricted in certain areas.

The results therefore highlight that fishing is very important to the Rivière Banane community and the development of a no-take marine reserve in the region will have an important financial impact on a number of households. The young community suggests that the development of an alternative livelihood and re-training programme may be more suitable than a Voluntary Retirement Scheme as a means of reducing fisher numbers. The value of tourism is seen as low, suggesting that further tourism development in the area should also provide some benefit to the local community. Illegal fishing is seen as the main threat to the coastal resources in Rivière Banane and this is particularly relevant to the development of the new marine reserve, with better enforcement needed. Fishers feel that they have a low involvement in coastal management decisions, indicating that a greater involvement of the fishing community in coastal management issues is needed in order for the management plan to be successful.

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1.0 Introduction

Rodrigues is an island state of Mauritius, situated at 19°42'S and 63°25'E, 595km east of Mauritius. It is 18 km at its longest and 8 km wide, with a land area of 107.8 km². Rodrigues is surrounded by 90 km of fringing reef which has created a lagoon of over 240 km² in area, extending from between 20 m to over 7 km from the shore. The island supports a population of 36,772 people (CSO, 2005) and its economy is based mainly on agriculture, livestock and fisheries. Employment on the island is low at 38% with 28% of employed people working in agriculture and fishing (CSO, 2005).

The artisanal seine net, basket trap, line and octopus fisheries are extremely important in Rodrigues and fishing is one of the largest employment sectors, as there is a lack of industrial development and tourism is in its infancy. There are some 2,000 full-time, registered fishers (nearly 20% of the total workforce) with a further 2,000 people fishing on a casual basis (FRTU, unpublished data). Socio-economic surveys of the octopus fishers undertaken during 2000 indicate that many fishers exist at subsistence and low-income levels (Lynch *et al.*, 2001). The average wage for octopus fishers was less than Rs 820 (US\$30) per month with fishing being the only source of family income for 47% of fishers. Most fishers rely on government subsidies to improve their income and 80% cite a lack of alternative employment opportunities as their reason for fishing.

The limited area of productive offshore waters combined with the strong prevailing winds and lack of large boats severely restricts opportunities for fishing outside the protective fringing reef. Dependence on the sheltered water therefore concentrates large numbers of people in the lagoon and reef areas, and this intensive fishing causes damage to the ecosystem and disruption to the life cycles of many fish species, resulting in a serious decline in populations. In response to this decline in fish stocks, the Rodrigues Regional Assembly, in collaboration with *Shoals Rodrigues*, has now approved the creation of 4 marine reserves in the northern lagoon, of which the first at Rivière Banane will be proclaimed in late 2006/early 2007. There is however an urgent need for socio-economic monitoring to be carried out in combination with the biological monitoring of the fisheries and lagoon and reef habitats, which has been on-going since 2002 (Gell, 2005). In particular, a number of issues require research related to the establishment of these marine reserves:

1. Assessing the socio-economic status of the fishery in regard to potential compensation for fishers.
2. Investigation of new employment opportunities for displaced fishers.
3. Tourism development and marine reserve user fees.
4. Investigation of potential zoning of the marine environment.

The main objectives of this study therefore were:

- To formalise and add to existing knowledge on fisheries and fishers attitudes
- To collect data relating to the above and complement with data from other user groups.
- To establish baselines for future monitoring and evaluation as MPAs move from planning stages to implementation.

2.0 Methods

Assessments were carried out of 41 socio-economic variables as detailed in the SocMon guidelines (Malleret-King *et al.*, 2006) and these were undertaken using a combination of Secondary Sources, Household Surveys, Focus Group Interviews and Key Informant Interviews as shown in Table 1. Surveys were carried out in the village of Rivière Banane during May to July 2006 by a team of 5 staff members from *Shoals Rodrigues*.

Table 1. Variables assessed during the SocMon surveys (S = Household survey, KI = Key Informant Interview, FGI = Focus Group Interview, Sec = Secondary Sources).

Variables	Means of data collection
Area	
Study area	Sec., KI, FGI
Stakeholders	
Stakeholders	KI
Gender roles and responsibilities	KI, FGI
Population	Sec., KI, FGI
Number of households	Sec., KI, FGI
Migration rate	KI, FGI
Occupation	Sec., KI, S
Age	KI, FGI, S
Gender	All
Ethnicity	All
Literacy	Sec., KI
Education	All
Religion	All
Language	All
Household size	S
Household structure	S
Sources of income	S
Infrastructure and business	
Community infrastructure	KI, FGI
Business development and ownership	
Coastal and marine activities	
Activities	All
Goods and services	KI, FGI, S
Methods	KI, FGI, S
Value of goods and services	KI, FGI
Target markets and marketing mechanisms	KI, FGI, S
Use patterns	KI, FGI,
Level of use by outsiders	KI, FGI
Levels and Types of Impact	KI, FGI
Use of Goods and Services	KI, FGI, S
Tourist profile	Sec., KI, FGI
Governance	
Stakeholder participation and satisfaction	KI, FGI, S
Community and stakeholder organisations	KI, FGI
Membership in organization and groups	S
Power and influence	KI, FGI
Attitudes and perceptions	
Perceptions of resource conditions	S
Perceived Threats	S
Awareness of rules and regulations	S
Compliance	S
Enforcement	S
Perceived coastal management problems and solutions	S
Perceived community problems	S
Non-market and non-use values	S
Socioeconomic status	
Material style of life	S

Five Key Informant Interviews were undertaken with an octopus fisher, a basket-trap/line fisher, a tourist boat operator from a nearby hotel, the Head of the Village Committee and a local entrepreneur (owner of the local grocery shop, tourist accommodation and octopus buyer). Two Focus Group Interviews were carried out, one with a group of 5 fishers and one with a group of 6 planters. Surveys targeted 40 households within the Rivière Banane area (including the villages of Tréfles, Grand Montagne, Roche Bon Dieu, Bel Air and Brulé) and additional data were obtained from the Government Census.

