CERMES Technical Report No. 21

Information for the Negril Marine Park's Fisheries Management Plan

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2008

ABSTRACT

Information for the Negril Marine Park's Fisheries Management Plan

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Years of overfishing and habitat destruction have lead to a decline in fisheries throughout the Negril Marine Park (NMP). Still today, the communities around the NMP are dependent on fisheries resources for food and income. Currently, there is no active fisheries management for the park and the benefits the fisheries provide will continue to decline if no management plan is implemented. The Negril Coral Reef Preservation Society is looking to improve the fish stocks through the development of a Fisheries Management Plan (FMP) within the framework of the Park's general management plan and governing policy.

This paper addresses the information needs for the NMP's FMP. The main objectives of this research were to determine the kind of information needed for the FMP; how the information should be generated and the implications of information use for management. The national policy and legal framework, a description on NMP fisheries, fisheries management arrangements, the fisheries management context for the NMP and the management and implementation plans for specific fisheries and aquaculture were the key components set out in the draft FMP table of contents which was agreed to by all fisheries collaborators. A socio-economic monitoring survey, 1998 Jamaica fisheries census, fisheries management plan consultation meetings and interviews with charter boat fishers and restaurant owners provided adequate means for demonstrating the generation of information relevant to the FMP. As a result of the information generated, management must seek alternative fishery options and complementary livelihoods for the NMP communities. Fishers need to be integrated in the management regime through increased communication and stakeholder participation. There is some scope for co-management; however resource user groups need to become organised, enforcement should be strengthened and further education is needed.

The lack of organisational resources, bureaucratic impediments and the large size of the park were deemed as some of the limitations to the development and implementation of the NMP FMP and to NMP and fisheries management. Mechanisms for increasing communication and stakeholder participation specifically for co-management, and improving sustainable and alternative livelihoods of the NMP communities were some of the strategies recommended to NMP managers to assist fisheries management planning and to improve NMP and fisheries management.

Keywords: Fisheries, Fisheries Management Plan, Marine Protected Areas, Negril Marine Park

ACKNOWLEDGEMENTS

I would like to thank my supervisor Dr. P McConney for introducing me to the challenge of conducting research on information for the Negril Marine Park's Fisheries Management Plan. His guidance and patience throughout my research project is appreciated. I also want to thank him for opportunity of being a co-author of 'Socio-economic information for managing fisheries is the Negril Marine Park' which was presented at the GCFI in Columbia. Special thanks to my co-supervisor Maria Pena who produced 'An Annotated Bibliography relating to Socio-economic Monitoring for Coastal Management at the Negril Marine Park'. The wealth of documents identified was for useful for my project. I am also thankful to Counterpart Caribbean for funding my trips to Negril, Jamaica.

My sincere regards to the staff of the Negril Coral Reef Preservation Society (NCRPS) and especially to Carl Hanson (park manager) for providing his insights on park and fisheries management implications.

Special thanks to Malden Miller (CREP), Richard Kelly and June Masters (Fisheries Division) for attending the workshop in Negril and assisting in the formulation of the fisheries management plan for the park.

I would like to extend special thanks to my sister, Ingrid for her on-going assistance especially during the write up of my research project and encouraging me to never give up.

To the charter boat fishers and two restaurant owners who were willing to assist me in my research, I give my sincerest thanks.

Final thanks to my friends at CERMES who assisted me to varying degrees in my research and throughout the CERMES programme. Also thank you all for making a year at CERMES an extremely memorable experience.

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Blackman, K. and P. McConney. 2008. Information needed for the Negril Marine Park's Fisheries Management Plan. CERMES Technical Report No. 21. Centre for Resource Management and Environmental Studies. University of the West Indies, Cave Hill Campus, Barbados. 100pp.

1. INTRODUCTION

This paper focuses on the information needed for the formulation of a fisheries management plan (FMP) for the Negril Marine Park (NMP), Jamaica, primarily from a socio-economic perspective. The fish populations within Negril's Marine Park are declining and there are few measures in place to combat threats such as overfishing, irresponsible or illegal fishing and habitat degradation. The livelihoods of many people depend on fish and fisheries. Therefore it is important that the fisheries are appropriately managed. Currently, there is no fisheries management plan for the NMP. This research contributes towards the formulation of the NMP's first fisheries plan within the framework of the park's general management plan and the government's national policy on fisheries and marine protected areas (MPAs).

1.1 Overview of Negril and its Marine Park

Negril is situated in Westmoreland, bordering Hanover, (Figure 1.1) and it has been identified as the third largest resort area in Jamaica. Until the 1960s, Negril was a remote community of farmers and fishers, only accessible by boat. As Negril's recognition grew, more visitors arrived in the area transforming Negril into the third largest resort on the island.

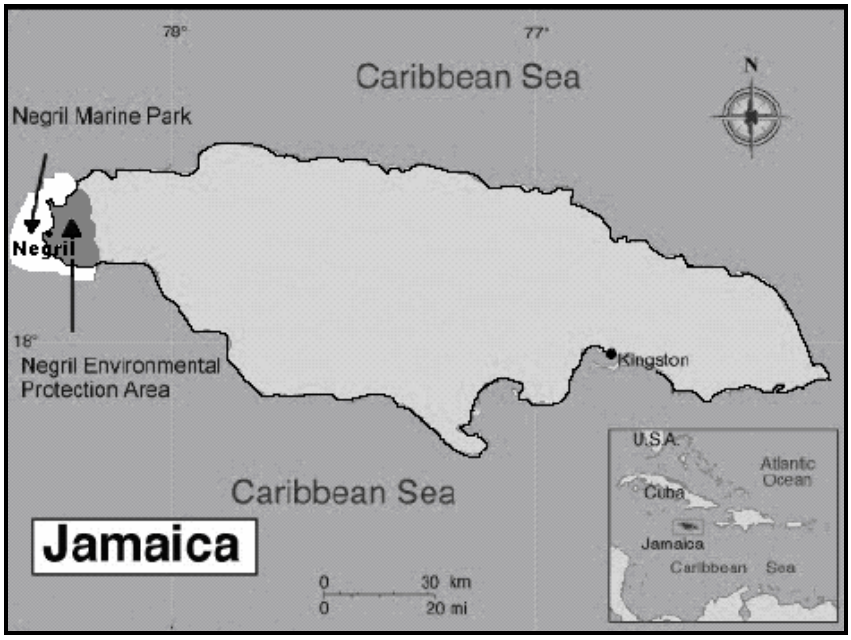

Figure 1.1: Map of Jamaica indicating location of the Negril Marine Park

(Source: O'Sullivan, 2002)

In 1960, it was recommended by the late Dr. Thomas Goreau that a Negril Marine Park should be established. However for over thirty years no definitive action was taken and tourism development continued to increase and expand, further transforming the area (Richards, 2001). Over the last 20 years, various impacts from land-based development and natural phenomena have resulted in the decline of the health of the coral reef and the surrounding marine environment. The chief stresses on the reefs were: heavy fishing

pressure, sedimentation from dredging and coastal development, excessive nutrient loading from wastewater, pollution (garbage, oil, sewage effluent, agrochemicals) and physical damage from anchors (Christophersen *et al*., 1997).

In 1989, a group comprising mainly scuba divers formed the Negril Coral Reef Preservation Society (NCRPS) and it grew quickly to include fishers and members of the tourism and business communities. From 1995, a Negril Marine Park was again proposed and this time its establishment was vigorously promoted by the NCRPS. The Negril Marine Park was established by the government of Jamaica under the Negril Marine Park Order in 1998 "to conserve the natural marine and coastal resources in a way that provides maximum protection of their health and integrity while allowing sustainable economic and social development within the Negril Environmental Protection Area" (Thacker and Hanson, 2003). In 2002, the Natural Resource Conservation Authority (NRCA), now within the Natural Environmental and Planning Agency (NEPA) delegated management of the NMP to the NCRPS (NRCA, 2002).

Negril Marine Park spans parts of the parishes of Westmoreland and Hanover. The boundaries of the park extend out to sea to include the reefs, varying 183 metres from the coast at Little Bay to 2.2 km from the coast at Long Bay further north. The coastal boundary of the NMP is approximately 33km and the area covered is approximately 160 square km (NCRPS, 2005). The NMP has eight zones to be demarcated and it is bordered by 13 fishing communities, the major communities being Little Bay, Orange Bay and South Negril (Garaway and Esteban, 2002).

1.2 Fishery issues in Negril

Negril was once a small but active fishing village, however, the increase in development was fuelled by tourism. The proliferation of beachfront hotels and watersport activities in the nearshore displaced the fishermen who were marginalized (NEPT *et al*., 1997). Eventually, they were forced to establish their base in the mouth of the South Negril River. In the last decade, reef fish populations have declined and very few large fish are now seen. Fishermen noticed decreases in catch, average fish size and species composition trends towards less valuable fish. According to Christophersen *et al*. (1997), there are several key factors responsible for the decline in the fish population over the last decade. Initially, it began with the destruction of the coral reefs by Hurricane Gilbert in 1988 (Christophersen *et al*., 1997), where there was a 20% reduction in coral cover and this impacted on juvenile fish stocks. Over the years, there were also the incursions of fishermen from communities outside of Negril who used the grounds within the Negril watershed as alternative fishing sites. Unsustainable and destructive fishing techniques such as spearfishing by those within the park and dynamiting by southern fishers from outside the EPA have also negatively affected the reefs and juvenile fish. There has been an increase in the use of spearfishing by younger men between the ages of 17-25 (Christophersen *et al*., 1997). This has resulted in rivalry between these fishermen and the traditional pot fishers, as spearfishers catch more fish in a shorter period. Seine nets damaged seagrass beds and shallow corals which were the breeding and nursery grounds of many reef and deep-water species. Continued degradation of the habitat led to a decrease in fishery stocks, and an increase in fishing pressure will exacerbate the worsening condition of the coral reef fishery. There are few data on the shallow shelf reef fishery in Negril (Christophersen *et al*., 1997), but it is clear that both the natural

resources of the park and the livelihoods of its various users are under threat from a variety of sources. It is difficult to assess fishery trends and take decisions on the management of the park and its users in the absence of comprehensive fishery information.

According to some studies (Garaway and Esteban, 2002; O'Sullivan, 2002, Thacker and Hanson, 2003), these aforementioned fishery issues persist in the NMP. If the heavy fishing pressure continues especially with an increase in fishers, this can become even more detrimental to fish populations. Estimates of the total numbers of fishers in the area vary considerably. Particularly in Negril town, there has been a substantial increase in fishers, especially younger men who increase the fishing pressure within the nearshore area. Fishing practices vary in the park from use of traps/pots, hook and line, and to a lesser extent use of seine nets (Garaway and Esteban, 2002). Unsustainable fishing practices and conflicts between fishers still persist in the park. For example, the use of spears is increasing, even though it is prohibited in the marine park.

Regarding park management, the fishermen believed that the park was not doing enough to help them such as prohibiting pollution and degradation of the marine environment and it gave partial treatment to dive operators who were destroying their fish pots (Garaway and Esteban, 2002). However, fishermen have assisted in the management of the park through their contribution to the zoning plan for the NMP (Thacker and Hanson, 2003). According to Garaway and Esteban (2002), the problem is that the park's zones could negatively affect fishers' access to the fishery and impact on their livelihoods. The zoning of the area prohibits fishing within two miles of the shoreline. The fishermen would be displaced and would be obliged to fish further out to sea to catch pelagic fish such as the tunas, barracudas. Those fishermen without boats, especially spearfishers, and those using canoes would suffer the most, as their fishing activity is more focused on the near shore environment.

The peak of the fishing season is between September and November. However, fishermen tend to fish all year round, regardless of whether it is the low or high season for the target species (Garaway and Esteban, 2002). Furthermore, many fishers within the area are not licensed and other fishermen from areas outside the park (e.g. Savanna-la-Mar, Lucea and Montego Bay) come within the boundaries of the park to fish. These fishermen may not be aware of the regulations within the park or they may be more prone to disregard the regulations.

1.3 Socio-economic importance of fisheries management and planning

Benefits of fisheries to communities in and around the NMP will continue to decline if there is no proper fisheries management in place. It is imperative that an effective fisheries management plan be implemented to prevent any further over-exploitation of NMP fisheries and to achieve sustainable fisheries. With the aim of improving the fish stocks, the NCRPS is seeking to develop a fisheries management plan (as stated as the third objective in the NMP management plan) for the park within the contexts of policy, planning and best practices for Jamaica's marine protected areas (MPAs) and its fisheries. The plan is now in its initial stages. The NMP FMP should help to rebuild and restore fish populations and ensure that fishing can continue throughout the generations, without having any negative social effects on the fishery dependent communities. The

plan is expected to provide a good framework for implementing appropriate legislation and regulations with adequate enforcement measures and to allow for collaboration between the government and stakeholders (mainly fishers) in the context of co-management.

1.4 Research objectives

The research objectives were to determine:

(1) the kind of information needed to be generated for the NMP FMP

(2) how the information for the NMP FMP should be generated

(3) the implications that the information generated has for management.

This research was integrated with the socio-economic monitoring survey and the Caribbean Coastal Co-management and Coral Regeneration Programme' projects (4C's Programme) that Centre for Resource Management and Environmental Studies (CERMES) conducted with NCRPS. Counterpart Caribbean was responsible for funding two research visits to Negril.

This paper is organised as follows: Chapter Two provides more background on fisheries in Jamaica, their relation to MPAs and the need for managing both fisheries and MPAs collaboratively. Chapters Three explains the research method used to achieve the three objectives. Chapter Four describes results including an outline of the proposed NMP FMP, the process of acquiring this information and the implications the generated information will have for management. Chapter Five provides an in-depth discussion about the importance of the information to the development of the FMP. Subsequently it concludes the paper and provides recommendations which could be used by park managers to encourage stakeholder participation, promote better communication and possible alternative livelihood strategies that can be implemented. Supplementary information is in the Appendices.

2. BACKGROUND

2.1 Marine Protected Areas

In the Caribbean, most inhabitants live along the coastal area which is economically important particularly for tourism, fishing and other activities which contribute to the well-being of most countries. As coastal development and populations in the Caribbean increased, human activities have exploited and degraded marine and coastal ecosystems. These activities range from overfishing, destruction of critical habitats for fish, beach erosion and pollution. Many Caribbean states are small and they are subject to environmental pressures that cannot be addressed by the management approaches applied in large continental countries. Caribbean states need a holistic approach to management such as integrated coastal area management (ICAM). ICAM is a dynamic process in which a coordinated strategy is developed and implemented for the allocation of environmental, socio-cultural, and sustainable multiple uses of the coastal zone (UNEP, 2004). ICAM requires balancing a wide range of ecological, social, cultural, governance and economic considerations and entail co-management and community participation.

As Caribbean islands are trying to address problems such as the degradation of marine and coastal resources, marine protected areas (MPAs) are often proposed as the

management tool of choice. The IUCN defines a marine protected area as 'any area of intertidal or subtidal terrain, together with its overlying water and associated water and associated flora, fauna, historical and cultural features, which have been reserved by law or other effective means to protect part or all of the enclosed environment'. Marine protected areas have been established throughout the Caribbean and have been very useful and beneficial in some cases (van't Hof, 1998; Woodfield, 1997, Geoghegan *et al.*, 2001). The establishment of MPAs is not only important for protecting the environment and conserving biodiversity but they are often potentially important for economic activities such as tourism and fisheries.

Jamaica has set out a policy that describes the system of protected areas as having an underlying foundation of environmental protection and a standardized approach to planning and management (Government of Jamaica, 1997). One of the goals of the policy is to conserve resources for sustainable use and this sets the stage for the role of MPAs in protecting an important resource: fisheries. There is substantial weight of evidence elsewhere around the world, and in the Caribbean, reflecting the beneficial role of MPAs to fisheries. These benefits range from improving fish stocks and protecting critical habitat to improving the socio-economic outcomes for local communities (Roberts and Hawkins, 2000; Sanchirico *et al.*, 2002 and Kenchington *et al.*, 2003). However, these benefits do not automatically reach to fishers who are form the poorer sections of the community (Garaway and Esteban, 2003). Despite the potential fishery benefits from MPAs, it is initially hard to gain the support of local fishing communities to establish MPAs because of their concern of the potential loss of livelihoods. However some parks, particularly NMP and Montego Bay Marine Park (MBMP) within Jamaica, have gained local support through programmes which address the needs of the fishing communities.

In Jamaica the role of fishing in local communities has somewhat been taken into account for the development of MPAs. However, problems have arisen whereby unsustainable fishing practices are prohibited and fishers have to change to alternative sustainable practices. At times, fishers continue with these destructive practices (e.g. spearfishing, use of small mesh nets, traps and dynamite) despite the stipulated regulations (Garaway and Esteban, 2002). Furthermore, few MPAs totally prohibit fishing and so zoning is used as a common form of fishing regulation. Zoning not only allows for protection of fish stocks and nursery areas for the purpose of replenishing the surrounding areas; but is thought to reduce conflict between fishers and recreational users. Despite this expected outcome, many conflicts still remain between local resource users, for example in the NMP (Francis, 2002; O'Sullivan, 2002).

As a result of some of these issues, the NMP and MBMP have programmes aimed at enhancing the livelihoods of fisher, mitigating the negative impacts of management on disadvantaged stakeholders and protecting the marine environment. For example the NMP has a "Fisheries Management Programme" which addresses the livelihood of local fishers and the "Mesh Exchange Programme" to allow fishermen to receive a 2 for 1 exchange of mesh wire to replace fish pots that frequently catch juvenile fish. One of Montego Bay Programmes is entitled "Towards Sustainable Fisheries Management in the Montego Bay Marine Park" which aims to stem the degradation of fisheries resources within the Montego Bay Marine Park. The impact of these programmes on livelihoods and poverty has not been documented, but there is evidence that the programmes could

increase the interest and involvement of the targeted user groups in the MPAs' management (Geoghegan *et al.*, 2001).

2.2 Fisheries in Jamaica

Fisheries play an important role in the economic, social and cultural lives of Jamaicans. In 2004, there were 15,392 registered fishers in Jamaica but estimates state that there may actually be over 20,000 full and part time fishers engaged in fishing (Kong, 2004). The ratio of full-time to part-time fishers is approximately 3:1 (CARICOM Fisheries Resources Assesment Management Program [CFRAMP], 2000). The structure of the Jamaican fishing industry is outlined in Figure 2.1. The fishing industry is mainly made up of artisanal fishermen operating from canoes powered by outboard motor or oars. There is also a commercial sport fishery (charter boat and tournament) associated with tourism, a small recreational fishery (Kong, 2003) and aquaculture. There are approximately four main types of fish production in Jamaica.

2.2.1 Artisanal fishery

The artisanal fishery is an open access multi-species fishery. The fish resources exploited are the deep slope demersals, the shallow reef finfish, coastal pelagics, spiny lobster, queen conch and shrimp. These species are primarily caught on the island shelf and offshore banks (Bedasse, 2004). The coral finfish accounted for the largest catch category in Jamaica fisheries. Most fish are caught in Z-shaped Antillean fish pots, along with gill and seine nets, hook and line and spear guns (Linton *et al.*, 2002). According to Kong (2003), ninety percent of artisanal fishers fish in the inshore areas (i.e. island shelf and proximal banks). The remaining ten percent work offshore and five percent of those reside on the Morant and Pedro cays (Kong, 2003).

2.2.2 Industrial fishery

The industrial fishery mainly exploits conch and lobster. Jamaica is the world's largest producer and exporter of Queen conch (*Strombas gigas*). Conch exports account for 95% of the total catch which is about 1800 tonnes, with a landed value of over J$500 million (US$15 million) making it Jamaica's most valuable fishery (CFRAMP, 2000). Conchs are harvested by large steel hulled vessels under foreign charter. These vessels have many divers with hookah or SCUBA gear. The industry also buys conch from artisanal fishers, carrier boats and middlemen. The industrial lobster fishery is a limited entry fishery with a maximum of twelve licences (Kong, 2003). This industry operates on the offshore bank (Pedro Cay Bank) using steel hull motor vessels with rectangular wooden slatted traps. According to Kong (2004), in 2001, total production of spiny lobster (*Panulirus argus)* was estimated to be 943.39 metric tonnes with a retail value of US$4,456,709.13.

2.2.3 Sport fishery

Sport fishing largely occurs on the north coast of Jamaica and sport fishers mainly target pelagic species such as yellowfin tuna, kingfish and marlins. The fishery is inadequately regulated. No official data exist on the number of vessels involved or the quantity of catch taken during tournaments and charter boat trips (Kong, 2003).