3.0 Results

3.1 Area

The survey area is shown in Figure 1. Data from the Fisheries Protection Service shows that of the 56 fishers registered in Rivière Banane, 6 come from the village of Roche Bon Dieu, 1 from Brulé, 1 from Grand Montagne, 1 from Tréfles and 1 from Bel Air. Key Informant Interviews indicate that boat operators bring tourists to snorkel and dive in the area from the hotels at Pointe Coton, Anse aux Anglais and Mont Venus and a dive centre in Port Mathurin. Figure 1 also shows the location of the proposed marine reserve.






- Key**
-  Hotel
 -  Snorkel Site
 -  Marine Reserve

Figure 1. The survey area around Rivière Banane.

3.2 Stakeholders

Results from the Key Informant and Focus Group Interviews highlight 8 stakeholder groups around Rivière Banane, which are shown in Table 2.

Table 2. The stakeholder groups in Rivière Banane.

Coastal Activity	Stakeholder Group 1	Stakeholder Group 2	Stakeholder Group 3
Fishing	Octopus Fishers	Basket Trap Fishers	Line Fishers
Agriculture	Vegetable Planters	Animal raisers	
Tourism	Guesthouse Owners	Boat/Dive Operators	Tourists

The results suggest that the adults of both genders take an equal role in both household and income activities for cultural reasons (Table 3). The two genders also take an equal share in decision-making within the household, however some Key Informants felt that women usually took decisions about education and health, whereas men took decisions about time use (Table 4). All respondents explained that decisions about marine and coastal activities are taken by whoever undertakes the fishing activities in the household.

Table 3. The division of household activities according to gender in the Rivière Banane community.

Activities	Gender and age		Why some activities only carried out by one gender?					
	Women	Men	Legal	Cultural	Physical	Education	Religious	Economic
Household								
Shopping	Adult	Adult		X				
Cooking	Adult	Adult		X				
Subsistence/income								
Fishing	Adult	Adult		X				
Planting	Adult	Adult		X				
Raising Animals	Adult	Adult		X				
Business	Adult	Adult		X				

Table 4. Decision-making according to gender in the Rivière Banane community.

	Women only	Men only	Usually Women	Usually Men	Both
Household activities					
Income use					X
Time use				X	
Saving/investment					X
Education			X		
Health			X		
Marine and coastal activities					
Location					X
Methods					X
Timing					X

3.3 Demographics

Results from the Key Informant Interviews suggest that there are between 400 and 1,500 inhabitants of Rivière Banane living in 77 – 150 households; however Focus Group Interviews condense this to 400 – 450 inhabitants in 120 – 150 households. Migration into and out of the area tends to be stable. Results are very variable in terms of the major occupations undertaken by members of the community, however fishing and planting emerge as the most important primary occupations, being undertaken by up to 90% and 95% of the community respectively (Table 5). When asked if they were aware of any illegal fishing activities taking place within the area, the group of fishers and 60% of the Key Informants answered that they were.

Table 5. Major occupations in the Rivière Banane community, based on Key Informant and Focus Group Interviews.

Major occupations in community	% conducting as primary occupation	No. conducting as primary occupation	% conducting as secondary occupation	% conducting as tertiary occupation
Planting	30 - 95	80 - 150	0 - 30	0 - 40
Fishing	10 - 90	100 - 200	7 - 90	0 - 25
Livestock	15 - 50	30 - 100	20 - 100	0 - 90
Handicrafts	15		10	5

These results are clarified by the Household Surveys which indicate that fishing is the most important primary occupation (16% of household members), with 22% of respondents dependent on fishing as either their primary or secondary occupation (Table 6). Based on data from the Fisheries Protection Service, which lists 45 registered fishers from Rivière Banane, this suggests that approximately 10% of the population is dependent on fishing as their primary occupation. Planting fruit or vegetables is the primary occupation for 12% of respondents and 28% are dependent on planting as either their primary or secondary occupation. Considering only those respondents who are employed, 40% list fishing as their primary occupation and 32% list planting, whereas of those who have a secondary occupant, 60% list planting and 25% list fishing. The majority of respondents (61%) however, have no occupation and are students, unemployed or retired. Miscellaneous occupations include working for the local Government, Builder, Labourer, Driver, Cook, Shop-Keeper and Cleaner.

Table 6. The primary and secondary occupations of 40 household occupants in Rivière Banane.

Occupation	Primary		Secondary		Total % dependent on this occupation
	No. listed as primary occupation	% listed as primary occupation	No. listed as secondary occupation	% listed as secondary occupation	
Fishing	24	15.5	10	6.5	21.9
Planting	19	12.3	24	15.5	27.7
Misc.	17	11.0	6	3.9	14.8
No occupation	95	61.3	0	0	61.3
TOTAL	155	100	40	25.8	125.8

Key Informant and Focus Group Interviews suggest that 80% of the community is aged below 50 years, with 50% aged less than 30 years. National Statistics also show that 50% of people in Rodrigues are aged less than 30 years. This is also confirmed by Household Surveys which show that 84% of respondents are aged 45 or under and 52% aged 25 or less (Table 7). All young people aged less than 16 years are in school and do not work. The majority of both fishers (75%) and planters (67%) are in the age 26 - 45 years category. The Miscellaneous category includes the highest percentage of respondents aged over 45 years (35%). The majority of respondents aged over 16 years have received less than 9 years of schooling (84%), with 43% attending school for less than 6 years. The majority of fishers have been to school for less than 9 years (96%), while 80% of planters have received less than 9 years of schooling. Of the unemployed respondents, 25% have received over 9 years of schooling. Key Informant and Focus Group Interviewees felt that between 50 - 75% of the population are literate. National statistics also highlight the low education level in Rodrigues, with only 53% of students passing their Primary School Examination.