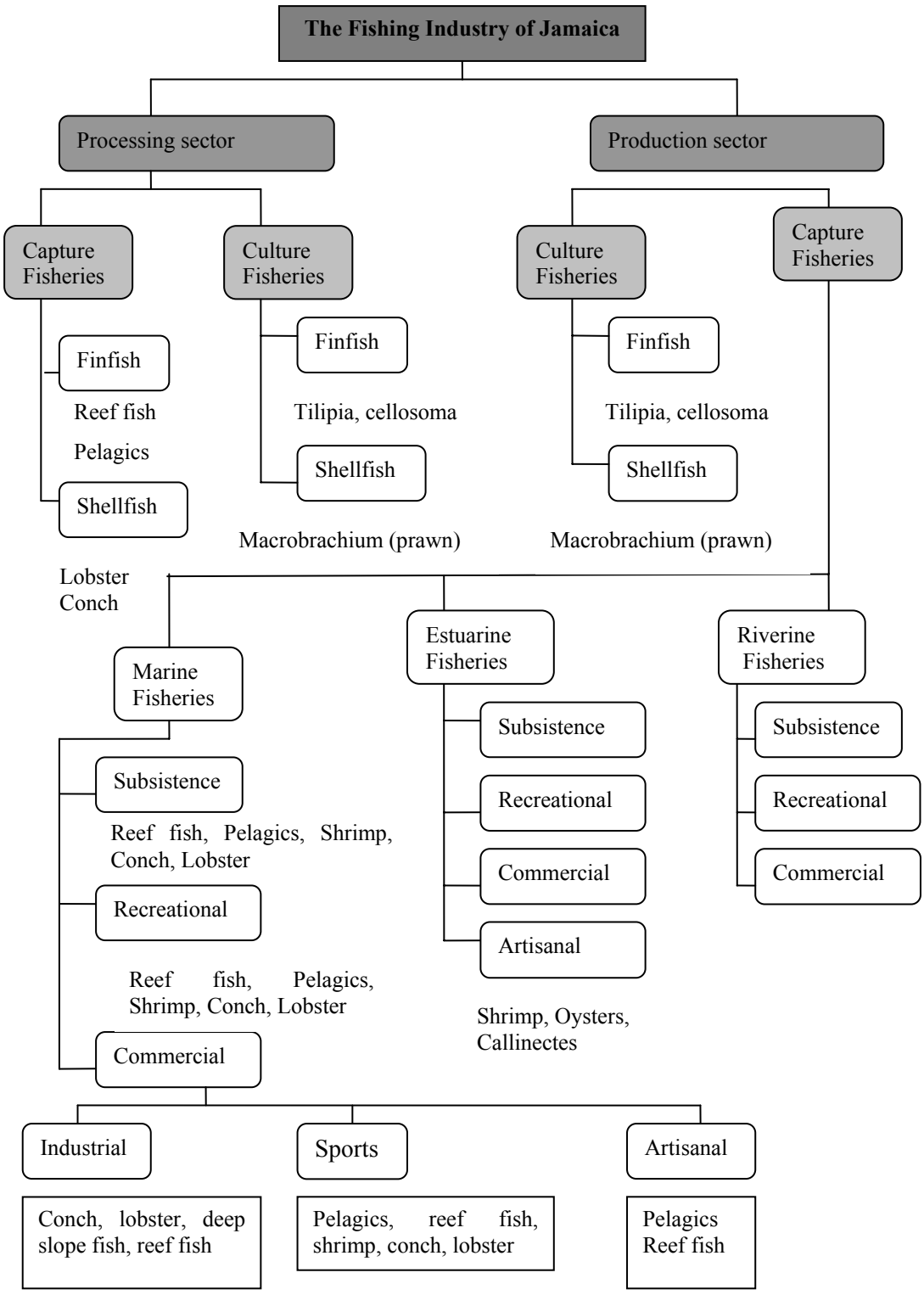

Figure 2.1: Structure of Jamaican Fishing Industry

(Modified from CFRAMP, 2000)

2.2.4 Aquaculture and mariculture

With the decline in marine fish supply, aquaculture has become an interesting investment for Jamaica. Aquaculture is being practiced by a number of small-scale fish farmers who own less than 1 hectares of land. Aquaculture of red tilapia is the most commercially important fish farming activity (Aiken *et al.*, 2002), having risen to 5000t in 2000. Most of the fish were exported to North America and Europe. There is also some small scale mariculture of mangrove oysters (Kong, 2003).

Fisheries have made socio-cultural and economic contributions to Jamaica. One of the most important roles is contributing to nutrition and food security. The sector generates a wide array of jobs from fish harvesters, processors, traders, gear making and repairs and engine repairs. Furthermore, the money earned from fishing supports additional alternative income generation opportunities in non-fishery related activities such as restaurants, shops and bars that provide value added products to consumers. Fisheries also contribute to foreign exchange through exporting of fishery products such as conch and lobster (Kong, 2003).

Despite these economic and social benefits, decades evidence has shown there has been a decline in fisheries around Jamaican waters. Studies have shown many reasons for a decline in fisheries (Woodley *et al.*, 2000; Spalding *et al.*, 2001). A recent study (Jones *et al.*, 2004) confirmed that intense fishing still occurs around Jamaica. Hence more effort must be placed on fisheries management.

2.3 Fisheries management in Jamaica

According to the Caribbean Regional Fisheries Mechanism [CRFM] (2005), proper management of the marine fisheries of Jamaica must focus on the sustainable use of fisheries resources for the benefit of the people of Jamaica. Optimal and sustainable fisheries management ensure fish stocks and the integrity of the marine ecosystem are maintained to reap economic and social benefits of the fishing industry. Worldwide, fisheries management is guided by the FAO Code of Conduct for Responsible Fisheries (1995), whereby principles and standards are set out for responsible fishing, to ensure effective conservation, management and development of living aquatic resources, with respect for the ecosystem and biodiversity.

Nationally, the Jamaican fishing industry is governed and regulated by The Fishing Industry Act of 1975 and the Regulations of 1976. Other related Acts include Natural Resources Conservation Authority Act (1995), The Maritime Area Act (1996), the Exclusive Economic Zone (EEZ) Act (1991), the Wildlife Protection Act 1945 which influence management of the fishing industry. Management of fisheries (e.g. coastal and offshore pelagics, reef fish, conch, lobster and shrimp) involves the implementation of conservation measures, socio-economic measures and other management options such as prohibition of sale and harvesting during closed seasons, regulating use of traps and mesh size, effort reduction and gear restrictions, protection of juvenile species and berried lobsters and designation of fish sanctuaries (i.e. no-take fish zones) (CFRAMP, 2000).

In Jamaica, there are many shortcomings in fisheries management which need to be addressed. First of all, there is a lack of political will from the government, as the government does not have fisheries as a high priority. According to a 1990 socio-

economic survey of the fishing industry, this lack of any feeling of urgency was demonstrated by 'the lengthy lag time taken in decision-making' (Aiken, 2005).

Enforcement is poor and ineffective as money to adequately support personnel is lacking (Aiken, 2005). Under the Fishing Industry Act, 1975, fishing is prohibited without a licence. However, there are many active fishermen operating without a licence (CRFM, 2005). Fishermen are not regularly monitored and inspected for licences. Furthermore, the fines and penalties are too small and do not keep up with the increase in people breaching laws (Aiken, 2005). Closed seasons have been imposed for spiny lobster and conch to allow the species to reproduce, but often these seasons are ignored. Fishers still openly sell lobsters on the beaches, and restaurants still have it on their menus. Undersized lobsters have been protected to allow them to at least reproduce once before being caught. However, some fishers are continually harvesting and landing undersized and berried female lobsters (Kong, 2003). In many cases, fishers were attempting to illegally remove the eggs by washing them off the female lobster.

Moreover, the laws of Jamaica which address fisheries management are deficient. Gear limitation is a management measure used. A review of the laws indicated that the Fishing Industry Regulations 1976 restricts the mesh size of beach seine nets to reduce capture of juvenile fish. Fish traps and pots are frequently used by fishers; however regulations, do not set minimum mesh sizes for the fish traps. There are also no fish size limitations for finfish documented in the regulations. However the Wildlife Protection Act, 1945 forbids the landing of juvenile fish. It states that juvenile fish are to be protected, and that the definition of juvenile/immature fish will be provided under section 14. The definition was to be given in accompanying regulations; those regulations were never issued (NRCA, 1995). The Wildlife Protection Act, 1945, also banned the use of dynamite; however, dynamite is still used by a minority of fishers (NRCA, 1995). The government is making efforts to manage these wild stocks; however it is hard to enforce fishery regulations, especially when these regulations put the livelihoods of the people at risk (NRCA, 1995).

2.4 Fisheries management in Negril Marine Park

The Negril Marine Park comprises many fishing settlements from Davis Cove in the north to South Negril River and to Salmon Point in the south. Within the area, zoning has been used as a management tool and fishermen have contributed to the development of the zoning plan and plans for managing the fisheries resources (Thacker and Hanson, 2003). The zones include areas for fishing, fish sanctuaries, swimming, anchoring, motorized craft, non-motorized craft, scientific research, diving/snorkelling (Geoghegan *et al.*, 2001) (Figure 2.2).

The Negril Marine Park Management Plan has outlined some management policies and programmes including those for fisheries. The park's interest is mainly in improving the fish stocks (Thacker and Hanson, 2003). A number of fisheries projects have helped with improvement of the fisheries and addressed the livelihoods of local fishermen:

- The exchange to encourage trap wire mesh of 1.5 inches and significant reduction of fishing within bays and mangrove areas (Garaway and Esteban, 2003).
- The Fish Aggregating Device (FAD) project was launched by the NCRPS Rangers. This was an attempt to assist fishermen who have been displaced by the

zoning plan. The device is set to attract fish such as tunas, barracudas and dolphin fish (Thacker and Hanson, 2003).The purpose of the FADs was to take the pressure off the reef fish.

- The Negril Fishing Cooperative plans to develop a Fisherman's Village which would incorporate several projects to assist fishermen such as providing additional income and jobs; purchasing larger boats to take fishermen out to sea to catch the larger pelagic fish (Thacker and Hanson, 2003).

Since the park's establishment there was an average of one case per year that has been successfully prosecuted. These cases mainly dealt with the use of dynamite in an area where there is no regular patrol and the use of seine nets in fish sanctuaries and nurseries (Richards, 2001). According to Richards, (2001) the problem is that the magistrates are unaware of the importance of the park's laws and regulations. The NCRPS has taken on the role of educating violators. NCRPS rangers are well respected, and violators listen to the rangers, so there are few repeat offenders except for spear fishers who are not from the Negril area (Richards, 2001).

While the aforementioned fisheries issues are not unique to Negril or Jamaica, these issues should be addressed through well informed management planning with sufficient emphasis placed on the social aspects of fisheries. The development of a fisheries management plan is a step towards protecting the fisheries, while maintaining opportunities for the livelihood of the people in the NMP communities. The plan must gear towards setting a legislative framework and stipulating regulations that are to the benefit of all.

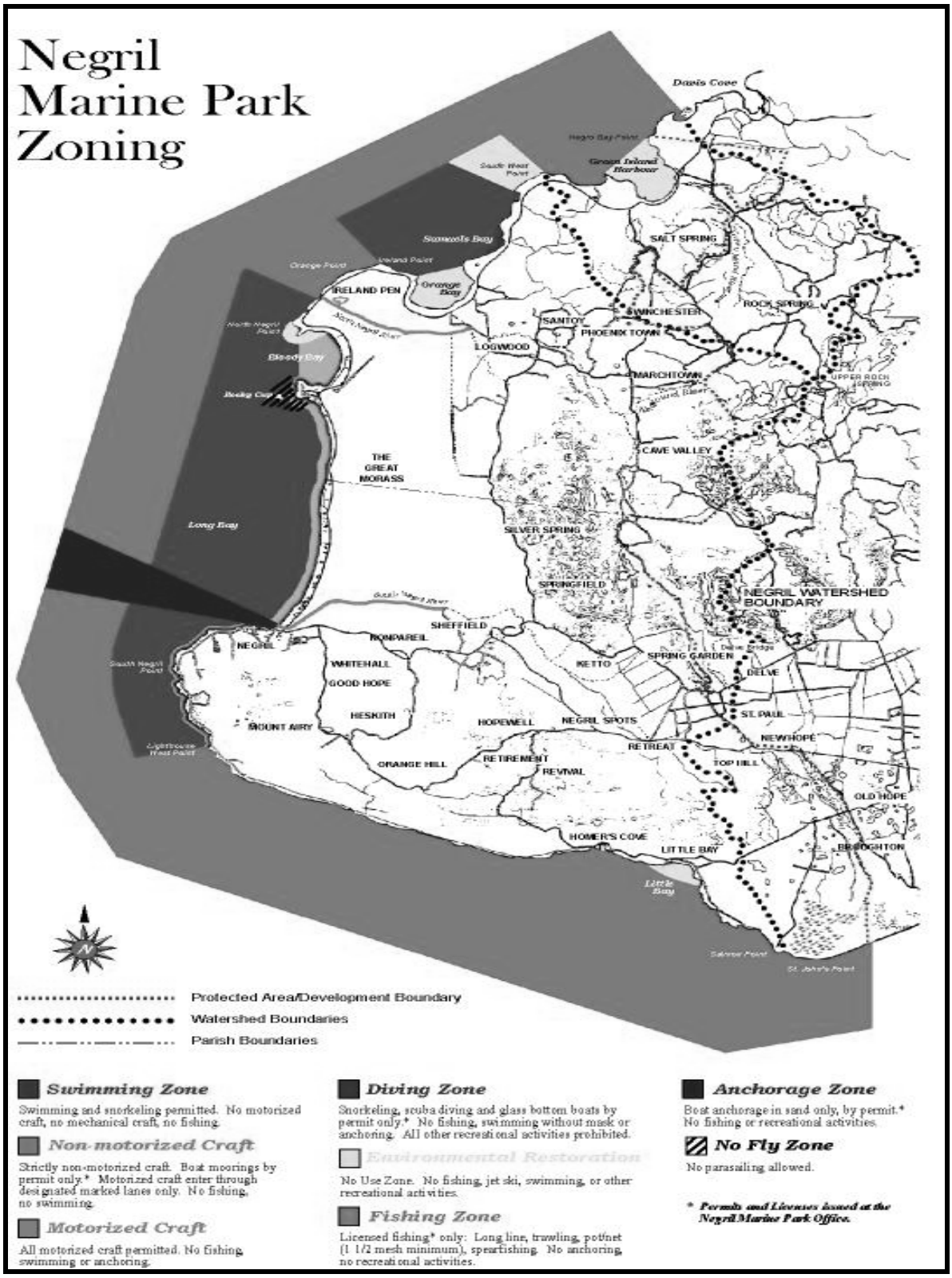

Figure 2.2: Zoning of the Negril Marine Park in Jamaica

(Map source:Thacker and Hanson, 2003)

3. METHODS

Based on the research objectives, three stages were used to research information for the NMP fisheries management plan (Figure 3.1). The first stage was to determine the relevant information needed for the FMP. Second, the process of generating this information was investigated and data collected were analysed to test selected processes. Thirdly the implications this information has for management were determined.

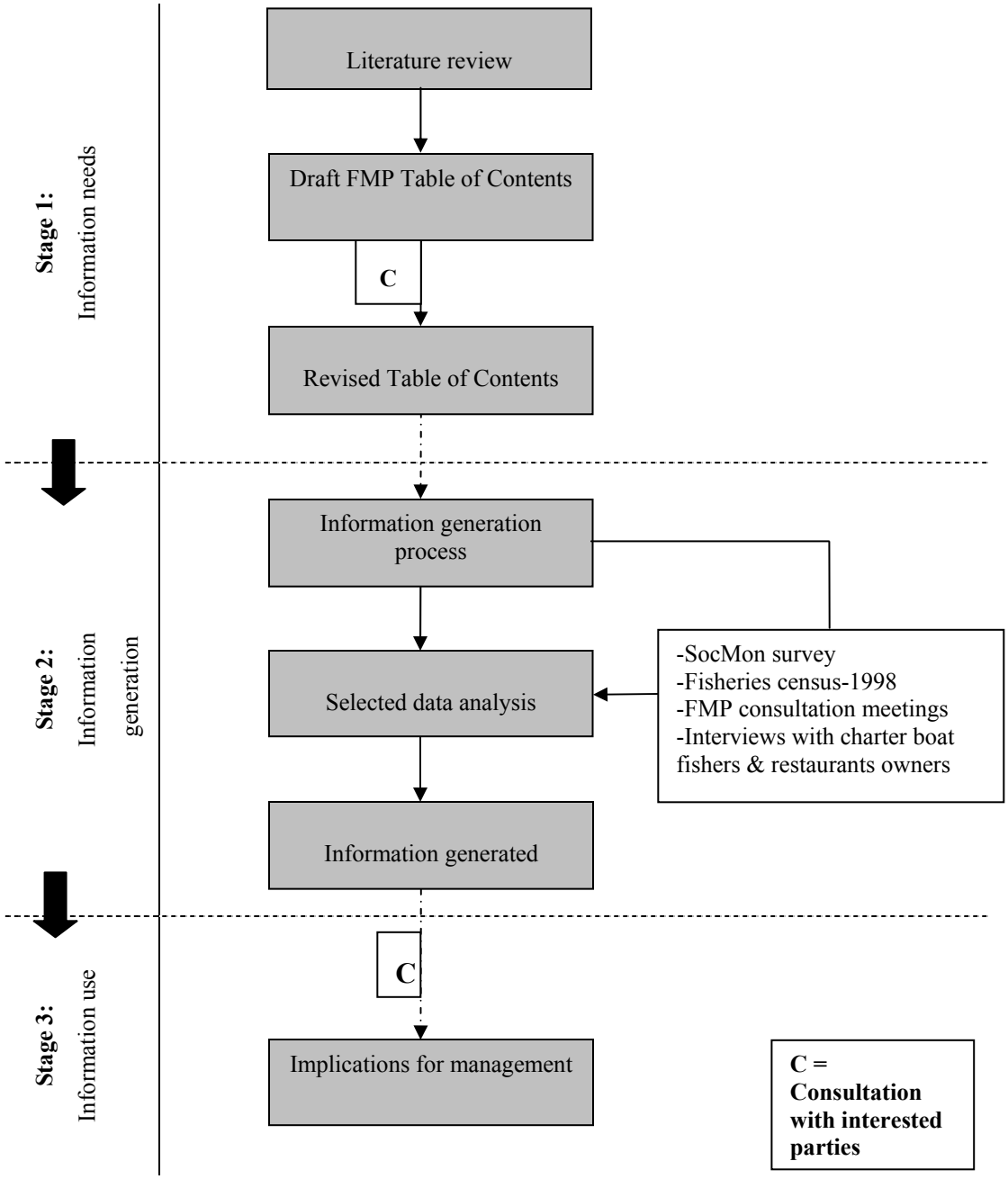

Figure 3.1: Flowchart of the procedure used for the development of the NMP FMP

3.1 Information needed for the NMP fisheries management plan

3.1.1 Literature review

A literature review was conducted on models of fisheries management planning and on the fisheries sector of Jamaica. Models of fisheries management planning were examined using Berkes *et al.* (2001) and the Barbados Fisheries Management Plan (2004-2006). The literature review aided in providing a framework for the FMP and in the development of an annotated table of contents which guided the necessary information to be obtained. Annotated tables of contents (TOC) were drafted for the three FMP documents: an executive summary to create awareness of the FMP, a non-technical volume - the main plan communications document for a wide cross section of readers; and a technical document for managers and researchers. These fisheries management plan documents were to be grounded in integrated coastal management and protected area policy, as well as fisheries policy.

3.1.2 Developing the FMP

The draft TOC included supporting policies and legislation, Negril Marine Park fisheries profile with description of the fisheries harvest sector and post harvest sector, general fisheries management including inspection, registration and licensing, and an outline of the species specific management plan. The draft was presented at a workshop in August 2005 conducted in Negril at the NCRPS office, where fisheries officers, NMP park manager and representatives from NEPT and CREP were present. The meeting allowed the group to examine the proposed outline and give their input on the contents of the FMP. At the end of the workshop, a revised TOC for the fisheries management plan was developed.

3.2 Information generation for the NMP FMP

3.2.1 Information generation process

The revised TOC for the FMP identified the information required for the FMP. The two components of the FMP (NMP fisheries and species specific plan) were examined to determine the procedure for generating information for them. The choices for the process of generating information were based on the following guidelines:

- stakeholders/data sources which are involved in producing information for the FMP
- the level of stakeholder participation required to generate this information
- data/information collection methods (e.g. secondary sources) to gather information
- knowledge base for information (i.e. scientific or local knowledge)
- data source location (where the information may be collected from)
- validity of information collected

Thereafter, the processes for generating information for the contents of the fisheries management plan were recommended.

3.2.2 Testing recommendations

A number of data collection methods were recommended to generate information based on the contents of the revised TOC. Data were collected to illustrate and test the recommendations for generating information for the FMP as indicated Figure 3.1 using the following data collection methods:

a) Socio-economic survey for the NMP,

b) Jamaican fisheries census (1998),

c) Fishery management Plan consultation meetings,

d) Interviews with charter boat fishers and,

e) Interviews with restaurant owners

3.2.2.1 Socio-economic monitoring (SocMon) survey

An individual/household survey (Appendix 1) was conducted by the NCRPS to improve how the area should be managed. It was designed to better understand the perceptions, practices and attitudes of the people and was not designed to be statistically representative. The method of data collection for the survey was based on the Socio-economic Monitoring Guidelines for Coastal Managers in the Caribbean (Bunce and Pomeroy, 2003) and the Socio-economic manual for coral reef management (Bunce *et al.*, 2000) The surveys were conducted in ten fisheries oriented communities adjacent to the NMP: Little Bay, Savanna-la-mar, Lucea, Orange Bay, Salmon Point, Green Island, Brighton, Boroughton, South Negril and Davis Cove. A total of eighty-eight people were surveyed. The data were analysed via SPSS and/or Excel and provided descriptive statistics. These results were presented at two consultation meetings with fisheries stakeholders (fisheries officers, NCRPS and CREP); and secondly with the SocMon interviewers. Additional information was gathered from consultations with these fisheries stakeholders on how this information will assist management of the NMP. Data relevant to the proposed fisheries management plan were selected based on the criteria shown in Table 3.1. All irrelevant data from the survey are in Appendix 2.

3.2.2.2 Jamaica's Fisheries Census (1998)

In 1998, the Government of Jamaica conducted a census of fishing units in the marine fisheries around Jamaica. The census investigated information on vessel owners and users, vessels, crew, fishing operations, fishing practices, gear specification, catch characteristics and marketing arrangements of catch (Appendix 3). The data were collected to help form the basis of future development and management plans. For the purpose of this research, fisheries data for the fishing beaches in the NMP were extracted from the 1998 fisheries census database. There were fifteen fishing beaches located within NMP; six were in Hanover Abingdon, Bloody Bay, Davis Cove, Green Island, Orange Bay and Orange Cove); while nine were in Westmoreland (Campbell Beach, Homers Cove, Little Bay, Pampie Bay Beach, Negril South Canal, Revival, River Bank, Salmon Point and Westland Beach) (Figure 3.2). Data were analysed using SPSS and Excel providing descriptive statistics. Data that were relevant to the proposed fisheries management plan were selected using the criteria listed in Table 3.1. The 1998 fisheries census was used to examine how information excerpted from it could be useful for the

FMP. A re-census is being planned by the fisheries authority for 2005 which still uses the 1998 census information for reporting.

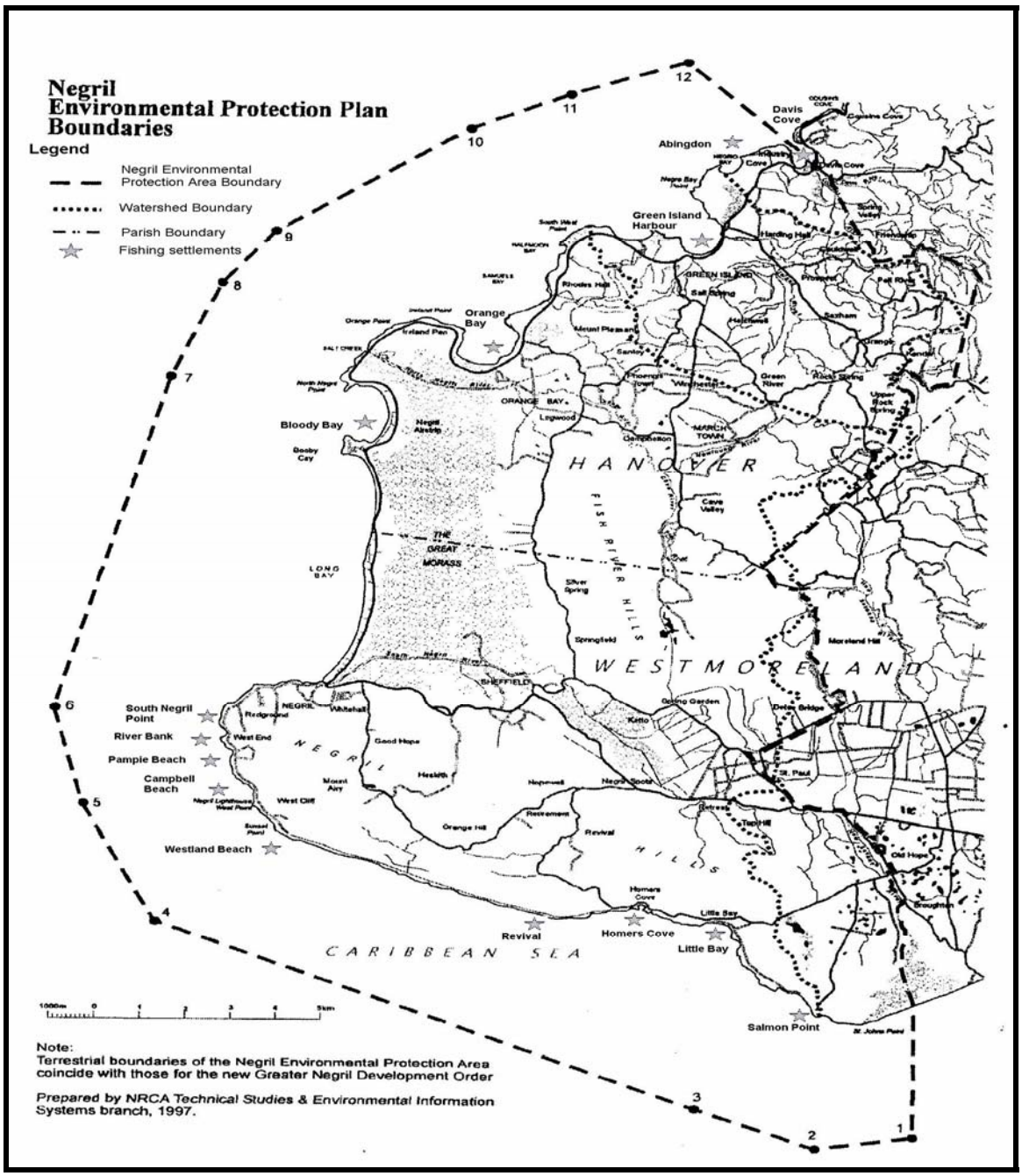

Figure 3.2: The location of the fifteen fishing beaches within the Negril Marine Park.

(Modified from Francis, 2002)

A literature review was conducted on fisheries management plans with specific reference to Food Agriculture Organisation (FAO) Technical Guidelines to Responsible Fisheries (1997) to develop the guidelines for selecting data for the NMP FMP. Based on these guidelines (Table 3.1), relevant data from the socio-economic survey and fisheries census were extracted to be incorporated into the FMP.

Table 3.1: Guidelines for selecting data relevant to a fisheries management plan

Guidelines	Comments
Description of the fishery	Does the data provide information on the fisheries? -target species and status -by-catch -fishing practices/methods (vessel types, gear specifications) -productivity of industry -catch and effort trends -landings (commercial, recreational and subsistence)
Biology/Ecology of the fishery species	Any biological/ecological information on fishery species? -condition of habitat and threats -distribution/location -reproduction/seasonality/spawning events -life span & mortality -age/growth -predator prey relationships -sex ratio
Socio-economic information on the fishing industry	Does the data show how the fishery affects livelihoods of the people (socially and economically)? -employment in the fishing industry -alternative employment -fish consumption and demand -value of landed catch and market value -capital cost and expenses
Governance	Does the information aid in management of the fisheries? -stakeholders and participation -regulatory history & compliance -proposed management measures -fisheries-related issues (user group conflicts)

(Sources: FAO, 1997; Schrading *et al.*, 1998; Dudley *et al.*, 2000; Berkes *et al.*, 2001; Fisheries Division, 2004)

3.2.2.3 Fisheries Management Plan consultation meetings

The Fisheries Division and NCRPS conducted FMP consultation meetings with the fishers to discuss fisheries management and policy for the FMP. The meetings were held with fishers of Green Island (June 30th, 2005), Davis and Cousins Cove (July 13th, 2005), South Negril Fishing beach (July 22nd, 2005). A fisheries enforcement meeting was also held at Russia Savanna-la-Mar (30th August, 2005). The FMP consultation meetings involved staff from Fisheries Division and NCRPS, various types of fishers (pot fishers, spearfishers, hook and line, seine net) and those in postharvest activities.

The purpose of the meetings was to gather information from the fishers within the park to assist with establishing a management policy/plan for the park which will be geared towards better management of the resources within the park. The FMP consultation meetings discussed the current threats to the fishery, fish nurseries and habitats; the need to manage the fishery, the mechanisms that can be applied for managing the fishery through permits, fines and penalties, and some solutions to fishery problems. The reports from the meetings were compiled by a US Peace Corps volunteer and others assisting the NCRPS. The reports were reviewed and the similarities and conflicts of interests of the fishers were identified. The meeting at Savanna-la-mar was focused mainly on dynamite fishing, a main threat to fisheries. The report of this meeting was made an assistant from CREP. Insights of dynamite fishing and conflicts were produced.

3.2.2.4 Charter boat fishers interview

Information was lacking on tourism-related recreational fishing, therefore interviews with charter boat fishers were conducted. The three main charter boat fishers in Negril were interviewed to gain more knowledge on recreational fishing. The interview followed the guide shown in the Appendix 3.

3.2.2.5 Restaurant owners interview

Information was needed from the post-harvest sector to address fisheries management. A brief interview was conducted with two restaurant owners in Negril as an exercise in obtaining marketing information. The initial plan was to examine a range of hotels/restaurants including small scale and large scale. However, due to lack of time, only two restaurants were interviewed. The interview followed the guide shown in the Appendix 4.

3.3 Analysis of implications

After producing samples of the information to be put in the FMP, a brief analysis of the implications that the various types of information (from the socio-economic survey, fisheries census, fisheries consultation meeting and charter boat fishers interviews) may have for decision-making was conducted. Conclusions were drawn about the possible uses of information regarding how management of the NMP and its fisheries can be improved in the context of sustainable livelihoods; the level of management required by NCRPS and the fisheries authority; and the scope for co-management of the NMP. Feedback from the NMP manager and key stakeholders was sought on the suggested conclusions and any other management implications.

4. RESULTS

This section presents the information needed for the NMP FMP; the information generation processes and the implications of information use for management of the NMP and fisheries. Figure 4.1 illustrates the relationship between the selected contents of the FMP, how information was generated and the implications this information will have for management. Here we can see how information generated from various methods can contribute to the management process.

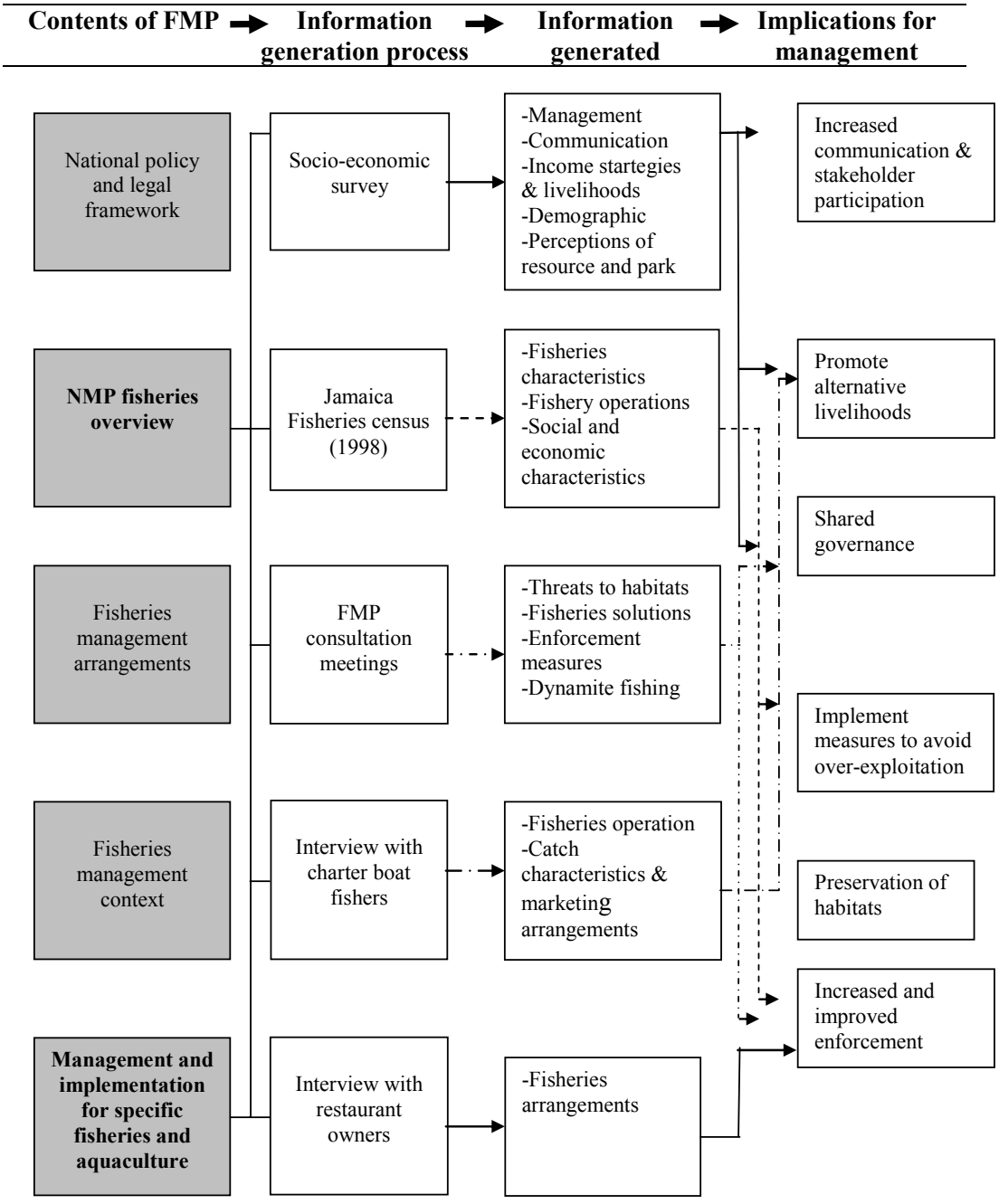

Figure 4.1: Generation of information and implications for the FMP contents

4.1 Information needed for the NMP FMP

The proposed outline for the NMP FMP and the proposed sections of specific management plans were developed in a workshop conducted with the FMP collaborators (Box 4.1 and Box 4.2).

Box 4.1: Proposed outline for the NMP Fisheries Management Plan

Fisheries Management Plan for Negril Marine Park

Executive Summary

1. Introduction
- 1.1. Mission of the NMP and NCRPS
- 1.2. Co-management of the NMP
- 1.3. Purpose and process of the FMP
- 1.4. Factors demanding an FMP
- 1.5. Legal authority for the FMP
- 1.6. 'Ownership' of the FMP (governance)
- 1.7. Arrangement of the FMP document

2. National policies and legal framework
- 2.1. National fishing industry profile
- 2.2. NMP in the national context
- 2.3. International and regional agreements
- 2.4. Social and economic development policy
- 2.5. Integrated coastal management policy and laws (tourism, agriculture, environment)
- 2.6. Marine protected areas policy and laws
- 2.7. Fisheries and aquaculture policy and laws
  - 2.7.1. Proposed national laws may require a plan for each major fishery
- 2.8. Integrated coastal management policy and laws (tourism, agriculture, environment)
- 2.9. Marine protected areas policy and laws
- 2.10. Fisheries and aquaculture policy and laws
  - 2.10.1. Proposed national laws may require a plan for each major fishery

3. Negril Marine Park fisheries overview
- 3.1. NMP location and geographic description
- 3.2. Environmental assessment/status
- 3.3. Marine resources [fished and unfished]
- 3.4. NMP fisheries to be managed
  - 3.4.1. Fishing vessels and gear
  - 3.4.2. Landing sites and landings
  - 3.4.3. Socio-economic profiles
- 3.5. Threats and opportunities

4. Fisheries management arrangements

- 4.1. Stakeholders and organisations
  - 4.1.1. Ministry responsible for fisheries and aquaculture
  - 4.1.2. Government agencies relevant to NMP fisheries
  - 4.1.3. Fisheries-related non-governmental organizations
  - 4.1.4. Regional/international agencies and programmes
- 4.2. Fisheries and coastal area research
- 4.3. Monitoring, control and surveillance
- 4.4. Disaster management and recovery
- 4.5. Services and incentives for fisheries

5. Fisheries management context for NMP 2006-2008 plan

- 5.1. Vision for fisheries and aquaculture (based on national vision)
- 5.2. Constraints on achieving the vision
- 5.3. Fisheries governance for the NMP
  - 5.3.1. Multi-agency fisheries management committee for NMP with decision-making power as part of the delegation instrument from government (NEPA, FD, fisher settlements)
- 5.4. Strategic overview of action planned

6. Management and implementation plans for specific fisheries and aquaculture

- 6.1. Shallow-shelf reef fishes
  - 6.1.1. Management plan for shallow-shelf reef fishes
  - 6.1.2. Implementation strategy for period 2006-2008
- 6.2. Deep-Slope and Bank Reef Fishes
  - 6.2.1. Management Plan for Deep-Slope and Bank Reef Fishes
  - 6.2.2. Implementation strategy for period 2006-2008
- 6.3. Coastal Pelagics
  - 6.3.1. Management Plan for Coastal Pelagics
  - 6.3.2. Implementation strategy for period 2006-2008
- 6.4. Large Pelagics
  - 6.4.1. Management Plan for Large Pelagics
  - 6.4.2. Implementation strategy for period 2006-2008
- 6.5. Lobsters
  - 6.5.1. Management Plan for Lobsters
  - 6.5.2. Implementation strategy for period 2006-2008
- 6.6. Conch
  - 6.6.1. Management Plan for Conch
  - 6.6.2. Implementation strategy for period 2006-2008
- 6.7. Seamoss aquaculture
- 6.8. Oyster aquaculture
- 6.9. Finfish aquaculture
- 6.10 Shellfish aquaculture

7. Glossary of technical terms and management measures
8. References and supplementary reading
9. Appendices

The 'management and implementation plans for specific fisheries and aquaculture' section of the FMP will provide a separate plan for the different fisheries (coastal pelagics, large pelagics, lobsters, conch, seamoss aquaculture, oyster aquaculture, finfish

aquaculture and shellfish aquaculture). The FMP collaborators agreed to use the following headings (Box 4.2) for the species specific management plans for these fisheries.

Box 4.2: Proposed sections of specific management plans

- Target Species
- Ecology and habitat status
- Description of Fishery
- Management Unit (area)
- Resource Status
- Catch and Effort Trends
- Livelihoods assessment
- Management Policies and Objectives
- Regulatory History
- Proposed Management Approaches
- Constraints
- Opportunities

4.2 Information generation process

4.2.1 Choices to consider when generating information

Based on the guidelines in section 3.2.1, some considerations when selecting information include: the types of stakeholders involved and the level of participation required; whether the data are scientific or local knowledge is required; whether secondary sources are suffice or not, primary data need to be collected; sources of data and validation of data. The tables below set out the choices for producing information for two components of the FMP: the "Section 3: NMP fisheries overview" (Table 4.1) and the "Section 6: Management and implementation plans for specific fisheries and aquaculture" (Table 4.2). Section 6 will be referred to as the "Species specific management plan" NMP overview provides the background of fisheries in the NMP.

Table 4.2 is an example of the generation process that can be used for developing a concise management plan for any type of fishery species. In this case, shallow-shelf reef fisheries were used as an example. The species plan requires a more intensive process due to the diverse nature of fisheries information needed e.g. socio-economic data, biological and ecological data.

Table 4.1: Information generation process for NMP Fisheries

Contents of FMP	Information/ data required	Stakeholders/data sources	Data source location	Data collection methods	Validation of data
3. NMP fisheries overview					
3.2 Environmental assessment/status	Water quality Species diversity Coral cover	Government Universities Dive operators	NMP (all sites)	Secondary data Surveys: water quality, reef monitoring	
3.3 Marine resources	Commercial species Unfished species Mariculture species	Fishers Fish farmers	Fishing beach	Fisheries census	Interview with key informants Observations
3.3 *NMP Fisheries to be managed*					
3.3.1 Fishing vessels and gear	No. of vessels Gear types	Fishers	Fishing beach	Secondary data Fisheries census	Observations
3.3.2 Landing sites and landings	List of sites Value of fish landed	Fishers Fish vendors	Fishing beach Markets	Fisheries census	Observations
3.3.3 Socio-economic profiles	Demographics Livelihoods Alternative	Fishers Boat builders Fish vendors Fish scalers	Fishing village	Socio-economic survey	Interview with key informants
3.5 *Threats and opportunities*	Negative impacts on fishing and livelihoods (e.g. illegal practices)		Fishing village	Interview with key informants	

Table 4.2: Information generation process for a species specific plan

Contents of FMP	Information/ data required	Stakeholders/ data sources	Data source locations	Data collection methods	Validation of data
6.Management & implementation plans for specific fisheries & aquaculture					
6.1 *Management plan for shallow-shelf reef fishes*					
a. Target species and by-catch	-Name of species	-Fishers	-Fishing beach	-Interview with key informants	-
b. Ecology and habitat status	-Habitat distribution -Growth, Life span -Reproduction -Seasonality -Feeding habit	-University	-University	-Secondary data -Research: habitat survey -Local ecological knowledge	-
c. Description of fishery					
c.i. Economic importance	-Demand of fish -Price of fish -Total landings (daily/weekly)	-Fishers -Fish vendors -Hoteliers/ and restaurant	-Market -Fishing beach -Post harvest sector	-Economic survey	-Interview with key informants
c.ii Vessel and gear	-Types -Numbers	-Fishers -Boat builders -Pot makers -Government	-Fishing beaches -Support service industry	-Fishery census/survey -Interview with key informants	-Observation
c.iii. Landing site	-Names/location	-Fishers	-Fishing beach	-Interview with key informants	-Observation
c.iv. Employment	-No. of fishers -No. of registered or licensed -Full time/ part time -Fishery related jobs	-Fishers	-Fishing village or community -Fishing beaches	-Secondary data: statistics (fishery census) -Fishery census	-Interview with key informants
c.v. Catch and effort trends	-Daily catch of species	-Fishers Government	-Fishing beach	-Secondary data: statistics -Fishery census	-Interview with key informants
c.vi. Livelihood assessment	-Importance of fishery	-Fishers	-Fishing village/community	-Socio-economic survey	-Interview with key informants
c.vii. Regulatory history	-List of regulations -Penalties for non compliance -Compliance levels	-Government	-Government	-Secondary data: Fishery Act & regulations	-Interview with key informants
c.viii. New management approaches	-List of regulations -Conflicts of interest	-Government -Fishers	-Government	-Focus group -Consultation meetings	-

Based on the types of data needed according to Tables 4.1 and 4.2, available data from socio-economic surveys, fisheries census and fisheries consultation meetings were used to generate information for insertion into the FMP. This was conducted as a test to show how useful these methods were for generating information for the FMP. Data from these methods were selected based on their relevance to the fisheries management plan. The figure below illustrates

4.2.2 Socio-economic survey

The following is the information generated from the socio-economic survey for the Negril Marine Park which provided the "Socio-economic profiles" for the NMP FMP. The selected data included demographics, perception of resource status, management responsibility and participation, communication, livelihoods and alternative livelihoods and interaction between fishers and tourism and among fishers.

4.2.2.1 Demographics

Community demographics were necessary for developing stakeholder participation in fisheries management. Fisheries managers should have background information on the communities that depend on fisheries before the development of any programme of change.

Most of the respondents (95%) surveyed were male. For the majority of respondents (55.7%) primary school was the last school attended (Figure 4.2). Most of the respondents (26.32%) were between were between the 40-49 range (Figure 4.3). Most respondents were Pentecostal (35.4%), 15% were Roman Catholic and 10% were Seventh Day Adventist.

4.2.2.2 Perception of park and resource status

Perceptions on the park would help determine if the objectives of the park are being met especially in relation to protecting fisheries which is one of the objectives of the park. Perceptions on resource status can help managers to determine the state of the resource. If the NMP communities do not consider the fisheries to be at risk, then it might be difficult to persuade them to participate in fisheries management.

Most respondents (59.9%) believed that the main purpose of the park was to preserve the environment while 16.6% stated it was to assist fishers. The majority of respondents (40.8%) stated that the NMP had been beneficial through protecting the fisheries (Figure 4.4). The majority of the respondents believed that ten years ago the inshore and offshore reefs were very good compared to now where these reefs are in a very bad condition (Figure 4.5).