Table 7. The age structure and level of education of 40 household occupants in Rivière Banane.

Primary Occupation	% responses						
	Age 0-15	Age 16-25	Age 26-45	Age over 45	< 6 years schooling	6-9 years schooling	>9 years schooling
Fishing	0	8.3	75.0	16.7	47.8	47.8	4.4
Planting	0	11.1	66.7	22.2	53.3	26.7	20.0
Misc	0	5.9	58.8	35.3	29.4	64.7	5.9
None	39.8	39.8	9.7	10.8	42.5	32.5	25.0
TOTAL	24.3	27.6	32.2	15.8	43.2	41.1	15.8

Key Informant and Focus Group Interviews suggest that 25 – 40% of the community is female and 60 – 75% is male. Household Survey results confirm this, with 43% of respondents being female and 47% male (Table 8). Of the fishers, 58% are male and 42% female; in contrast, 56% of planters are female and 44% are male. Those undertaking Miscellaneous employment tend to be male (77%). Information from the Fisheries Protection Service lists 56 registered fishers from the Rivière Banane area, of which 57% are women and 43% are men. Key Informant and Focus Group Interviews suggest that between 90 – 98% of the community are Catholic and all belong to the ethnic group Creole. The Household Surveys confirm this, showing that 98% of respondents are Catholic and that all fishers and planters are Catholic. All Household Survey respondents belong to the ethnic group Creole.

Table 8. The gender, religion and ethnic group of 40 household occupants in Rivière Banane.

Primary Occupation	% responses				
	Female	Male	Catholic	Christian	Creole
Fishing	41.7	58.3	100.0	0.0	100.0
Planting	55.6	44.4	100.0	0.0	100.0
Misc.	23.5	76.5	94.1	5.9	100.0
None	45.1	54.9	97.9	2.1	100.0
TOTAL	43.3	56.7	98.1	1.9	100.0

Key Informant and Focus Group Interviews suggest that 85% of the community speak Creole only, with 10% speaking Creole and French and 5% speaking Creole, French and English. Household Surveys also show that in total, 89% of respondents speak only Creole, with 96% of Fishers and 90% of Planters speaking only Creole (Table 9). In the Miscellaneous category, 24% of respondents speak Creole and French, however <10% of respondents from all occupations speak Creole, French and English.

Table 9. Languages spoken by 40 household occupants from Rivière Banane.

Primary Occupation	% responses		
	Creole	Creole & French	Creole, French & English
Fishing	95.8	4.2	0.0
Planting	89.5	5.3	5.3
Misc.	70.6	23.5	5.9
None	90.4	1.1	8.5
TOTAL	89.0	4.5	6.5

Household Surveys show that the average household size is 4 persons, consisting of 2 females and 2 males and 15% of households are women-headed (Table 10). Planters tend to have the smallest households (4 persons), compared to 5 persons for the other occupations. The percentage of women-headed households is <10% for all occupations, except for Planters, where 18% of households are headed by women.

Table 10. The average household size and number of men and women per household for 40 households from Rivière Banane.

Primary Occupation	Average household size	Average No. of women	Average No. of men	% women headed households
Fishing	4.9	2.2	2.7	4.2
Planting	3.8	1.9	1.8	17.7
Misc.	5.1	2.0	2.7	7.1
None	5.0	2.5	2.4	5.6
TOTAL	3.9	1.9	1.9	15

The most important occupation is fishing, with 30% of respondents citing it as their household's primary source of income and 32.5% noting it as their secondary source of income (Table 11). Planting is the second most important occupation, with 20% of respondents noting it as their primary source of income and 37.5% as their secondary source. 25% of respondents are dependent on a pension as their primary source of income.

Table 11. Primary and secondary sources of income for 40 households from Rivière Banane.

Occupation	% noted as primary source	% noted as secondary source
Fishing	30.0	32.5
Planting	20.0	37.5
Misc.	25.0	2.5
Pension	25.0	2.5
None	0.0	25.0

3.4 Community Infrastructure

Key Informant and Focus Group Interviews indicate that the following community facilities exist in Rivière Banane:

Schools (primary only), electricity, telephone, internet access, radios, televisions, satellite TV, newspapers, tarmac road access, water supply to homes, church
Food stalls, restaurants, guesthouses.

The businesses are owned by local people who reside in the Rivière Banane area (Table 12).

Table 12. The origin and place of residence of the owners of the businesses in Rivière Banane.