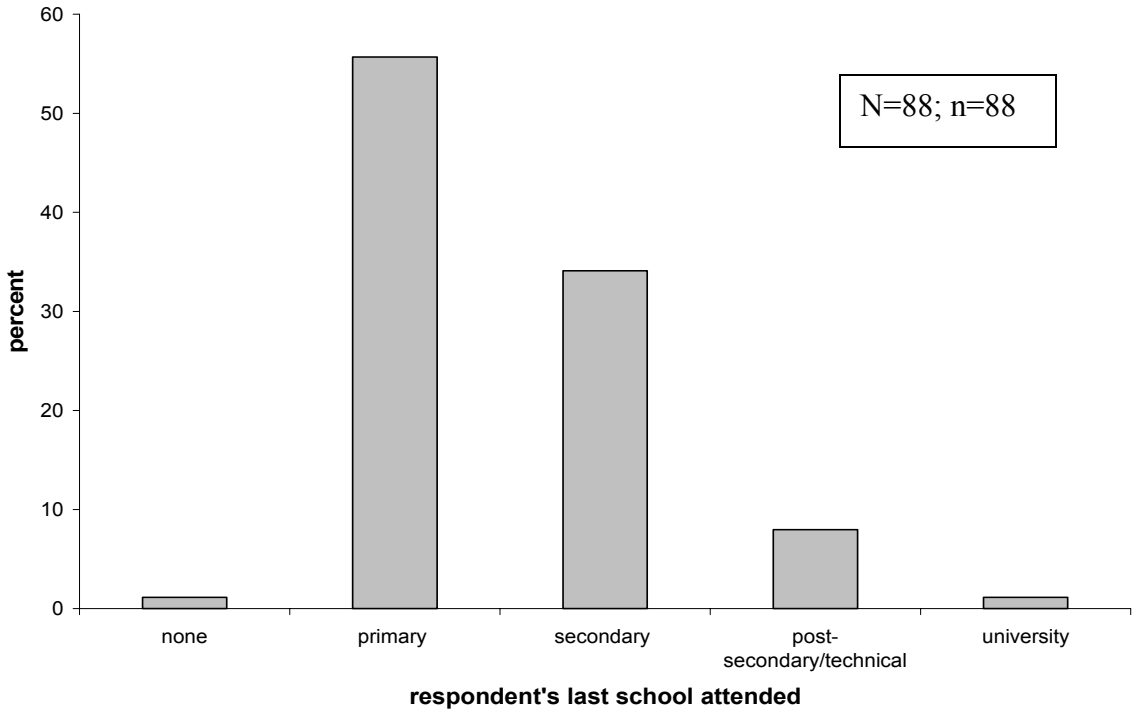

Figure 4.2: Educational level of respondents

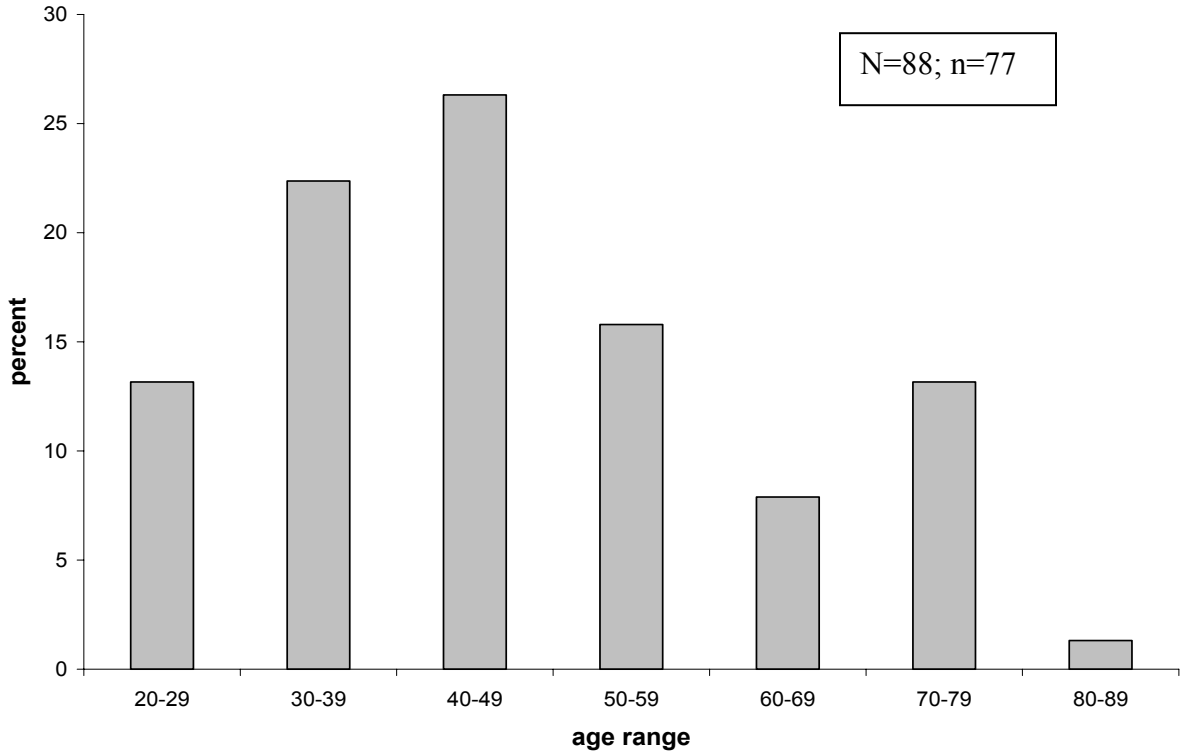

Figure 4.3: Respondent's last birthday

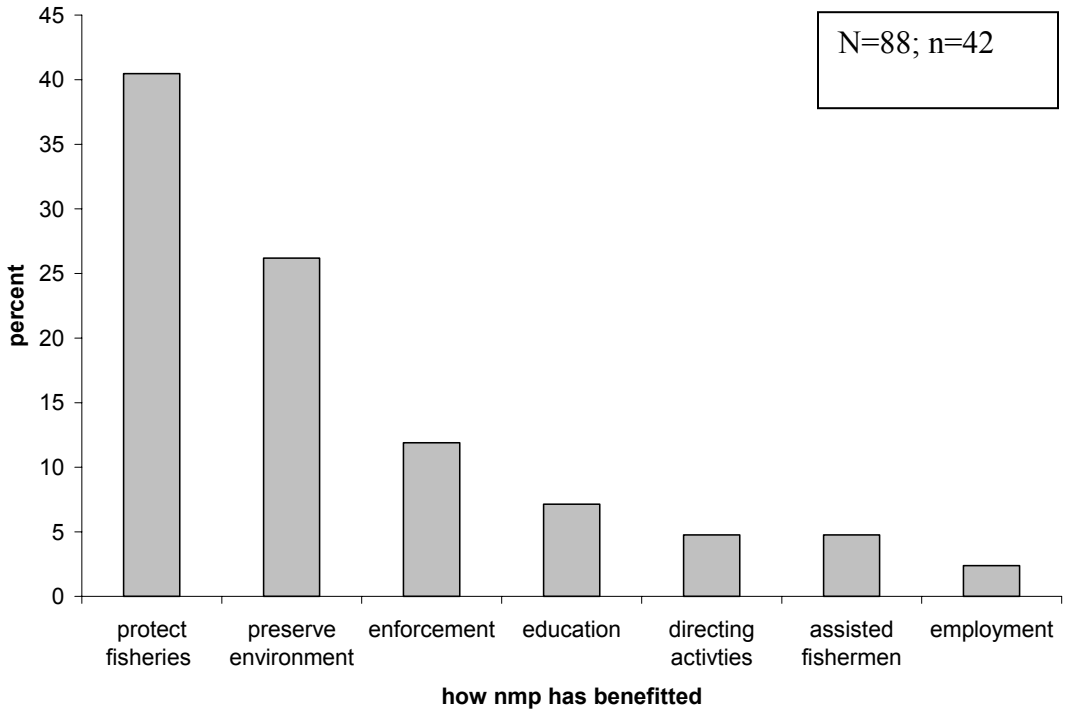

Figure 4.4: Benefits of the NMP

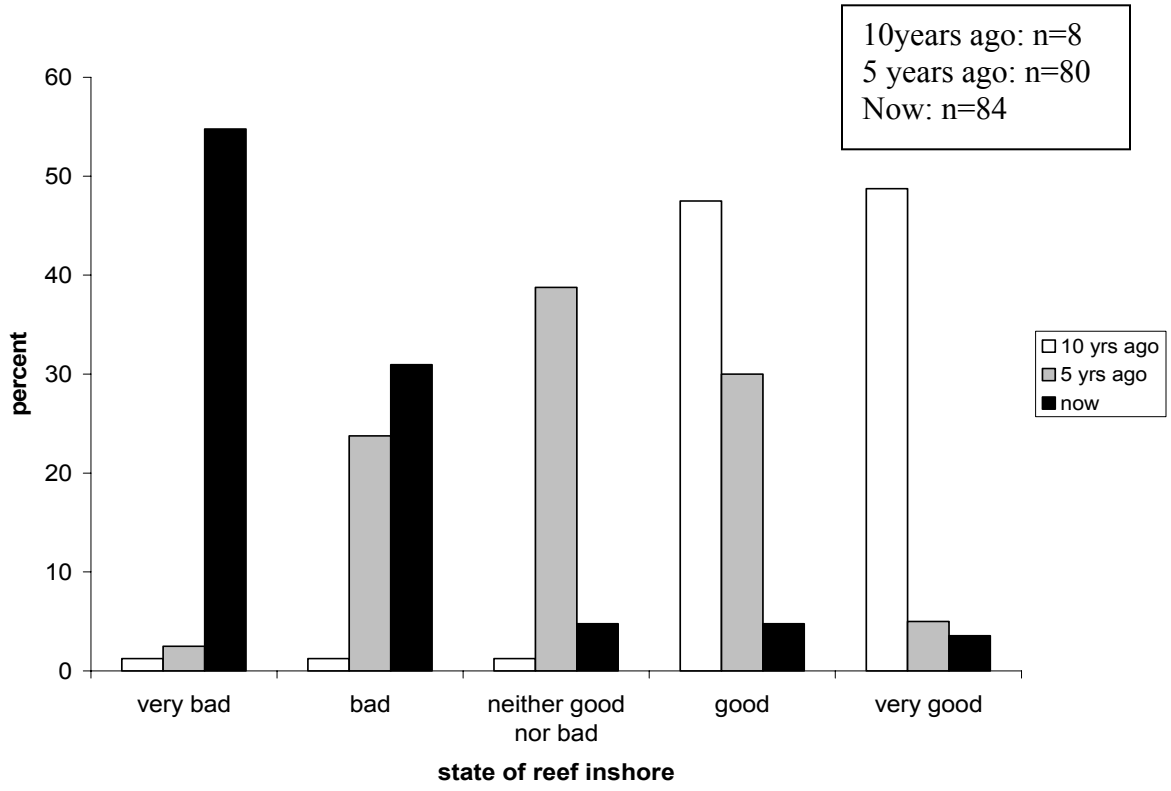

Figure 4.5: State of reef inshore

4.2.2.3 Management responsibility and participation

The role of the government and whether stakeholders have the ability to play a role in the decision making process is important to fisheries management. The participation of stakeholders is important because fisheries management does not only manage fisheries but management could affect the livelihoods of the people who depend on fisheries.

Most of the respondents believed that NCRPS (71.3%) was the main group responsible for solving the problems of the park, followed by the government (65.5%) and resource users (64.4%). The Negril Green Island Local Planning Authority (NGLPA) and parish councils were considered having the least responsibility (Figure 4.6). Despite, NCRPS having the responsibility of solving the park's problem, the government was suggested as being the most responsible for managing the marine park (37.3%) (Figure 4.7). Thirty six percent believed that NCRPS was the second most responsible followed by resource users (15%) (Figure 4.7). Most of the respondents, 36.4% believed they had little influence on management; in contrast only 6.8% believed they had very much influence (Figure 4.8).

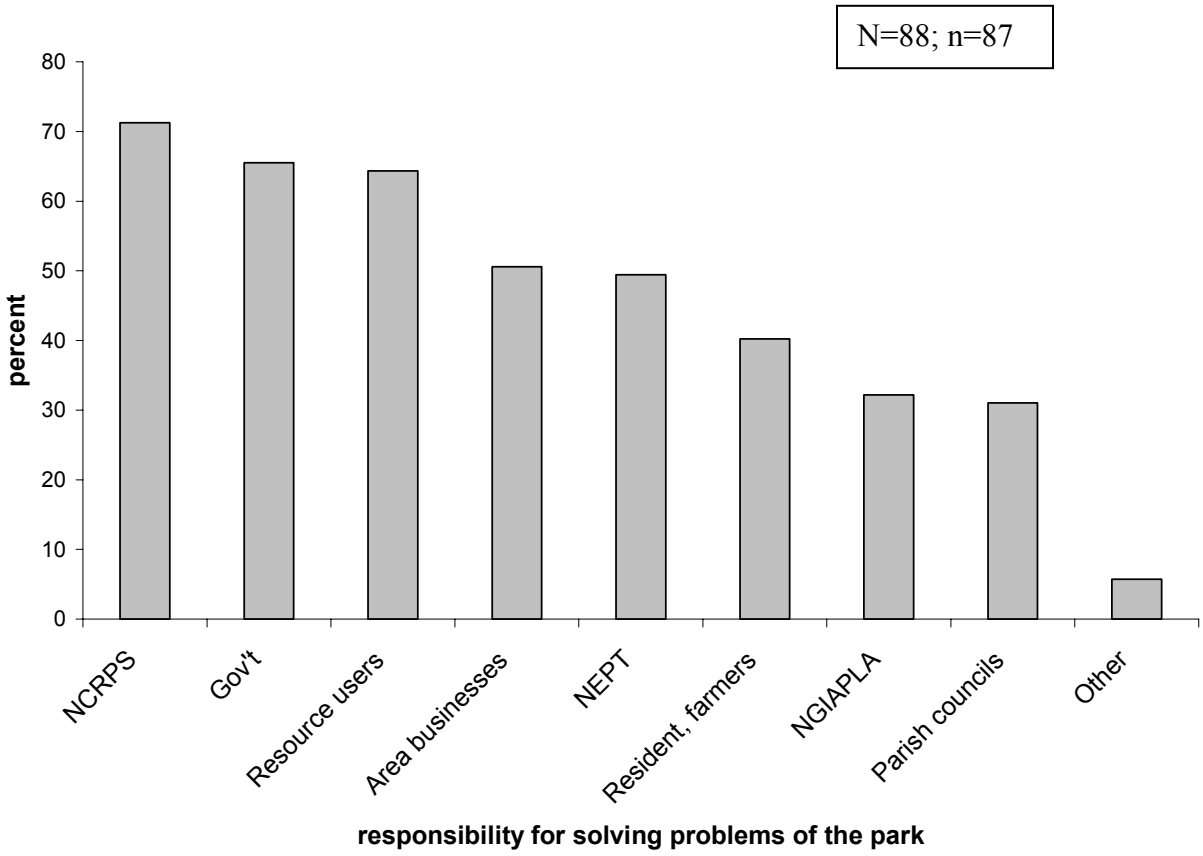

Figure 4.6: Responsibility of solving problems of the park

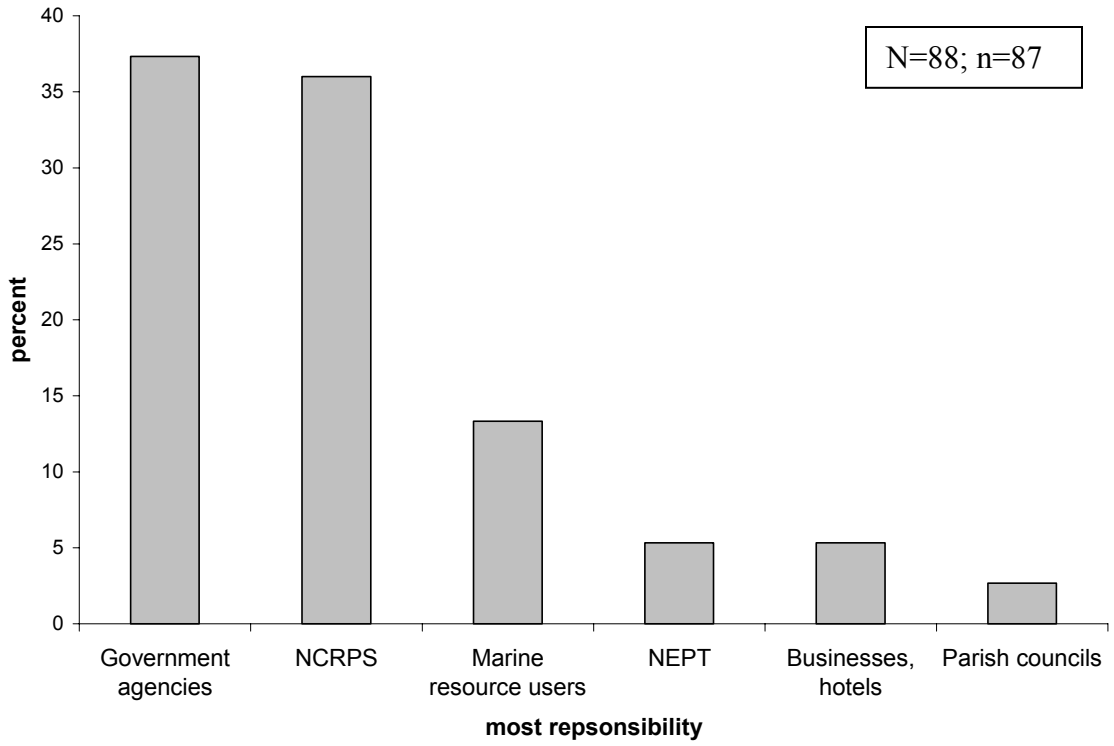

Figure 4.7: Comparison of who has the most responsibility

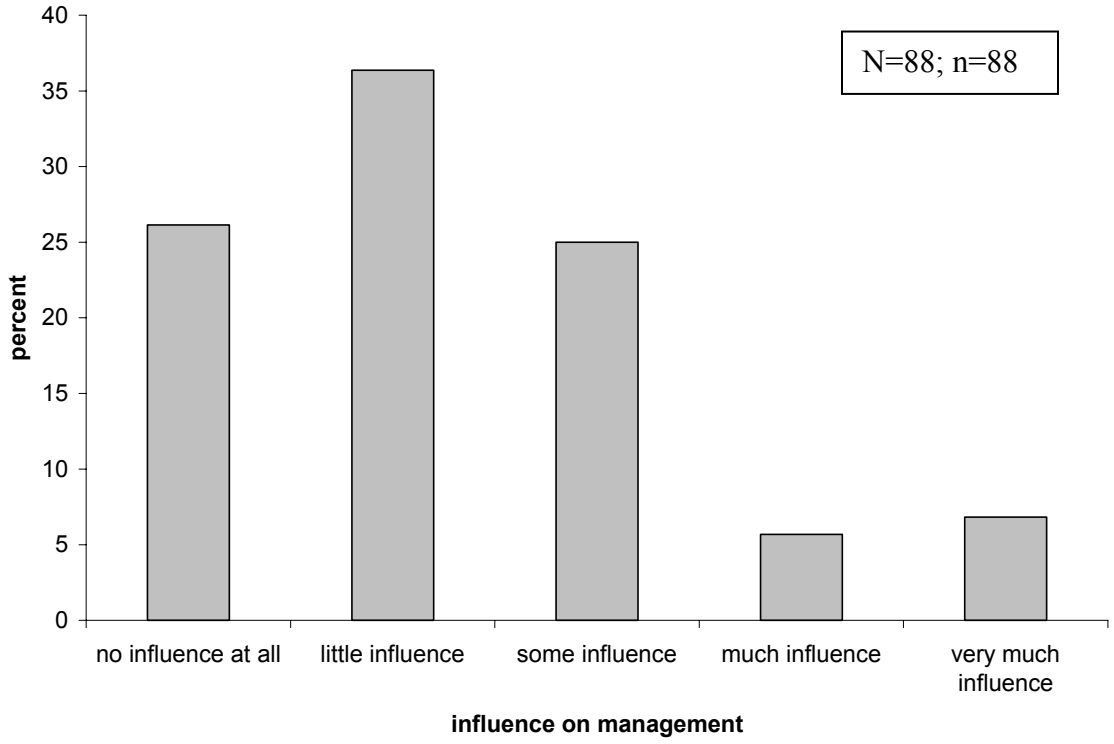

Figure 4.8: Perception of people's influence on management

The majority of the respondents did not participate in NMP management. The main reason for their lack of participation was due to not being informed. However, most of the respondents (21.6%) would be motivated to participate if they were aware of the meetings; others thought that they would be motivated if they were provided with benefits (11.8%); while 13.7% would not be motivated at all (Figure 4.9).