Business	Origin and place of residence of owners	Rank in order of frequency
Guesthouses	Locals, residents	1
Food stalls	Locals, residents	2

3.5 Coastal and Marine Activities

The Key Informant and Focus Group Interviews highlight 4 coastal and marine activities carried out in the area: fishing for octopus using harpoons, fishing for fish using basket traps and lines, tourist snorkelling trips and planting vegetables (Table 13). The value of all goods and services is classed as low – medium and all goods (octopus, fish and vegetables) are sold to a local market as well as being consumed by household members. The level of impact from fishing is high – medium, with suggested impacts being the tsunami, overgrowth by algae, overfishing and illegal fishing. The level of impact from snorkelling trips is classed as low –

medium and occurs as a result of anchor damage. Fishing for octopus is carried out on the reef at low tide, whereas fish are caught at high tide. Snorkelling is also carried out at high tide, within the lagoon at a site called “Aquarium”. The level of use by outsiders is low – medium for fishing, with outsiders classed as those who come to fish from neighbouring villages such as Brulé, Grand Montagne and Roche Bon Dieu.

Table 13. Coastal and marine activities undertaken in the Rivière Banane area, the goods and services obtained, their value and the level of impact.

Coastal & Marine Activities	Coastal & Marine Goods and Services	Methods	Value of Goods & Services	Target Markets	Level of use by Outsiders	Level of Impact	Types of Impact	Household Use
Fishing	Fish	Line/Trap	Low -Med	Local	Low - Med	High - Med	Tsunami Over-fishing	Yes
	Octopus	Harpoon	Low - Med	Local	Low - Med	High - Med	Algae, Over-fishing, Illegal fishing	Yes
Tourism	Snorkelling	Snorkel	Low	International	High	Low - Med	Anchor damage	No
Planting	Vegetables	Manure/ Fertiliser	Med	Local	Low			Yes

Coastal and Marine Activities	Coastal and Marine Goods and Services	Use Patterns		
		Location	Timing	Season
Fishing	Fish	Reef	High Tide	All
	Octopus	Reef	Low Tide	All
Tourism	Snorkelling	Lagoon	High	All

Respondents in the Household Surveys undertake fishing for fish using lines and basket traps, fishing for octopus using harpoons and planting vegetables and fruit (Table 14). No respondents undertake tourism activities however 2 households also rear livestock. Over 90% of fish and octopus and 75% of fruit and vegetables are also sold and all goods are sold locally. All households also use the goods for their own consumption.

Table 14. Coastal and marine activities undertaken by 40 household occupants in Rivière Banane area, the goods and services obtained, methods used and their market.

Activities	Goods	Methods	Market	% Consumption	% Sold
Fishing	Fish	Line	Local	100	94.11
		Trap	Local	100	94.11
	Octopus	Harpoon	Local	100	95.45
Planting	Vegetables	Manure/Fertiliser	Local	100	75.0
		Manure/Fertiliser	Local	100	75.0
Rearing Animals	Livestock	Grass	Local	100	50.0

According to the Key Informant Interviews approximately 1,500 tourists visit the area each year, of which 500 are from Mauritius, 400 from La Réunion, 500 from France, 100 from the U.K. and 100 from other countries. Most tourists visit in December (700), with August and September (500 tourists each month) and October and November (250 each) also popular

months. Tourist numbers are low during the remaining months of the year. Between 15 – 30% of tourists are aged 0 - 18 years, 20% are aged 19 - 30, 30 - 40% are aged 31 - 50 and 20 - 25% are aged over 50. Males make up 40 – 50% of tourists, while females make up 50 – 60%. The majority of tourists are interested in nature (70%); 50% are interested in the local culture, 30 - 40% come for the beaches, 30% for diving/snorkelling and 10% are interested in fishing. National statistics show that of the 60,862 arrivals in Rodrigues during 2004, 50% were from Mauritius and 24% were from France/La Réunion.

3.6 Governance

All stakeholder groups are involved in the decision-making process. Key Informant and Focus Group Interviews showed that fishers feel that they have the least involvement (3), whereas boat operators have the most (5) (Table 15). All groups had a medium – high level of satisfaction with this involvement. In the Household Surveys however, the majority of respondents felt that they had no involvement in management activities: 62% of respondents stated that they had no involvement in decision-making and 69% felt that they had no involvement in awareness-raising; only 3% felt that they had full involvement in the decision-making process (Table 16). Of the respondents who felt that they had a low involvement in decision-making activities, 73% had a medium level of satisfaction, while 86% had a low level of satisfaction. For awareness-raising activities, 63% of those who felt that they had a low involvement had a medium level of satisfaction while 75% had a low level of satisfaction.

Table 15. Involvement of stakeholders in coastal management decisions and the level of satisfaction according to Key Informant and Focus Group Interviews.

Stakeholder Group	Decision making and management activities	Stakeholder participation	Satisfaction with level of involvement
Fishers	Decision-making	3	Medium
Planters	Decision-making	4	Medium
Boat operators	Decision-making	5	High

Table 16. Involvement of stakeholders in coastal management decisions and the level of satisfaction according to 40 household occupants in Rivière Banane.

Management activity	Percent Responses				
	5 (full participation)	4	3	2	1 (no participation)
Decision-making	2.6	2.6	2.6	30.8	61.5
Awareness-raising	0	2.6	5.1	23.1	69.2

Management activity	Level of Participation	Percent Responses		
		High Satisfaction	Medium Satisfaction	Low Satisfaction
Decision-making	5 (full participation)	0.0	0.0	0.0
	4	100.0	0.0	0.0
	3	100.0	0.0	0.0
	2	9.1	72.7	18.2
	1 (no participation)	7.1	7.1	85.7
Awareness-raising	5 (full participation)	0.0	0.0	0.0
	4	0.0	100.0	0.0
	3	0.0	100.0	0.0
	2	12.5	62.5	25.0

Three formal organisations were highlighted during the Focus Group and Key Informant Interviews: Rivière Banane Village Committee, Planters Association and Fishers Association (Table 17). All organisations address and solve the problems of their members, take these matters to the local Government (Rodrigues Regional Assembly) and make decisions about community issues. The Fishers Association also makes decisions about coastal zone management issues. Of the respondents in the Household Surveys, 60% were a member of at least one of these organisations: 83% were members of the Association of Planters, 8% were members of the Association of Fishers and 29% were members of the Village Committee.

Table 17. Community and stakeholder organisations in the Rivière Banane area.

Community Organisation	Formal or Informal	Main Functions	Influence
Village Committee	Formal	Solve problems, make decisions	Community Issues
Planters Association	Formal	Solve problems, make decisions	Community Issues
Fishers Association	Formal	Solve problems, make decisions	Community & Marine

In addition to the formal organisations, the village president and the relevant department of the Rodrigues Regional Assembly must be consulted for any activity to be carried out or changed in the coastal zone (Table 18). All interviewees gained information about coastal and marine resources from *Shoals Rodrigues*, as well as from the Fisheries Protection Service (fishers only).

Table 18. Organisations influencing the use of marine and coastal resources in Rodrigues.

Coastal Activity	Organisations/ individuals which make decision	Who else	Source of information on coastal and marine resources
Fishing	Fishers Association	Rodrigues Regional Assembly Village president	NGO – <i>Shoals Rodrigues</i> Fisheries Protection Service
Planting	Planters Association	Rodrigues Regional Assembly Village president	NGO – <i>Shoals Rodrigues</i>

3.7 Attitudes and Perceptions

In the Household Surveys, 41% of respondents felt that the coral reefs are in good condition, whilst 24% felt that they were in a bad condition (Table 19). Opinion was divided with concerns to the rivers, with 38% feeling that they are in good condition and 38% feeling that they are in a bad condition, 16% however felt that the rivers are in a very bad condition. 57% of respondents felt that the forests are in good condition, with 17% stating that they are in very good condition. 36% of respondents felt that the lagoon is in a good condition, however 28% felt that it is in a bad condition and 16% felt that its condition is very bad.

Table 19. The perceptions of 40 household occupants in Rivière Banane on the conditions of resources.

Resources	Percent responses that describe resource conditions as:				
	Very good (5)	Good (4)	Neither good nor bad (3)	Bad (2)	Very bad (1)
Coral Reefs	5.9	41.2	17.7	23.5	11.8
Rivers	6.3	37.5	3.1	37.5	15.6
Upland Forests	17.1	57.1	11.4	5.7	8.6
Lagoon	5.6	36.1	13.9	27.8	16.7

The most common identified threats are: illegal fishing (24% of respondents) and pollution (21%), followed by coastal flooding, soil erosion and cyclones (Table 20). Miscellaneous threats include: tsunami, overgrowth by algae, damage to corals and water temperature changes.

Table 20. Identified threats to the health of coastal resources based on the response of 40 household occupants from Rivière Banane.

Identified Threats	% noted this threat
Illegal Fishing	24.4
Pollution	21.1
Flooding	12.2
Soil Erosion	11.1
Cyclones	8.9
Others	22.3

Most respondents were aware of rules and regulations related to activities taking place in the coastal zone, with 88% aware of fishing regulations, 65% aware of rules related to hotel development, 78% aware of rules related to residential development and 55% aware of regulations related to tourism activities.

54% of respondents feel that compliance to coastal management rules and regulations is average (3), with only 5% stating that compliance is full and 8% stating that there is no compliance at all (Table 21). 37% of respondents feel that enforcement is good (4), with 14% stating that there is full enforcement.

Table 21. The degree of compliance and enforcement to coastal management regulations according to 40 household occupants.

	Percent Responses				
	5 (full)	4	3	2	1 (none)
Compliance	5.41	18.92	54.05	13.51	8.11
Enforcement	14.29	37.14	22.86	14.29	11.43

In contrast to the above results, 29% of respondents feel that illegal fishing is the most important problem facing coastal management in the community (Table 22). The list is similar to that in Table 19, with pollution, coastal flooding and soil erosion also identified as major threats. Solutions to the problems are listed as: better enforcement (45%), clean the beaches and rivers (26%) and better facilities and training for fishers (10%). Only 3% of respondents identified the development of a marine park as a potential solution.

The most important problem facing this community is poor roads/lack of public transport, listed by 45% of respondents (Table 23). Other problems include lack of water during summer for agriculture, invasive plants, lack of facilities (especially for young people), litter and a lack of communication between community members.

Table 22. Major problems facing coastal management in the community and their solutions according to 40 household occupants.

	% noted this problem
Major Problems:	
Illegal fishing	28.6
Pollution	19.1
Flooding	16.7
Soil erosion	11.9
Invasive plants	7.1
Algae	4.8
Other	11.9
Solutions:	
Better enforcement	45.2
Clean beaches and rivers	25.8
Better facilities/training for fishers	9.7
Build reservoirs	6.5
Remove invasive plants	6.5
Marine park	3.2
Plant trees	3.2

Table 23. Major problems facing the Rivière Banane community according to 40 household occupants.