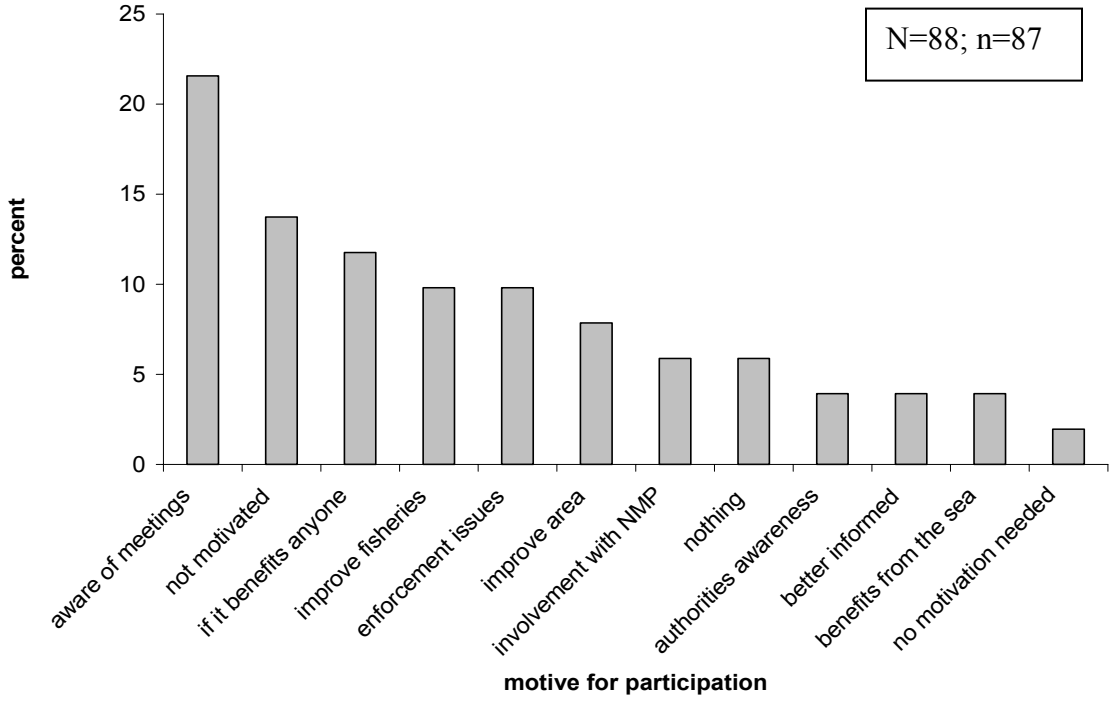

Figure 4.9: Motive for participation

4.2.2.4 Communication

Communication between community members and park managers is vital to successful park management. It ensures the community are aware of fisheries issues and regulations and that managers can ensure that rules are complied and enforced. However, one must consider the appropriate media to be used so communication is effective.

Twenty-six percent of the respondents suggested several methods may be used to get information on the NMP; while 20% believed the television is the best source of information (Figure 4.10). Thirty percent believed the telephone was the best way to inform NCRPS; while 20% suggested a visit to the office (Figure 4.11)

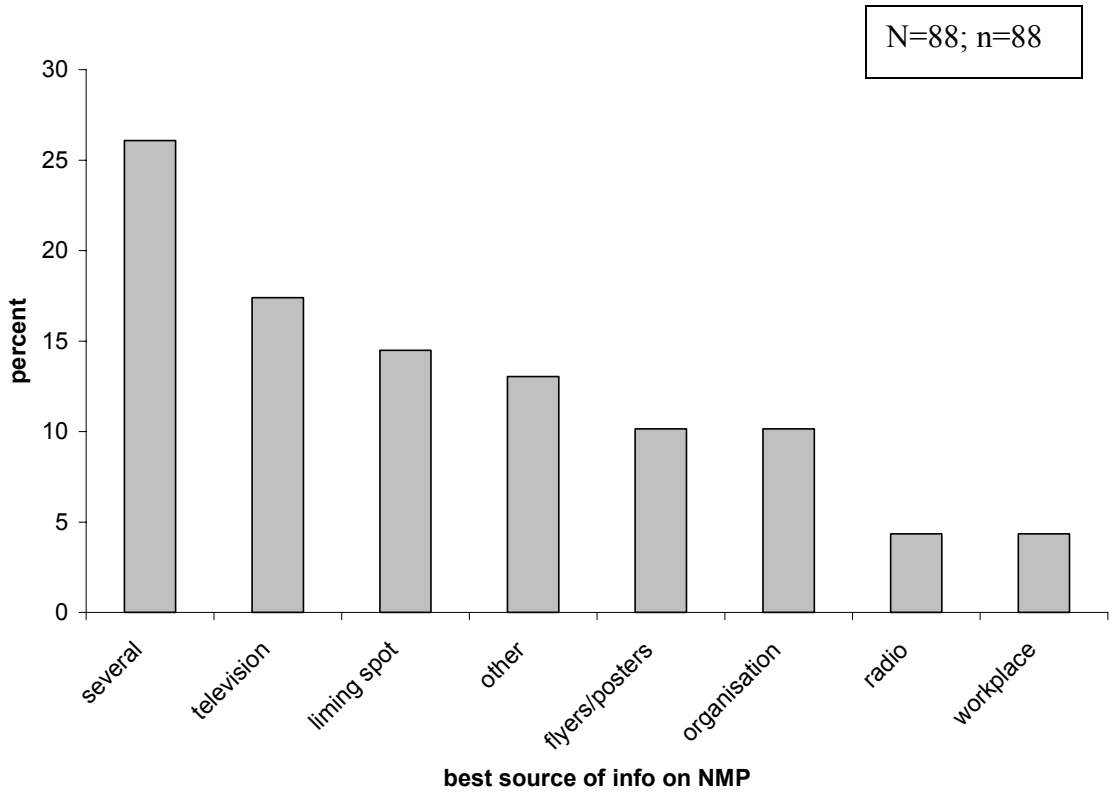

Figure 4.10: Best sources of information on the NMP

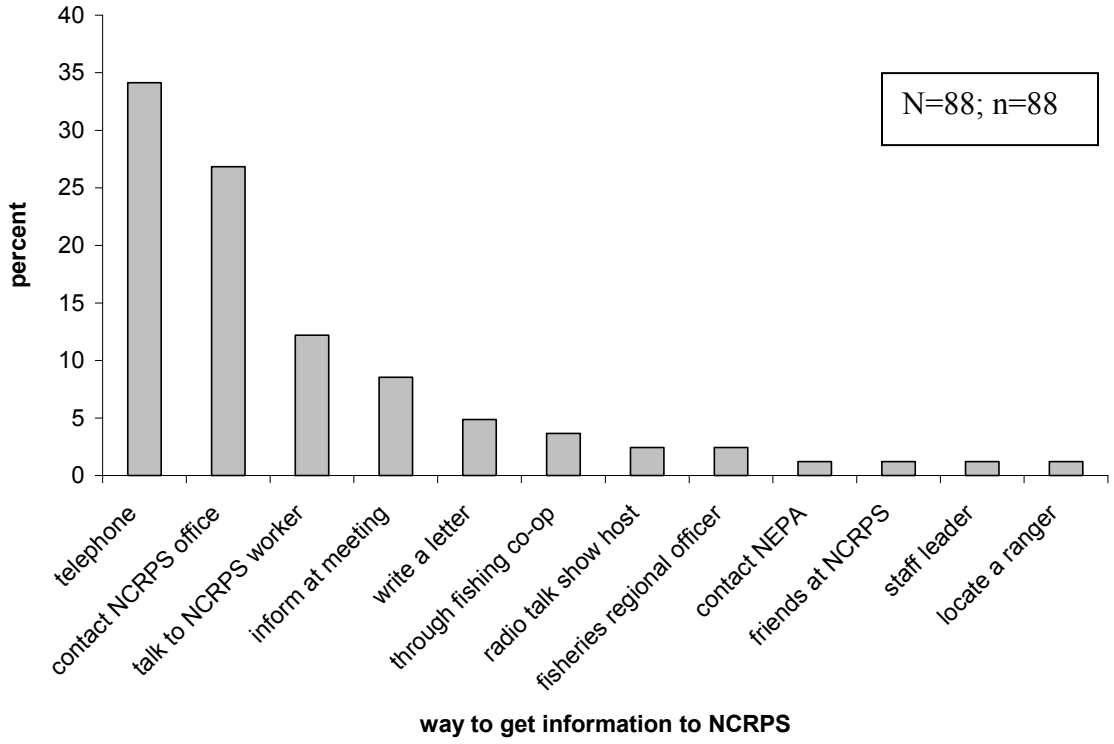

Figure 4.11: Ways to get information to NCRPS

4.2.2.5 Income sources and livelihood strategies

Managers require baseline information on the livelihoods of the communities to determine how fisheries management interventions implemented will impact on the fishing communities.

Most of the respondents consume fish about seven times a week (Figure 4.12). The majority of respondents were fishers (75%) (Figure 4.13) and have no secondary occupation (Figure 4.14). Those who have a secondary occupation are mostly involved in farming and fishing. Eighty percent of the respondents had no other sources of income except a minority who received remittances and income from child relatives (Figure 4.15) However in terms of alternative generation strategies, of those who responded the majority (22.9%) would like to get into tourism; however the majority (39.6%) has no other alternative income generation strategies (Figure 4.16) The barrier to this alternative income is the lack of financial resources (60%) (Figure 4.17). Most of the respondents (88.2%) were not being trained. Thirty-five percent believe that training is not necessary, while 25% said no opportunity existed for them and 13% stated that age constraints prohibited them from being trained (Figure 4.18).

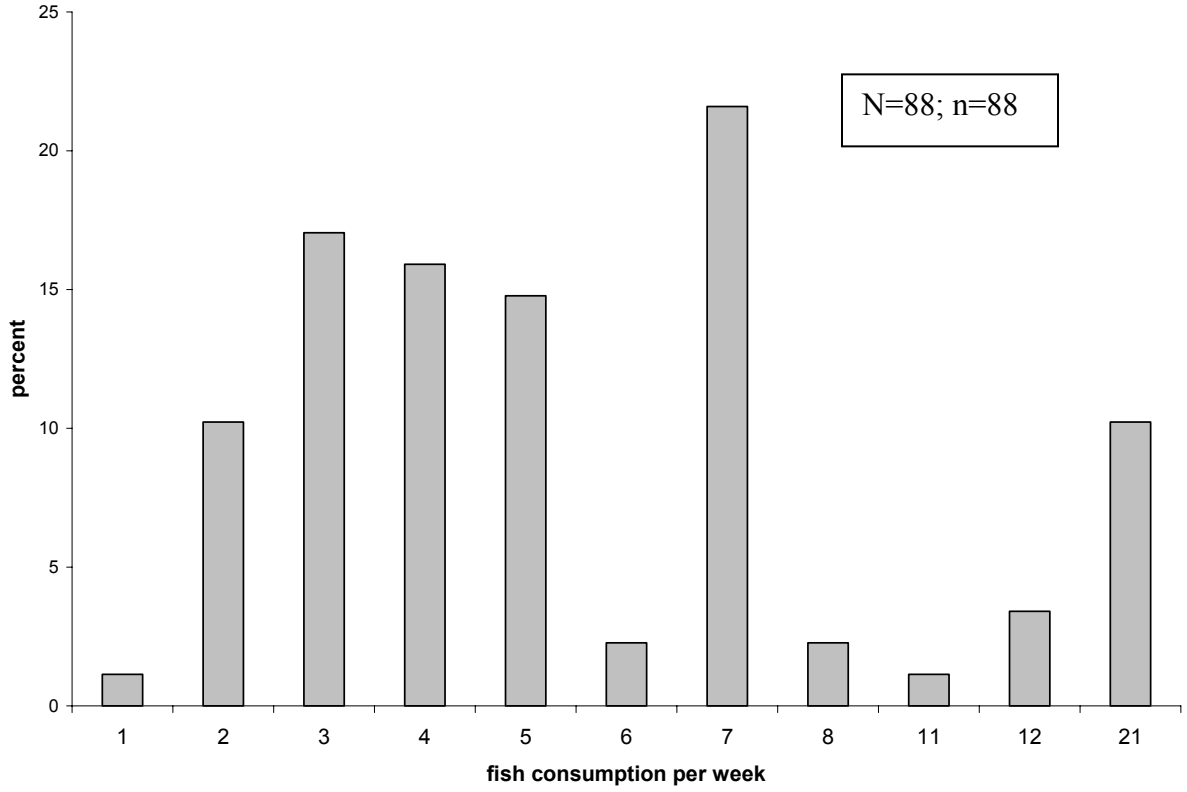

Figure 4.12: Fish consumption per week

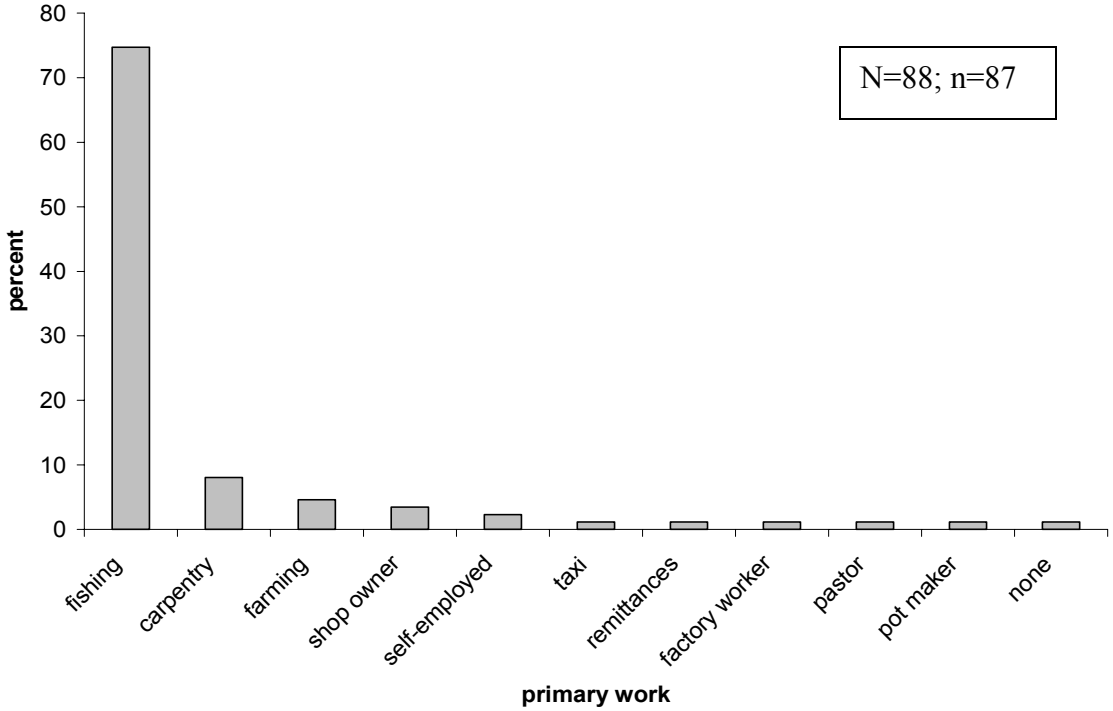

Figure 4.13: Primary work of respondents

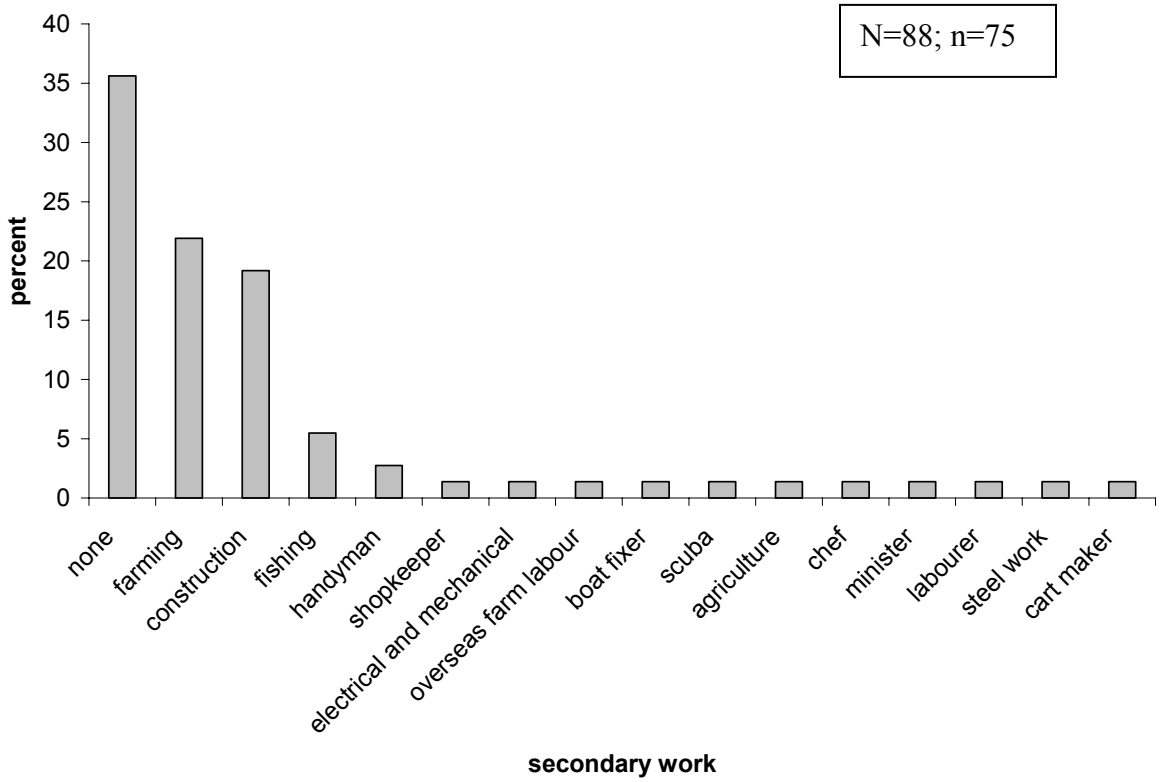

Figure 4.14: Secondary work of respondents

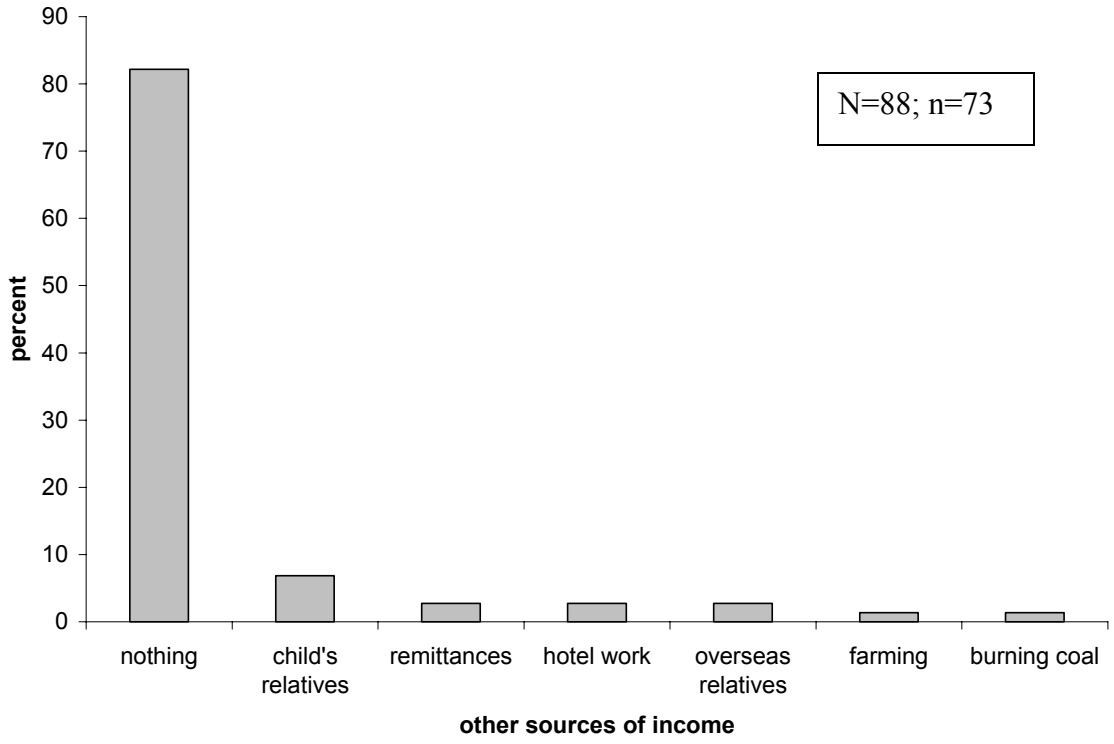

Figure 4.15: Other sources of income

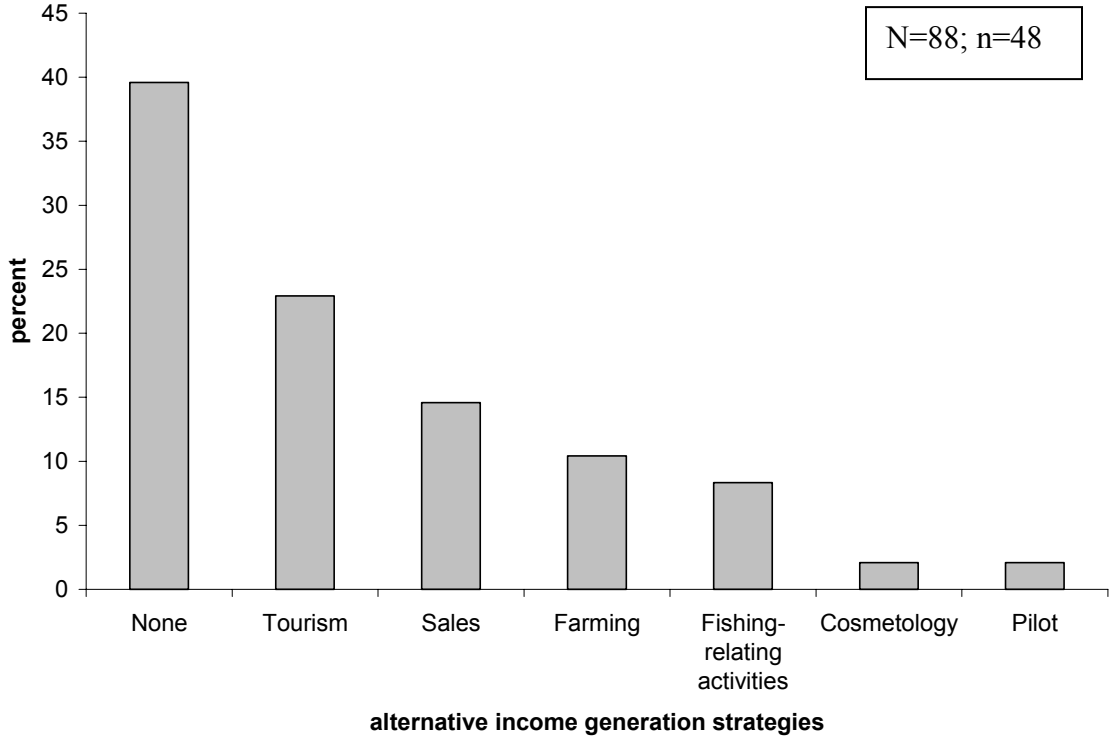

Figure 4.16: Alternative income generation strategies

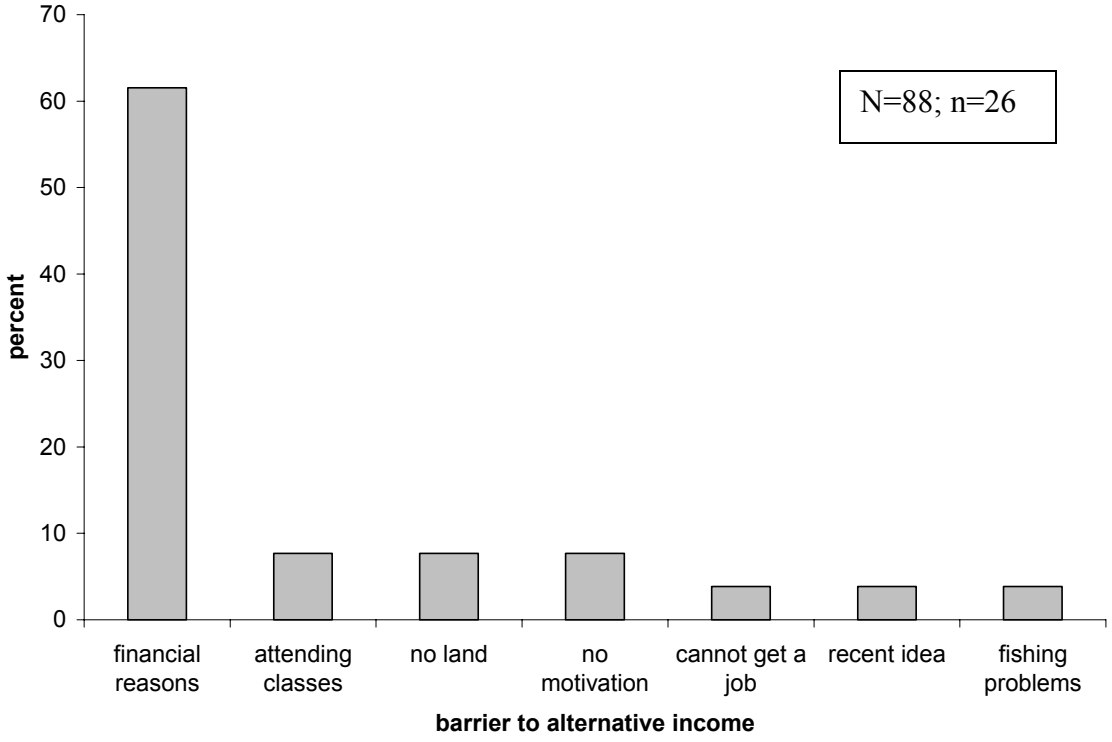

Figure 4.17: Barrier to alternative income

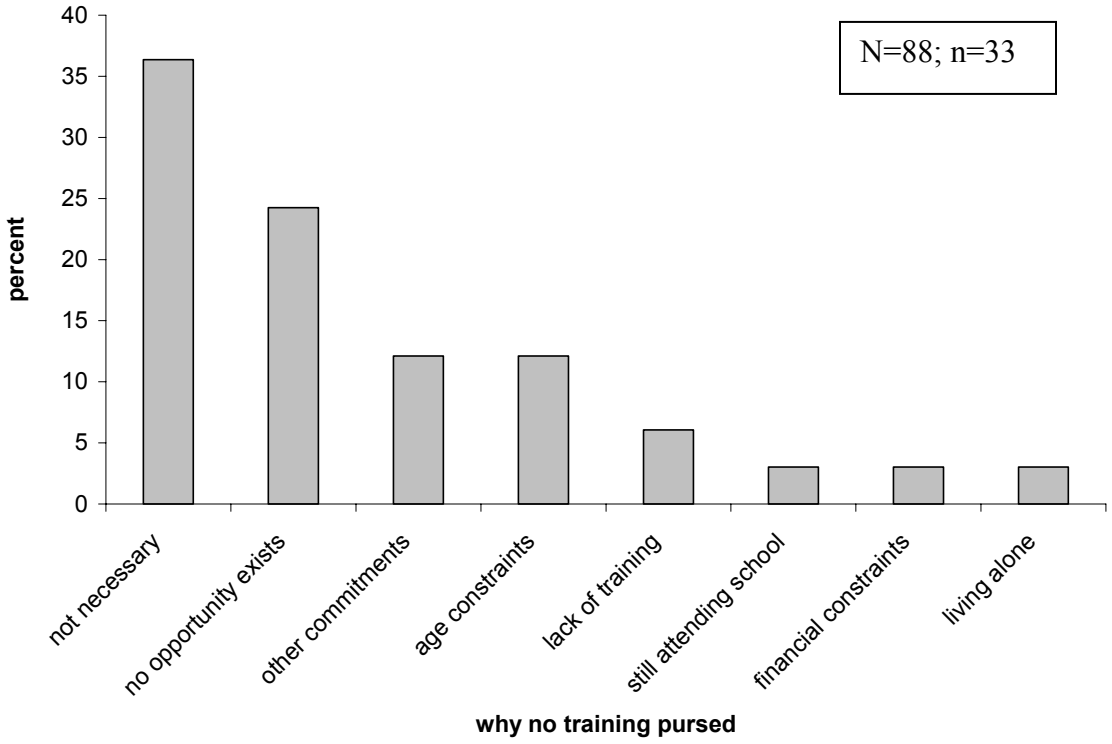

Figure 4.18: Reasons why no training is pursued

4.2.2.6 Interactions between fishers and tourism

This would help determine if these resource user groups could work together or whether there are conflicts of interest that need to be addressed in the NMP FMP.

Most of the respondents (91.8%) believed that fishing and tourism were compatible. Of that 91.8%, 51% believed both were compatible as they provided income and employment.

The majority of respondents (38.5%) believed the amount of tourism in the park was just right (Figure 4.19). These views mostly came from those from Davis Cove. The majority of respondents from Little Bay and some from Brighton and Salmon Point believed there was too little tourism. The majority (52.5%) believed the amount of fishing in the park was just right (Figure 4.20). Those from Orange Bay and Davis Cove believed there was too much fishing while those from Salmon Point and Broughton believed there was too little fishing.

Most of the respondents 66.7% believed that fishers could cooperate. Fishers can cooperate by sharing ideas (56.1%) and having discussion meetings (15%) (Figure 4.21). Of those who said fishers could not cooperate mainly believed that fishers need assistance and supervision (36.4%) (Figure 4.22).

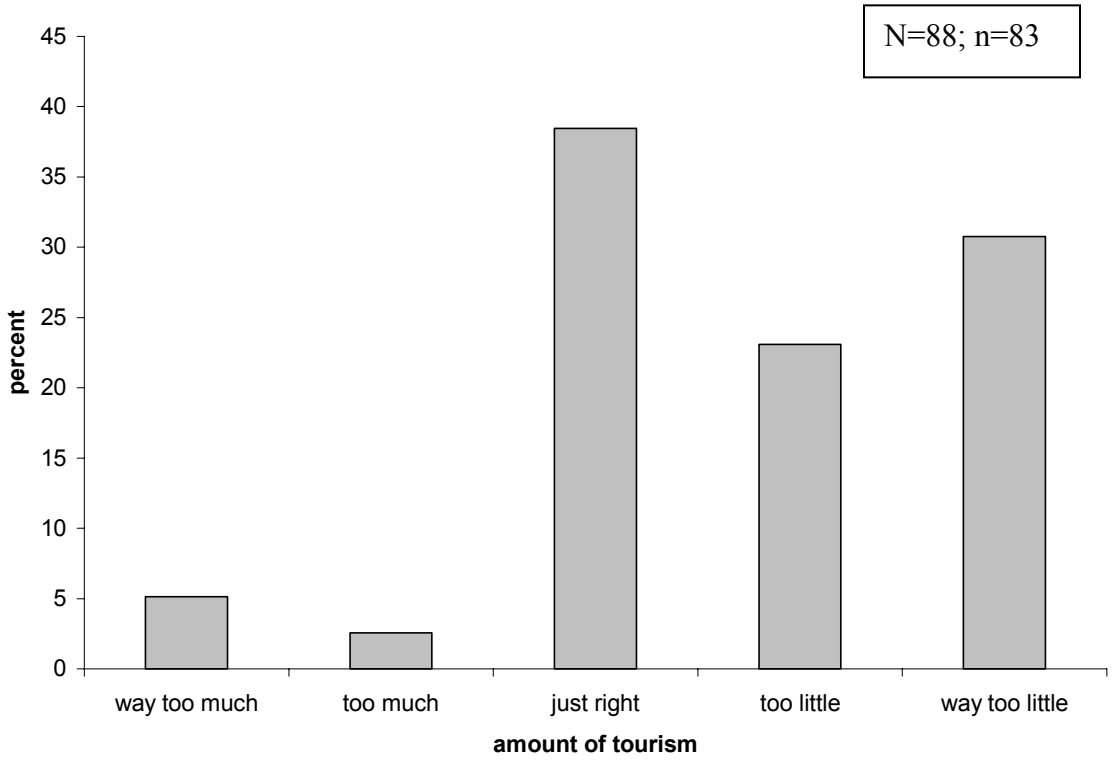

Figure 4.19: Amount of tourism in NMP

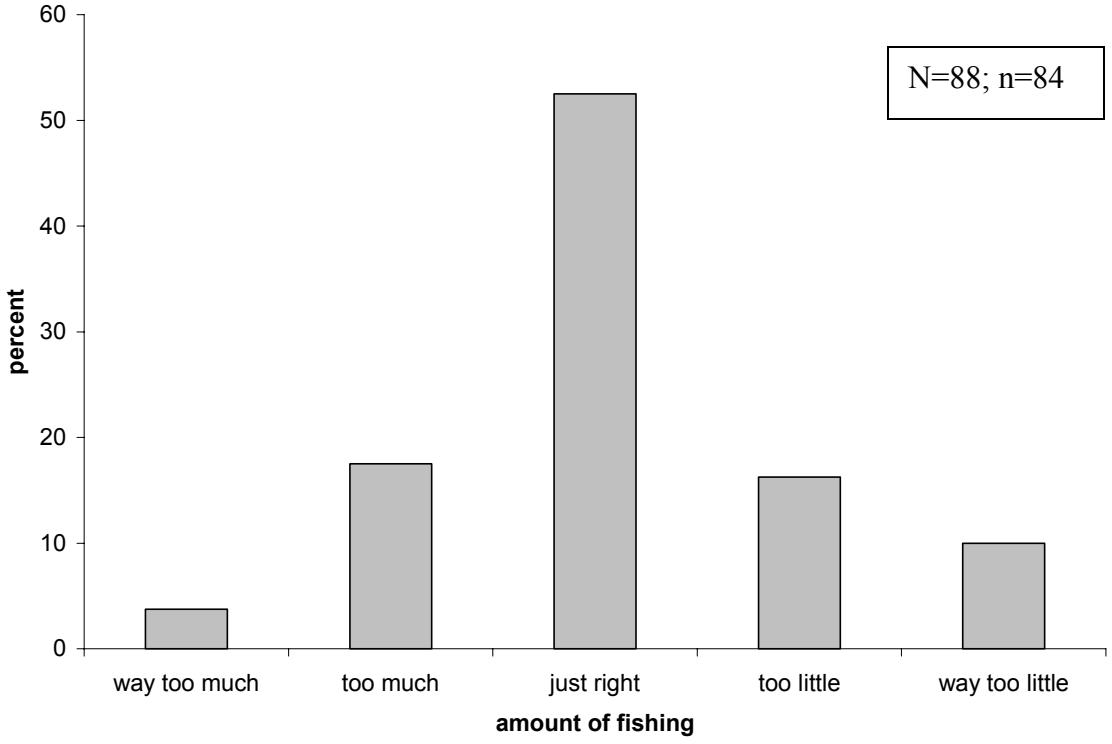

Figure 4.20: Amount of fishing in NMP

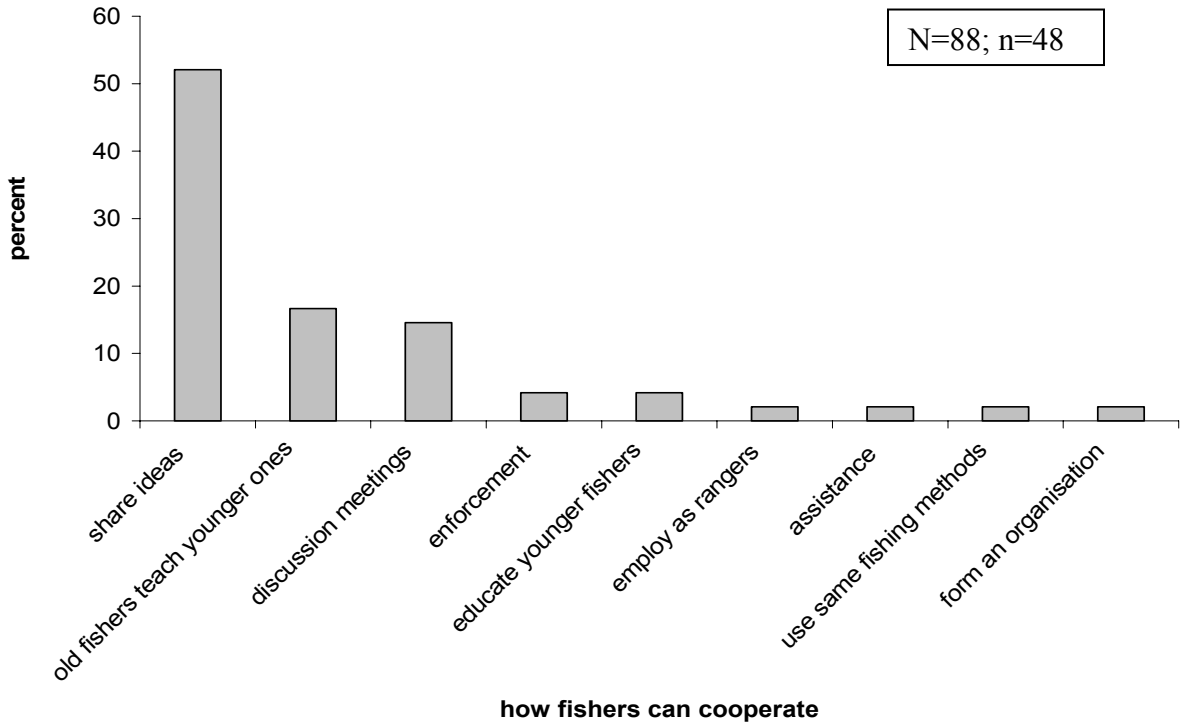

Figure 4.21: Ways in which fishers can cooperate

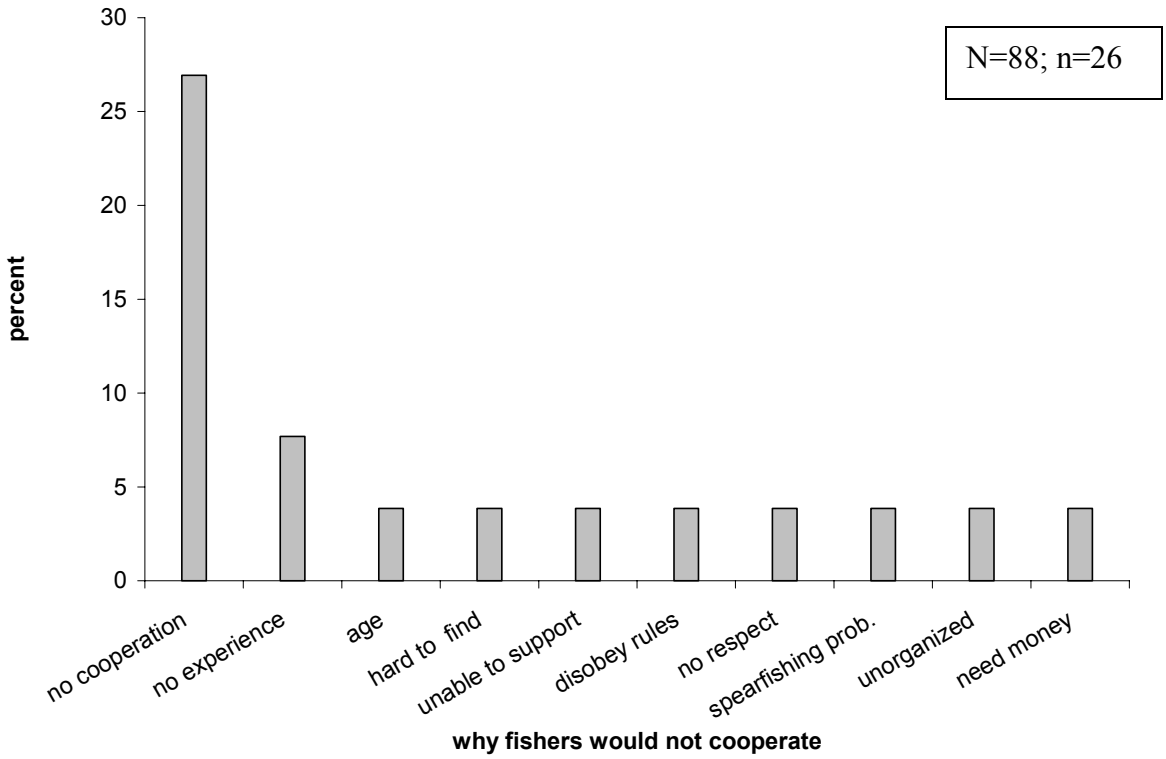

Figure 4.22: Reasons for lack of cooperation between fishers

4.2.3 Jamaica Fisheries Census (1998)

The following is the information generated from the fisheries census (1998) which would be relevant to the FMP, specifically relating to the **Negril Fisheries overview** and **Species specific management plan** (Table 4.1). The selected data included information on the respondents, their vessels, fishery operations, gear specifications, catch characteristics and marketing arrangements. The data from the 1998 fisheries census could be compared to those of the planned 2005 re-census to detect any changes or trends in NMP fisheries. The Fisheries Division considers the 1998 data to still be valid for many fishing beaches around Jamaica and this data could be useful for management.

4.2.3.1 Information on respondents

The majority of the fishers (73.6%) were captains and owners of their own fishing vessels while approximately 13.2% were spear fishers (Figure 4.23). The majority of the spear fishers were from Green Island. Most of the fishers (57%) were unregistered and have been fishing for ten years or more.

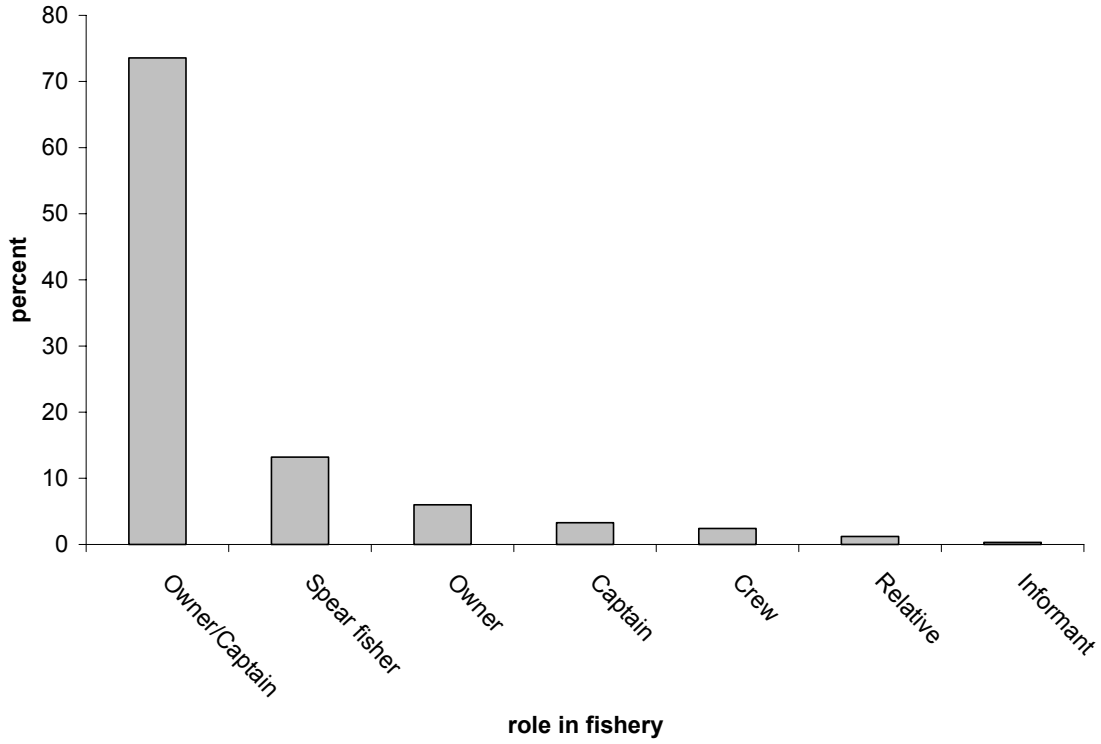

Figure 4.23: Respondent's role in the fishery in the NMP

4.2.3.2 Vessel owners and vessels

The majority of vessels (50.2%) used within the park were dug out (Figure 4.24) and wooden plank vessels were the second most common type of vessels. The length of the majority of vessels (80.6%) ranged between 5 to 10 m. The vessels were mainly powered either by oars (52.2%) or outboards.