	% noted this problem
Poor roads/lack of transport	45.2
Lack of water	26.4
Invasive plants	17.0
Lack of facilities	5.7
Litter	3.8
Lack of communication	3.8

The majority of respondents agree with Statement 1 ('The reefs are important for protecting the land from storm waves'), with 54% strongly agreeing, 35% agreeing and no respondents disagreeing (Table 24). The majority of respondents (69%) strongly disagree with Statement 2 ('In the long-run fishing would be better if we cleared the coral'), with no respondents agreeing with this statement. 64% of respondents either disagree or strongly disagree with Statement 3 ('Coral reefs are only important if you fish and dive'), however 13% agree with this statement. 82% of respondents strongly agree with Statement 4 ('I want future generations to enjoy the coral reefs') and 92% either agree or strongly agree with Statement 5 ('Fishing should be restricted in certain areas even if no-one ever fishes I those areas just to allow the fish and coral to grow'). 67% of respondents agree with Statement 6 ('We should restrict development in some coastal areas so that future generations will be able to have natural environments'), however 18% disagree, with some respondents stating that new developments would bring more employment.

Table 24. Non-market and non-use values of the coastal resources according to 40 household occupants.

Value Statements	Percent Responses				
	1=disagree strongly	2=disagree	3= neither	4 = agree	5= agree strongly
The reefs are important for protecting land from storm waves.	0.0	0.0	10.8	35.1	54.1
In the long-run fishing would be better if we cleared the coral.	69.2	18.0	12.8	0.0	0.0
Coral reefs are only important if you fish or dive.	23.1	41.0	23.1	7.7	5.1
I want future generations to enjoy the coral reefs.	5.3	0.0	2.6	10.5	81.6
Fishing should be restricted in certain areas even if no one ever fishes in those areas just to allow the fish and coral to grow.	0.0	7.7	0.0	25.6	66.7
We should restrict development in some coastal areas so that future generations will be able to have natural environments.	0.0	18.0	15.4	18.0	48.7

3.8 Material Style of Life

Ninety-five percent of respondents own their own house with an average of 4 rooms per house. The majority of houses have concrete roofs and walls (83%), glass windows (80%) and cement floors (77%) (Table 25). All houses have access to piped water and 98% of homes have mains power. Only 13% of respondents own a boat and of these, 60% are made of wood and only 20% have an engine.

Table 25. The wealth of 40 household occupants from Rivière Banane.

	% respondents					
Roof	Tin: 17.5	Concrete: 82.5	Thatch: 0	Grass: 0	Wood: 0	Tile: 0
Walls	Tin: 17.5	Concrete: 82.5	Stone: 0	Thatch: 0	Tile: 0	Grass: 0
Windows	Glass: 80	Frame: 20	Open: 0	None: 0		
Floors	Tile: 23	Wooden: 0	Cement: 77	Mud: 0		
Water	Piped: 100	Well/borehole: 0	Public well: 0	River: 0		
Power	Mains: 97.5	Solar: 0	Battery: 0	None: 2.5		
Boats	0 boats: 87.5	1 boat: 12.5	2 boats: 0	3 boats: 0		
	Fibreglass: 40	Wood: 60				
	Motor: 20	Sail: 80				

4.0 Discussion

The majority of families interviewed, own their own house with an average of 4 rooms per house for 4 people and have access to mains electricity and piped water, suggesting that they

have a fairly good standard of living. However, previous surveys indicate that in the year 2000, 87% of octopus fishers in Rivière Banane earned less than 1,000Rs per month (US\$30) from fishing (Lynch *et al.*, 2001). 22% of respondents in the household surveys listed fishing as their primary or secondary occupation, which accounts for 40% of employed people, whilst 28% of respondents (32% of employed people) are dependent on planting. 63% of households surveyed were dependent on fishing as either their primary or secondary income, with 58% dependent on planting. This is higher than the national average of 28% of employed people being dependent on fishing and planting (CSO, 2005). The results therefore suggest that fishing is very important to the Rivière Banane community and the development of a no-take marine reserve in the region will have an important financial impact on a number of households and thus alternative income schemes will need to be developed.

The results suggest that the population of Rivière Banane is relatively young, with 50% of the community aged less than 30 years, suggesting that there will be more pressure on the marine resources in coming years. Indeed, despite migration abroad the population of Rodrigues is increasing at a rate of 0.74% (CSO, 2005). The majority of fishers are in the age category 26-45 years, with only 17% aged over 45. The Rodrigues Regional Assembly has suggested a Voluntary Retirement Scheme as a technique for reducing fishing pressure, however these results suggest that this would have limited success. Younger fishers tend to be more enthusiastic about training for a new career and so the results suggest that the development of an alternative livelihood scheme, including re-training programmes may be more suitable. However, the majority of fishers speak only Creole and only 4% speak French, which indicates that re-training for the tourism industry may only be possible for a small number of fishers, as most tourists tend to come from France and La Réunion.

The value of fish and octopus is classed as low – medium, with these produce sold locally as well as being used for own consumption by all household respondents. This suggests that the development of a no-take zone in the area will not only result in a reduction in income, but will also affect local diets, which at present are based around seafood. The level of impact is seen as high – medium, with impacts listed as the tsunami, overfishing, illegal fishing and algal overgrowth. The value of tourism is seen as low, as the inhabitants of Rivière Banane gain no benefit from the divers and snorkellers and no household respondents were involved in tourism activities. This suggests that further tourism development in the area should also provide some benefit to the local community, with tourist trips stopping to use resources such as the local shops and food stalls as well as employing some community members as boatmen or rangers for the new marine reserve.