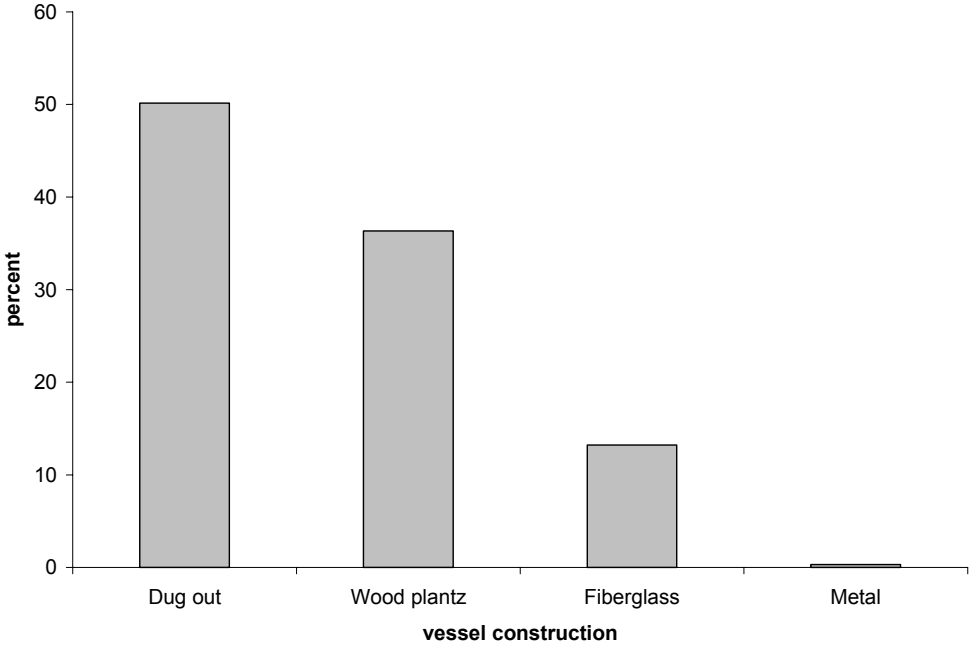

Figure 4.24: Vessel construction material

4.2.3.3 Gear specification

Most of the fishers (42.2%) used lines as their main fishing method (Figure 4.25); and primarily handlines were used by 49.3% of those fishers. According to the majority of fishers, use of handlines, trolling and droplines caught about five fish per trip. The rod and reel caught about nine fish per trip. Pots were the second most common gear used by fishers (39.9%) but these fishers only used z-traps. Of the 9.4% fishers who used nets, 69.2% used china nets (Figure 4.26). The majority (40.7%) used a mesh size of 1.25 inches in the china nets (Figure 4.27). The minority which used seine nets used a mesh size of 1 inch.

4.2.3.4 Fishing operations

The majority of the vessels (98.8%) operated in the small scale fisheries. Most vessels (27.6%) travelled 3 miles from the main fishing ground while others (25.9%) travelled 5 miles offshore (Figure 4.28). Most of the vessels (24.6%) made three trips per week; others made six trips (20.7%) while 18.5% made two trips (Figure 4.29).

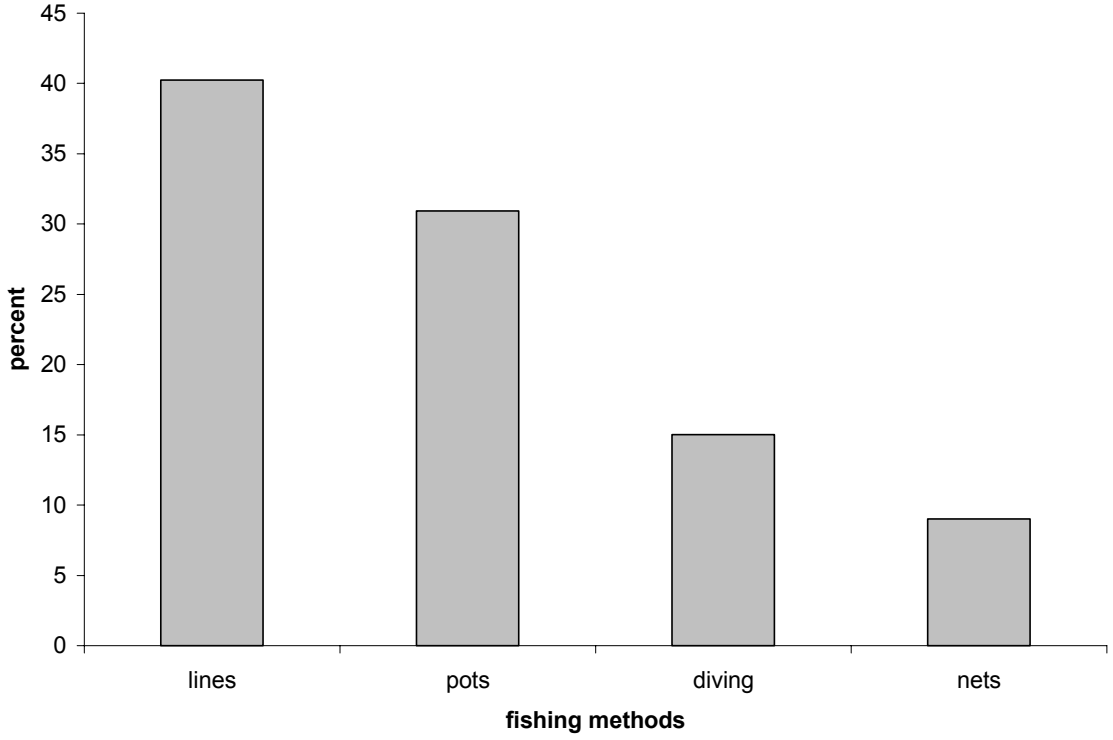

Figure 4.25: Fishing methods used throughout the NMP

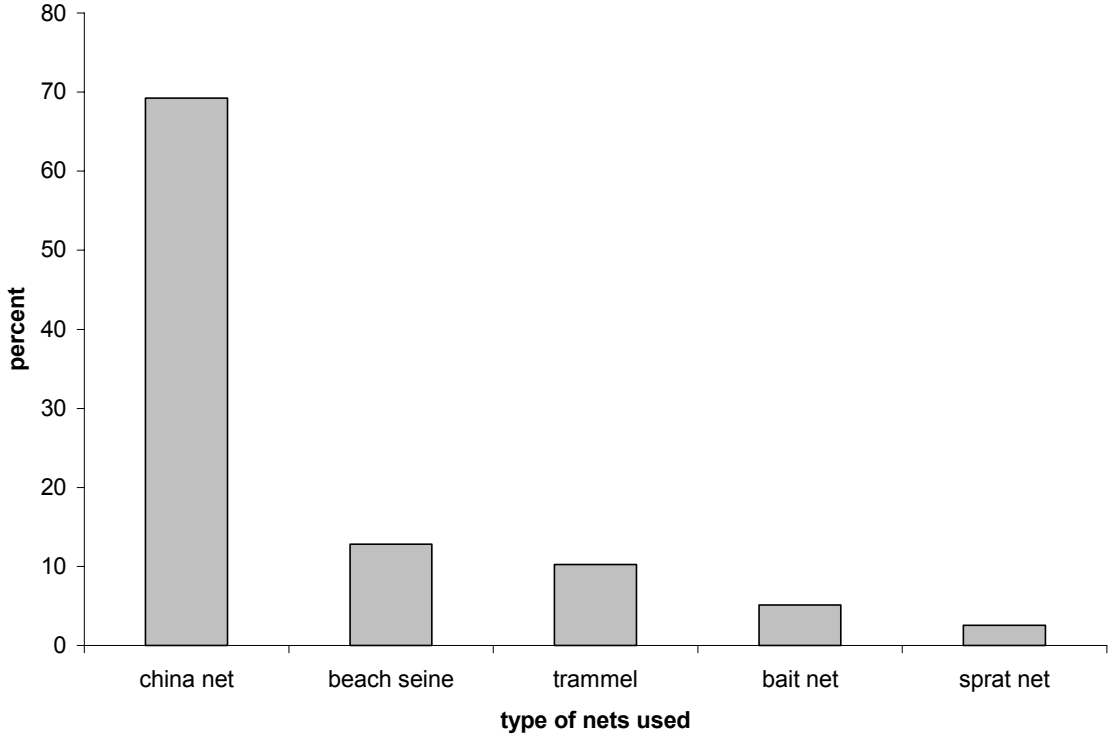

Figure 4.26: Types of nets used throughout the NMP

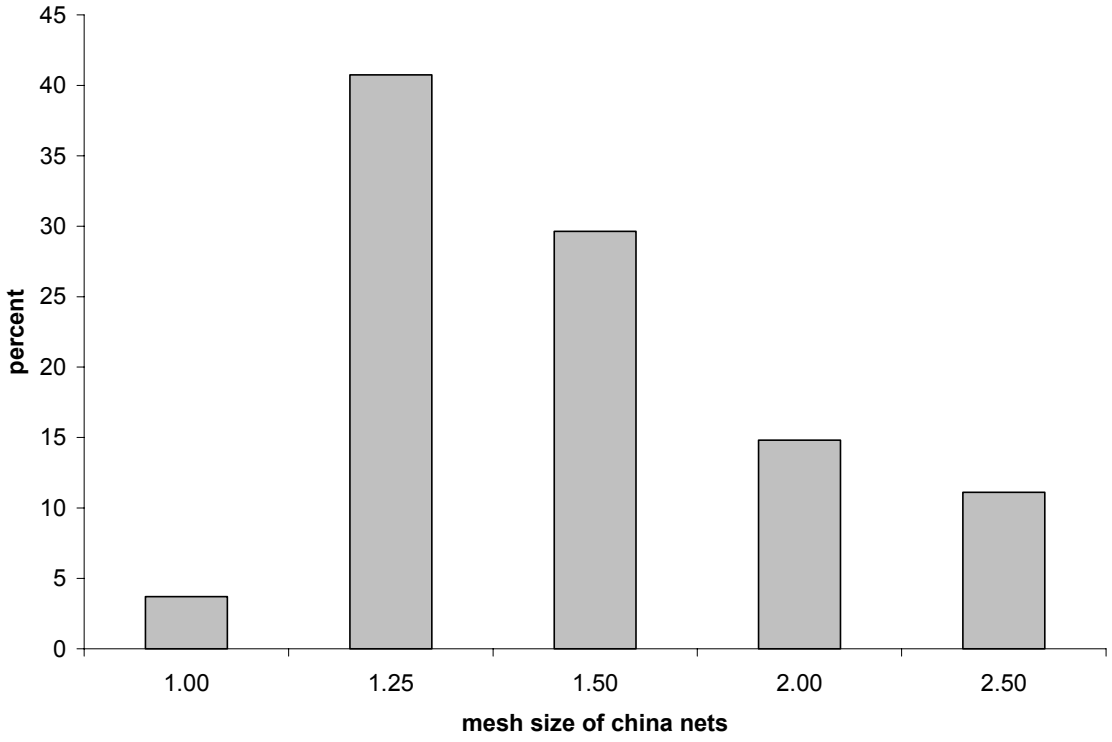

Figure 4.27: Mesh size of china nets used in the NMP

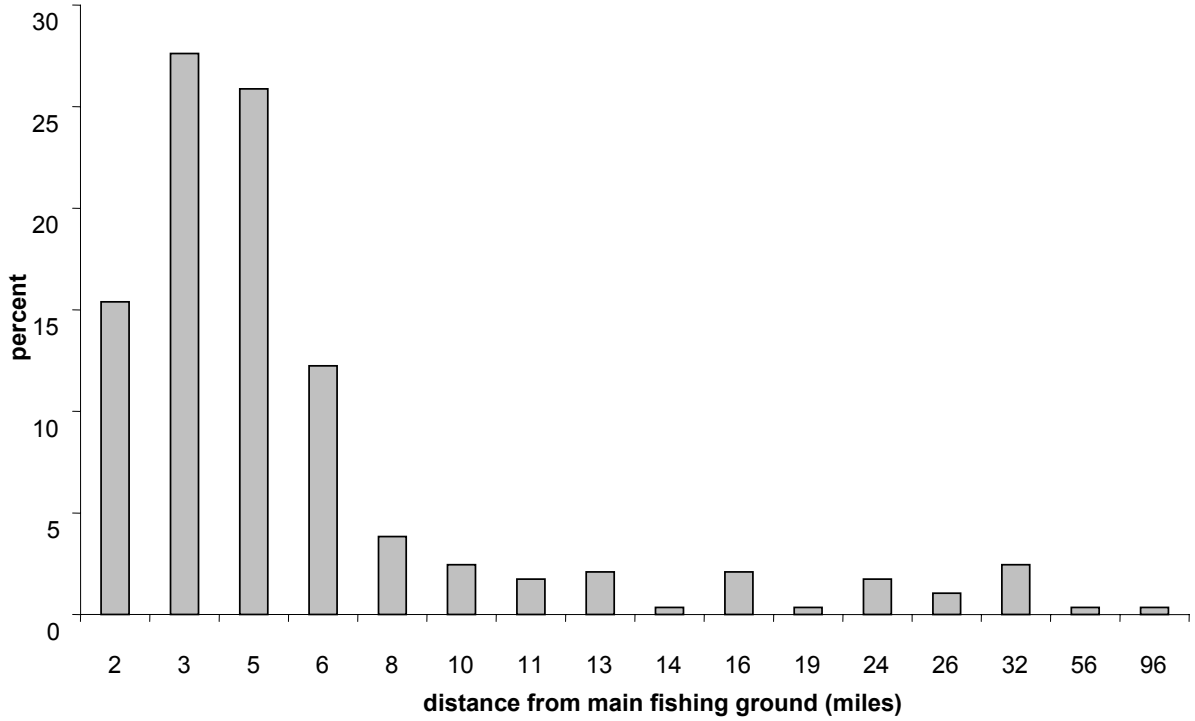

Figure 4.28: Distance from main fishing ground

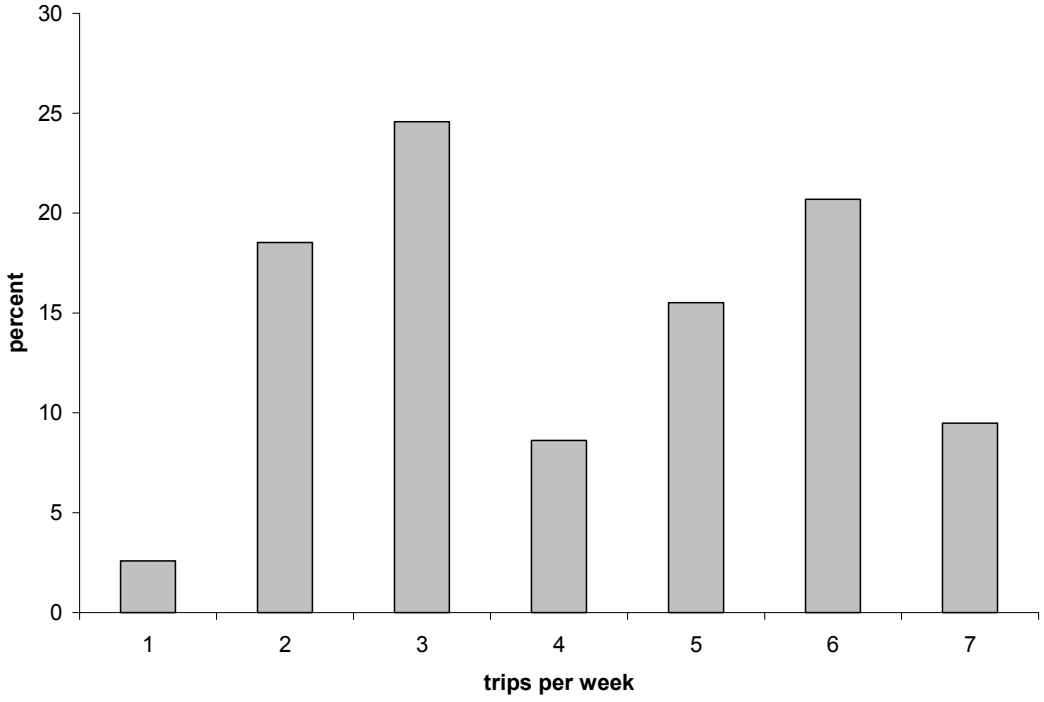

Figure 4.29: Number of day trips per week

4.2.3.5 Catch characteristics

This provided a description of the fisheries and examined at the main targeted species and on the productivity of the fisheries, specifically relating to catch value.

Most of the fishers (49.8%) mainly targeted reef fish within the Negril Marine Park (Figure 4.30). The second and third most commonly caught target species were offshore pelagics (23%) and snappers (18.9%) respectively. For most of the fish, the price per pound was JM $80 (Figure 4.31).

4.2.3.6 Marketing arrangements

Marketing arrangements explained the dependence on the fishing industry by other stakeholders processing plants, hotels/restaurants and wholesale vendors and seafood outlets. The market demands by these stakeholders tend to influence fish harvest practices.

The majority of species caught from the various fisheries (deep slope, coastal pelagic, offshore pelagics, reef and snappers) were sold directly to the consumer (Figure 4.32). A small percentage (1-2%) of the catch from various fisheries was kept by fishers. None of the catch were sold to carrier boats or disposed of. A minority of fishers sold the minimum of their catch of reef, offshore pelagics and snappers to hotel/restaurants, wholesale vendors and processing plants. Deep slope and coastal pelagics were not sold to wholesale vendors and hotels/restaurants. However a minority was sold to fish vendors; coastal pelagics were sold to processing plants.

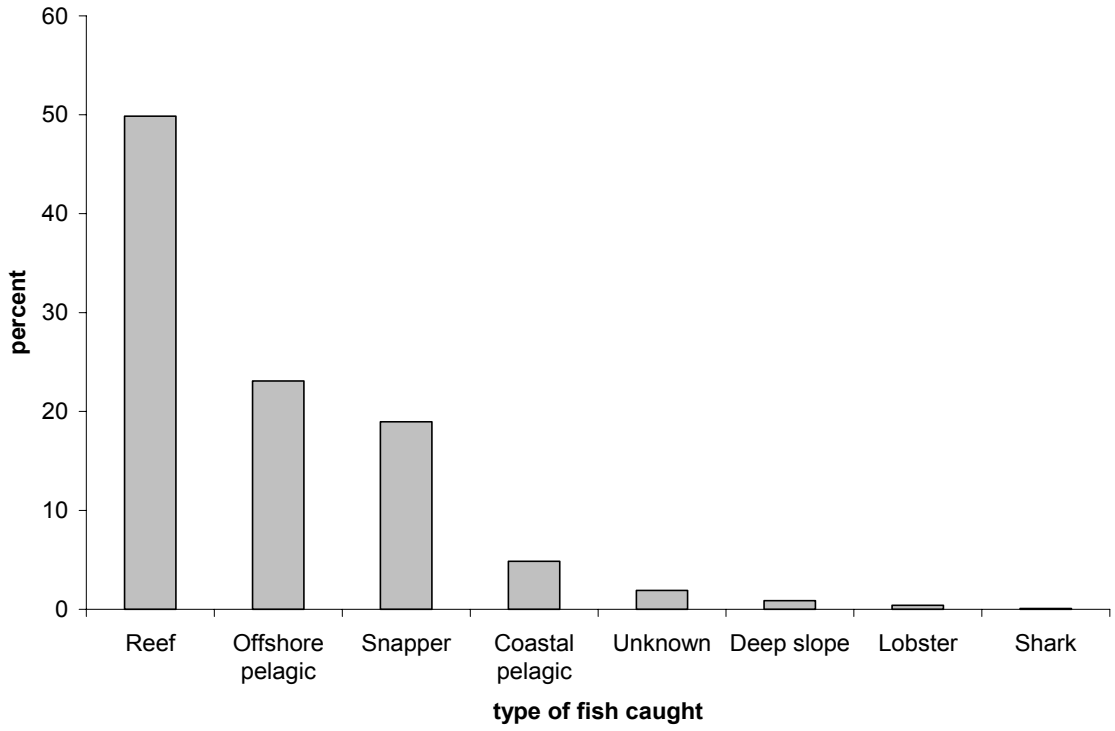

Figure 4.30: Types of fish caught and landed within the NMP

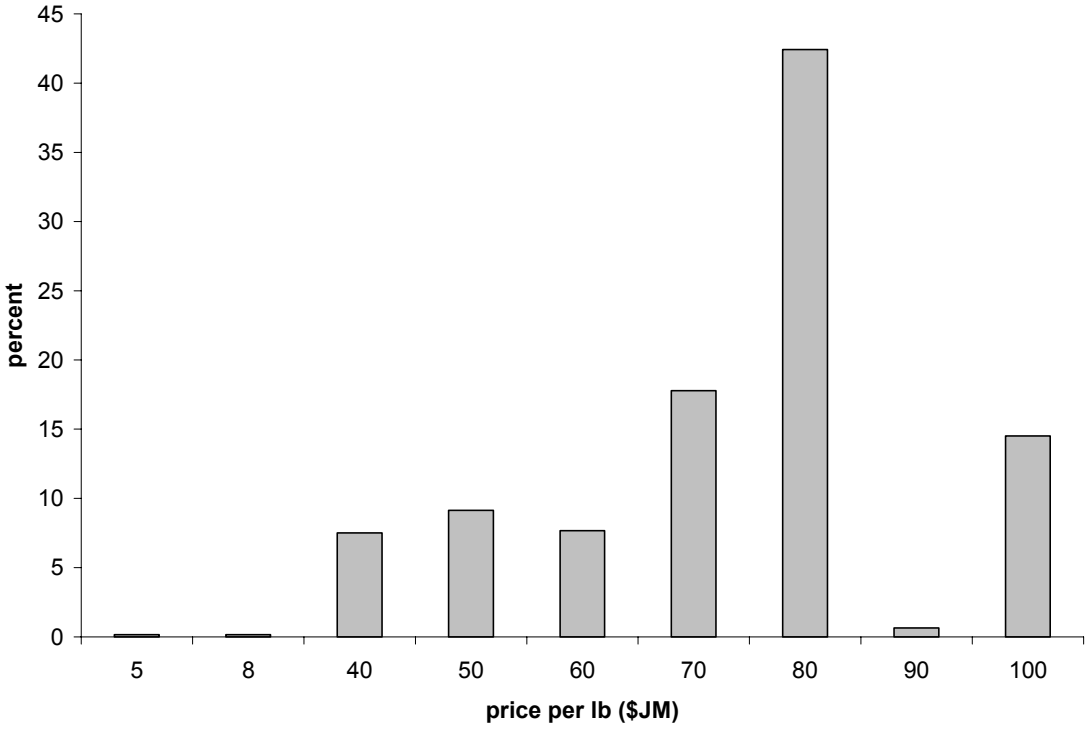

Figure 4.31: Price per pound of offshore pelagic

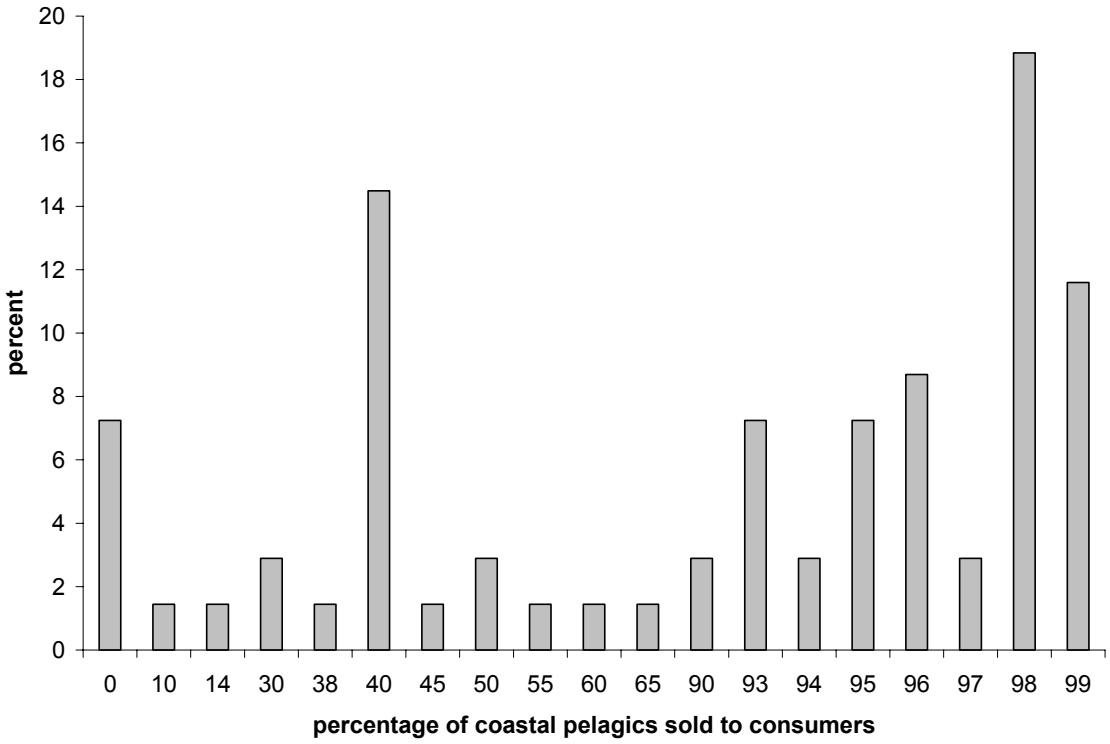

Figure 4.32: Percentage of coastal pelagics caught and sold to consumers

4.2.4 Fisheries Management Plan Consultation meetings

The fisheries consultation meetings were held in four communities (Green Islands, Davis Cove, South Negril and Savanna-la-mar) adjacent and outside to the NMP to gain the input of fishers on fisheries management and policy (see Chapter 3: Methods). The results were based on comments from the fishers would assist managers in defining appropriate management measures for the fisheries.