Respondents state that illegal fishing is the main threat to the coastal resources in Rivière Banane and 45% of respondents suggest that better enforcement of fishing regulations is needed. Illegal fishing has been cited as a major problem during consultation sessions with other fishing communities around Rodrigues (Hardman *et al.*, 2006). This is particularly relevant to the development of the marine reserve and one solution could be to employ local fishers as community rangers to prevent illegal fishing within the reserve. The local community appears to be in support of protection of the marine environment with 92% of respondents agreeing with the statements ‘I want future generations to enjoy the coral reefs’ and ‘Fishing should be restricted in certain areas even if no-one ever fishes in those areas just to allow the fish and coral to grow’, suggesting that community rangers may be effective. In terms of community problems, 45% of respondents cite poor roads and lack of public transport. Limited resources and facilities in the region will limit the development of new businesses in the area and this should be taken into consideration during the development of alternative-income schemes. The lack of water in the summer, coastal flooding with saline water and invasive plants also limits the development of further agriculture. The Rodrigues

Regional Assembly is also keen to develop off-lagoon fishing, however only 13% of respondents owned their own boat, of which only 20% had an engine and 10% of respondents asked for better facilities and training for fishers.

Although there is an Association of Fishers and a Village Committee, fishers feel that they have a low involvement in coastal management decisions, with over 60% of household respondents stating they had no involvement at all and 86% having a low level of satisfaction with this lack of involvement. The role of the Association of Fishers is to address and solve problems relating to fishing in the local community, make decisions and take these issues to the Rodrigues Regional Assembly (RRA). Only 8% of household respondents were members of this Association, however 29% were members of the Village Committee, which has a similar role. Fishers at Rivière Banane have been consulted on 2 occasions by *Shoals Rodrigues* during the development of the marine reserves, however fishers commented that they had never been consulted directly by members of the RRA or Fisheries Department (Gell *et al.*, 2003; Hardman *et al.*, 2006). These surveys therefore indicate that a greater involvement of the fishing community in coastal management issues is needed in order for the management plan to be successful.

5.0 Recommendations

The surveys highlight a number of issues, which should be further investigated and incorporated into the management plan for the Rivière Banane marine reserve:

- The need for greater involvement of fishers and other stakeholders in the decision-making process through regular consultation sessions.
- The development of an alternative employment scheme for fishers displaced from the marine reserve, including new training opportunities.
- The development of tourism in the area to provide greater benefits to the local community.
- Better enforcement of fisheries regulations to prevent illegal fishing.

6.0 References

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7.0 Appendices

HOUSEHOLD SURVEYS

Interviewer: _____

Date: _____

Name of Interviewee: _____

Village: _____

1) What is the age, gender, education level, religion, language, primary and secondary occupation of each person living in the household?

Complete the following table:

Household Members*	Age	Gender	Education level (only if >16 yr)	Religion	Ethnicity	Language (+ foreign languages)	Primary Occupation	Secondary Occupation
*Note the household head (e.g. mother) and whether she is a widow (if a woman)								

2) What is your household's most important source of income? _____

3) What is your household's second most important source of income? _____

4) Do you own your own house? yes _____; no _____

Size of the house: number of rooms _____

For household materials (Observe):

Type of roof: tin _____; concrete _____; wood _____

Type of outside structural walls: brick/concrete _____; stone; _____; tin; _____

Windows: glass _____; frame _____; none _____

Floors: tile _____; wooden _____; cement _____; mud _____

Do you have access to water? piped _____; private well/borehole _____; public well _____; river _____

What power supply do you have? mains _____; solar power _____; battery _____; none _____

Do you own a boat? _____

How many boats do you own? _____

What is the boat made of (fiberglass or wood)? _____

How is the boat propelled (sail or engine)? _____

5) Complete the table below:

What are the main marine activities carried out by members of the household?

What goods/services are produced from these activities (e.g. fish, octopus, snorkelling)?

What methods are used to obtain these goods (e.g. line fishing, basket traps)?

Where is the product usually sold (National, Local)?

Are the goods generally used for own consumption or for sale?

Coastal and Marine Activities	Coastal and Marine Goods and Services	Methods	Target markets	Household Uses
1.				
2.				
3.				

5) On a scale of 1 to 5 (1=no participation, 5=fully active participation), to what extent do you participate in coastal management:

decision-making? _____

awareness raising? _____

6) On a scale of 1 to 3 (1=Low, 2= Medium and 3= High) to what extent are you satisfied with your level of a participation in coastal management:

decision-making? _____

awareness raising? _____

7) Is someone from your household a member of a stakeholder organization? _____

Which organization (s)? _____; _____; _____

8) How would you describe current conditions of each of the following resources using the scale of very good (5), good (4), not good or bad (3), bad (2) to very bad (1)?

Lagoon _____;

Coral Reef _____;

Rivers _____;

Forests _____;

9) What do you think are the top 5 major threats to the health of coastal resources?

· _____; _____; _____; _____; _____

10) Are there rules and regulations related to the following activities?:

Fishing _____;

Hotel development _____;

Residential development _____;

Tourism activities _____;

11) On a scale of 1 to 5 (1=no compliance, 5=full compliance), to what extent do people comply with coastal management rules and regulations? _____

12) On a scale of 1 to 5 (1=no enforcement, 5=full enforcement), to what extent are the rules and regulations enforced? _____

13) Apart from the threats described above, what do you see as the two major problems facing coastal management in the community?

_____;

What do you see as solutions to these problems?

_____;

14) What are the three major problems facing the community?

_____;

15) Indicate degree of agreement with the following statements using the scale: agree strongly (5); agree (4); neither agree nor disagree (3); disagree (2); disagree strongly (1).

_____ a) The reefs are important for protecting land from storm waves.

_____ b) In the long-run fishing would be better if we cleared the coral.

_____ d) Coral reefs are only important if you fish or dive.

_____ e) I want future generations to enjoy the coral reefs.

_____ f) Fishing should be restricted in certain areas even if no one ever fishes in those areas just to allow the fish and coral to grow.

_____ g) We should restrict development in some coastal areas so that future generations will be able to have natural environments.

KEY INFORMANT AND FOCUS GROUP INTERVIEWS

Interviewer: _____

Date: _____

1) What are the boundaries of the study area?

Mark area on map

2) Who are the main stakeholders of the marine environment in the area?

Complete the following table:-

Coastal Activity	Stakeholder Group 1	Stakeholder Group 2	Stakeholder Group 3

3) What different activities take place in the village and who does them (Men or Woman; Elders, Adults or Children)?

Complete the following table:-

Activities	Gender and age*	Why are some activities only carried out by one gender?					
Household activities:							
	Women	Men	Legal	Cultural	Physical	Education	Religion
Income activities:							

4) Who participates in the decision making?

Complete the following table:-

	Women only	Men only	Usually Women	Usually Men	Both
Household activities:					
Income use					
Time use					
Saving/investment					
Education					
Health					
Marine and coastal activities:					
Location					
Methods					
Timing					

5) How many people live in the study area? _____

6) How many households are in the study area? _____

7) How many people moved into or out of the area in the last year? _____ (note + or – to reflect moving in or out)

8) What are the major occupations in the community?

Complete the following table:

Major occupations in community	% of working population conducting this occupation as primary occupation	Number of people conducting this occupation as primary occupation	% of working population conducting this occupation as secondary occupation	% of working population conducting this occupation as tertiary occupation
1.				
2.				
3.				
4.				
5.				

9) Are you aware of any illegal fishing activities taking place within the area?

10) What percent of the people in the study area are currently in the following age categories?: 0-18 ____; 19-30 ____; 31-50 ____; over 50 ____

11) What percentage of the population is male or female?: male ____; female ____

12) On average, how many years have the people aged over 16 been to school for? _____

13) What percentage of the population is literate (can read and write)? _____

14) What % of people in the study area is: Creole ____; Chinese ____; Indian ____; Other ____?

15) What % of people in the study area is: Catholic ____; Hindu ____; Other ____?

16) What % of people in the study area speak the following languages: Creole ____; French ____; English ____?

17) Which services or businesses exist in the study area?

Underline the activities which exist:-

schools, resident doctors, resident nurses, hospitals, pharmacy, electricity, telephone, internet access, radios, televisions, satellite TV, newspapers, sewage treatment plant, tarmac road access, water supply to homes, banking services, religious buildings (mosques, churches, temples)

food markets, restaurants, food stalls, banks, gift shops, dive shops, tour operations, fishing guides, guesthouses/ hotels/ inns/ resorts, yacht charters

18) Who owns the businesses in the area? Where do the owners come from and where do they live now? How important are the business to the area?

Complete the following table:

Business	Origin of owners	Place of residence	Rank*

*The least numerous category is ranked 1.

19) Complete the table below:-

What are the main marine activities that are carried out in the area?

What goods/services are produced from these activities (e.g. fish, octopus, snorkelling)?

What methods are used to obtain these goods (e.g. line fishing, basket traps)?

What is the value of these goods (High, Medium, Low)?

Where is the product usually sold (National, Local)?

Are the goods generally used for own consumption or for sale?

Is this area used by people who don't live in the study area? How important is this (High, Medium, Low)?

What level of impact do you think there is to the marine environment in the study area (High, Medium, Low)?

What do you think are the main impacts to the marine environment in the study area?

Where and when are the activities carried out?

Coastal and Marine Activities	Coastal and Marine Goods and Services	Methods (primary)	Value of Goods and Services	Goods and Services target markets (primary)	House hold Use	Level of Impact	Types of Impact (primary)	Level of use by Outsiders

Coastal and Marine Activities	Coastal and Marine Goods and Services	Use Patterns		
		Location	Timing	Season

20) Are stakeholders involved in decision-making and management of the coastal zone?

Complete the following table:

Stakeholder Group	Decision making and management activities	Stakeholder participation (1 to 5)*	Level of satisfaction with Participation (High, Medium, Low)

*1=no participation, 5=fully active participation)

21) What community organisations are people living in the area members of? What are the functions of these groups and do they have an influence on coastal zone management issues?

Complete the following table:

Community Organisation	Formal or Informal	Main Functions	Influence (on coastal management; community issues; both; none)

22) List which organisations or individuals are involved in making decisions about marine and coastal activities (i.e. where, when, how, and who can carry out this activity)? _____

23) Who (activity, age, gender) else (not necessarily part of an official process) **has** to be consulted for the activity to be carried out, expanded or changed? _____

24) Where do you get information from about marine and coastal resources (e.g. NGO, social group, news paper)? _____

FOR TOURISM SECTOR ONLY:

25) Approximately how many tourists visit the area each year? _____

26) How many tourists visit from the following countries: Mauritius _____; Réunion _____; France _____; U.K. _____; Other _____ ?

27) How many tourists visit in the following months: January _____; February _____; March _____; April _____; May _____; June _____; July _____; August _____; September _____; October _____; November _____; December _____

28) What percent of the tourists are in the following age categories: 0-18 _____; 19-30 _____; 31-50; _____; over 50 _____

29) What percent of the tourists are male or female? male _____ female _____

30) What percent of the tourists are interested in the following activities: nature _____; beaches _____; diving/snorkelling _____; fishing _____; culture _____; other _____; other _____?