The communities addressed the main threats to the fishery and nursery habitats during the meetings. The main threats identified were pollution, use of motorized boat, unsustainable fishing practices and use of small size mesh, and the effects of these threats were identified (Figure 4.33). These threats originate from fishing, tourism and agriculture.

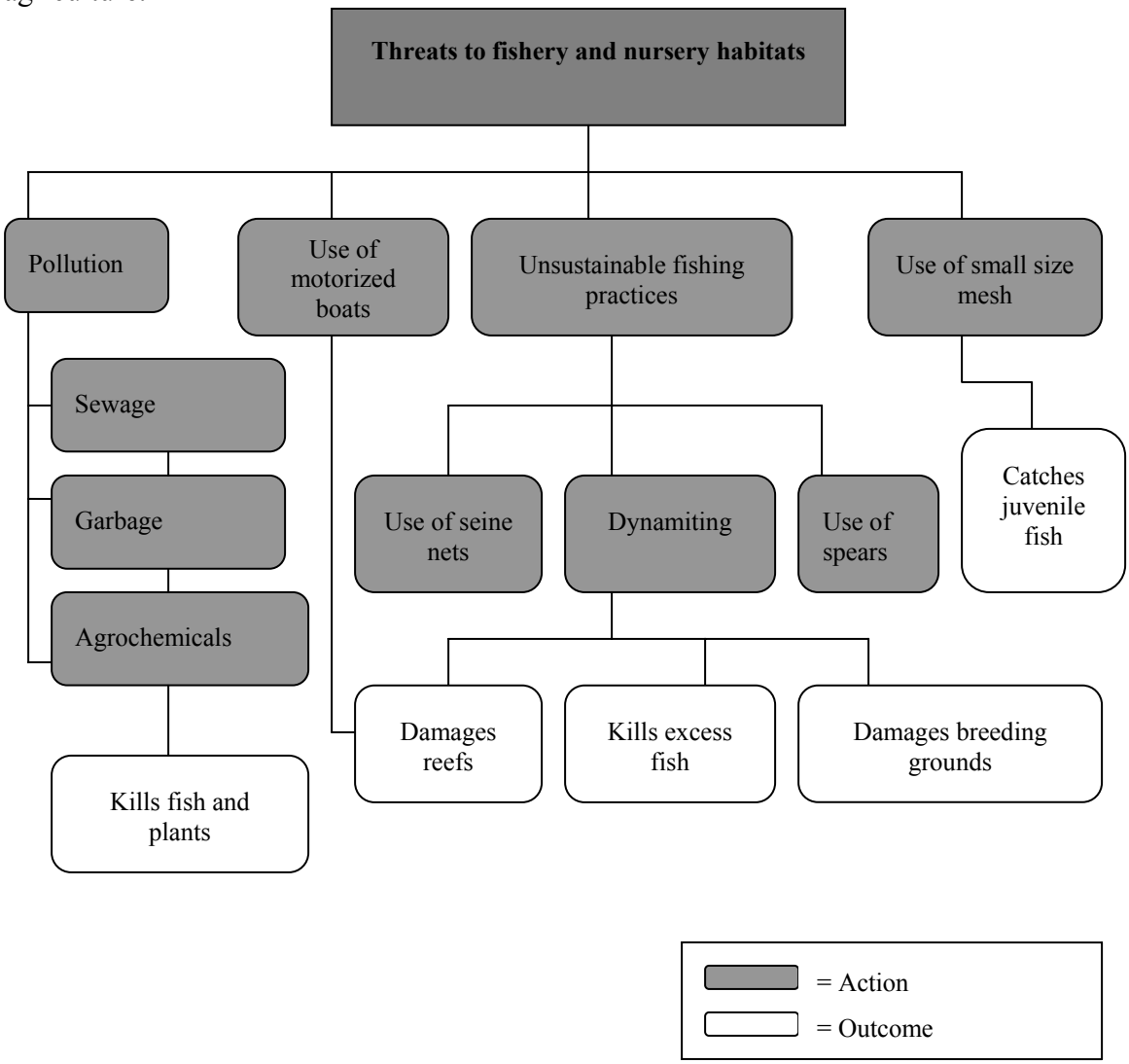

Figure 4.33: Threats to the fishery and nursery habitats as identified by fishers

After the fishers identified the threats some solutions were suggested to assist management. These solutions pertained to enforcement, participation and alternative practices (Figure 4.33).

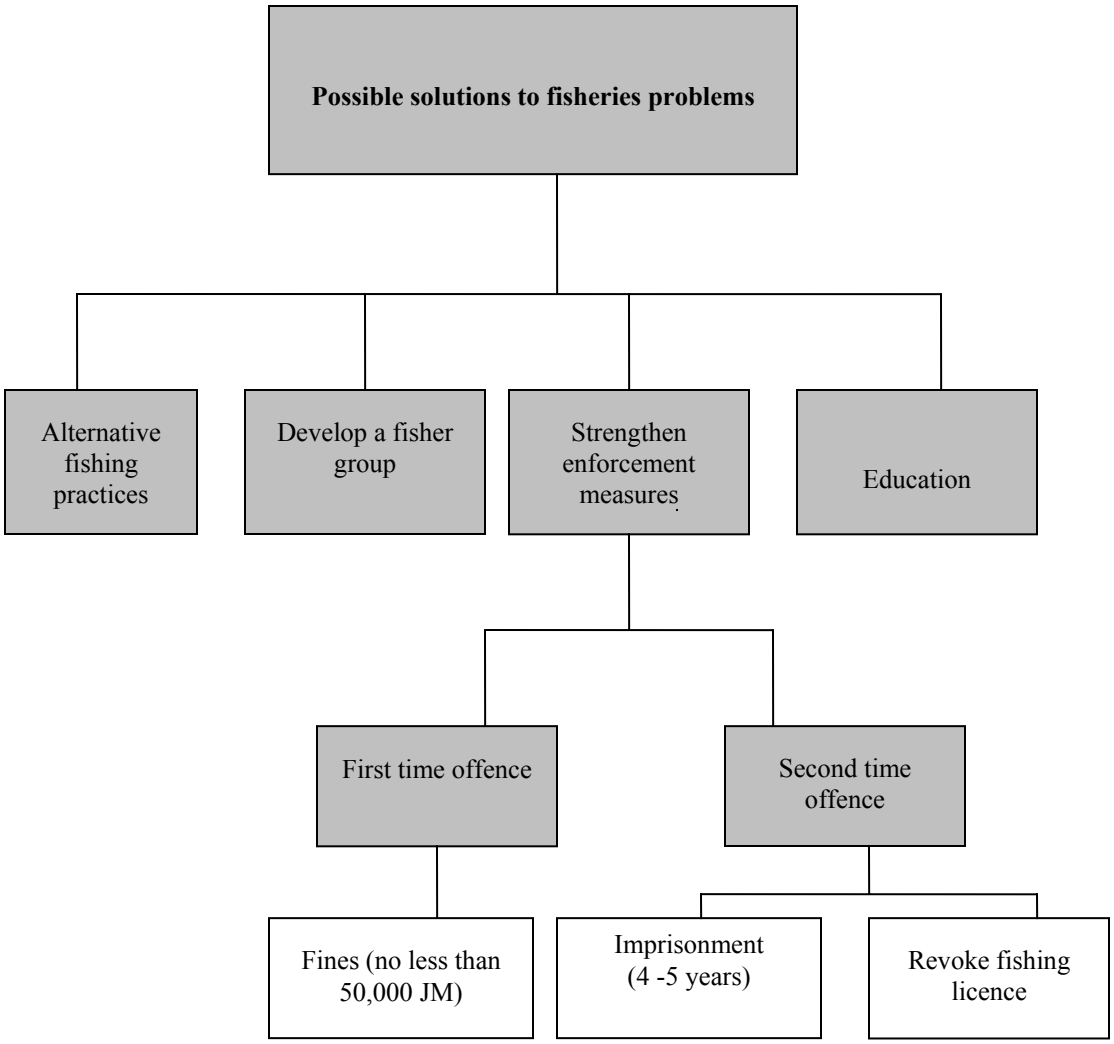

Figure 4.34: Solutions to fisheries problems in the NMP

Dynamite fishing is a problem in Savanna-la-mar and these fishers enter the park's waters to conduct their illegal practices. From the meeting at Russia, Savanna-la-mar, a few characteristics of dynamite fishing (e.g. fishing hours, origin of fishers, *inter alia*) were identified which could be useful for the implementation of enforcement measures (Figure 4.35).

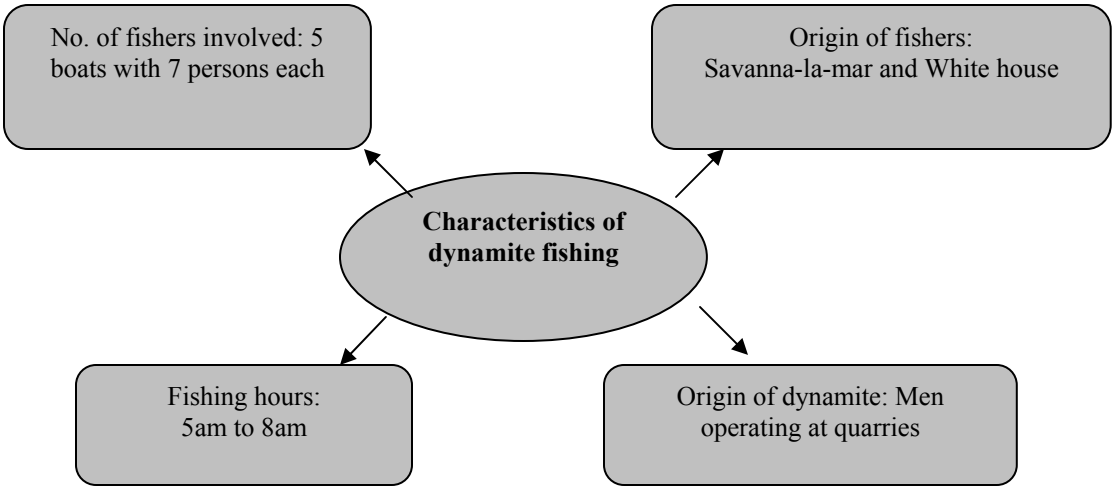

Figure 4.35: Fisheries characteristics of dynamite fishing

The main conflict of interest arising at the meeting was the issue of enforcement (Table 4.3) pertaining to the establishment of a permit system and also the use of the permitted mesh size of nets. The conflicts have not been fully resolved and may require additional participation from fishers for consensus.

Table 4.3: Conflicts of interest discussed at fisheries consultation meetings

Issues addressed	Results
Permit system	• It could cause conflict among fishers, especially since it is important to move back and forth through the NMP fishing beaches.
Mesh size	• The problem is that various fishers catch various sizes of fish, depending on what they find profitable. • For fishers catching large fish, a larger mesh size is agreeable as they make a good profit from larger fish. However some want to catch smaller fish because it is what the community finds to be more desirable. • Additionally, there are problems obtaining larger mesh from suppliers and this can impact on the acceptable mesh size for the fishers.

4.2.5 Interview with charter boat fishers

The following are the results from the interview with the three charter boat fishers in Negril. The interview investigated fisheries operations, catch characteristics and marketing arrangements, and recommendations for this occupation as a viable livelihood for some commercial fishers.

4.2.5.1 Fisheries operations

The fisheries operations of charter boat fishing were not as complex as the commercial/artisanal fishing industry. An outline of the charter boat fishing operations is shown below (Figure 4.36). The three main components of their fisheries operation that were described included the fishing duration, the distance from shore that they fish and fisheries characteristics e.g. the size of the vessels and the type of gear used.

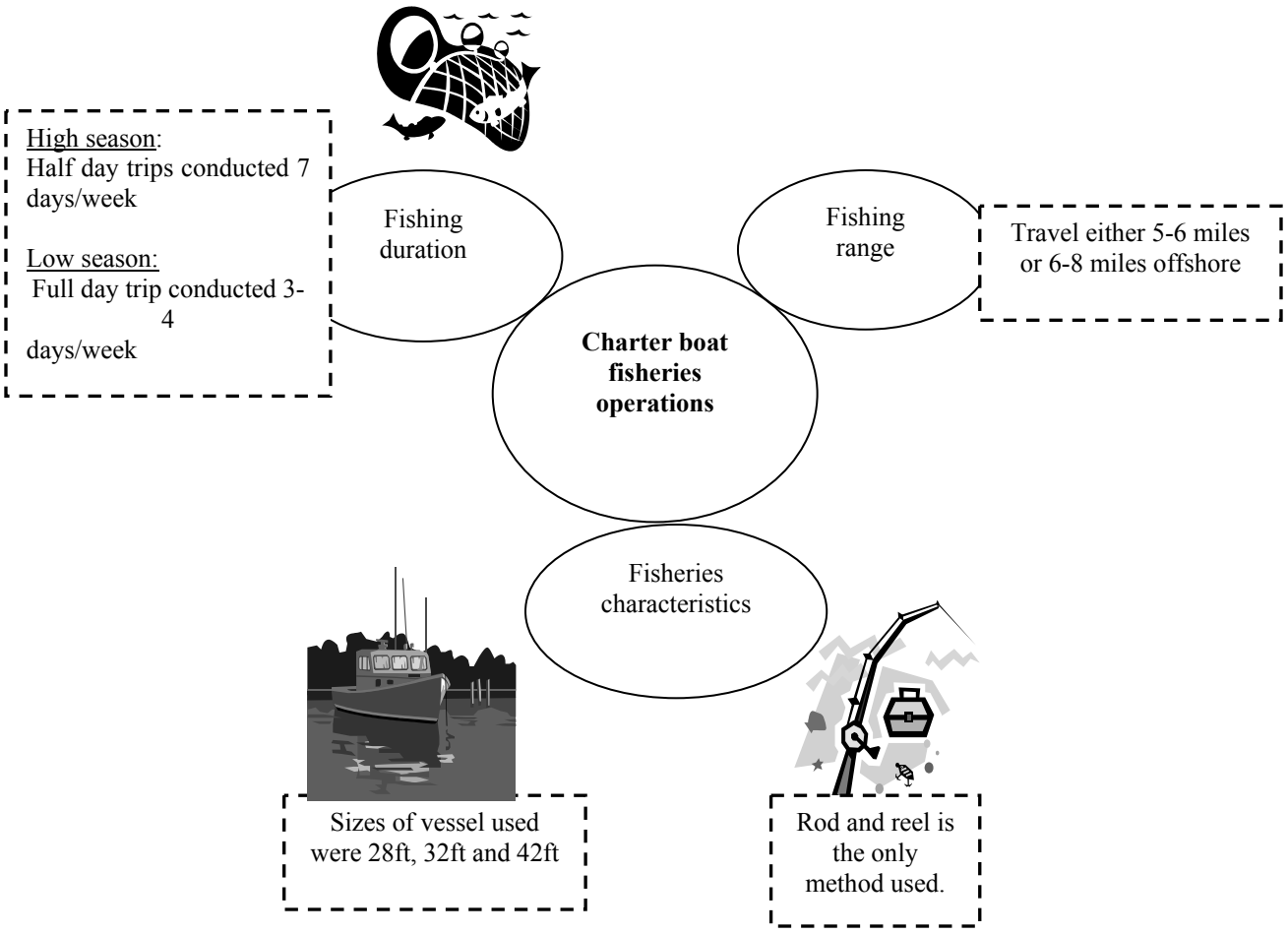

Figure 4.36: Diagram of fishing operations within the charter boat fishing sector

4.2.5.2 Catch characteristics and marketing arrangements

Charter boat fishers targeted many offshore pelagic species such as barracuda, blue and white marlin, dolphin, tuna and wahoo and these species are targeted all year round. The table below shows a seasonal calendar for the peak months of the offshore pelagics (Table 4.4).

Table 4.4: Seasonal calendar with the peak months of offshore pelagics

		Months of the year											
		J	F	M	A	M	J	J	A	S	O	N	D
Offshore pelagics	Barracuda								✓				
	Blue marlin									✓	✓	✓	
	Dolphin			✓	✓								✓
	Tuna									✓	✓		
	White marlin			✓	✓								
	Wahoo	✓											✓

The disposal of the fish caught by the angler gives an indication on whether recreational fishing has a significant impact on fisheries. For example, some fish were sold and not returned to the sea (Figure 4.37).

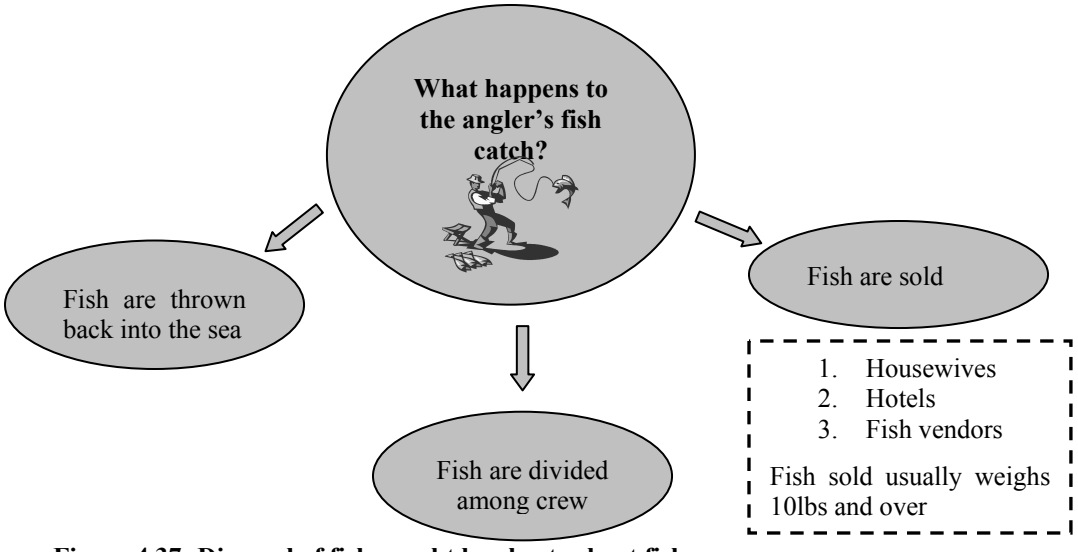

Figure 4.37: Disposal of fish caught by charter boat fishers

4.2.5.3 Charter boat fishing as an alternative livelihood

According to the charter boat fishers, there are some pros and cons about charter boat fishing as an alternative livelihood (Table 4.5).

Table 4.5: Pros and cons for charter boat fishing as an alternative livelihood

Pros	Cons
• An available niche for commercial fishers (most charter boat fishers were commercial fishers) • Greater advantage if fishers provide something unique. • A lucrative option since some fishers from the north already travel 10-15 miles or even 20-30 miles offshore.	• Expensive business (regarding finances for fuel, boat problems, insurance, food). • Fishers must provide hotel concessions even if they do not obtain any fish catch. • The business may provide inadequate capital. Hence it may be better to have a leased boat instead of buying a boat.

4.2.6 Interview with restaurant owners

The following are the results from the brief interview with two restaurant owners in Negril. Figure 4.38 shows the fisheries arrangements for restaurants. It specifically relates to the type of fish sold within restaurants, where the harvested fishery species are bought, the amount bought and compliance to regulations.

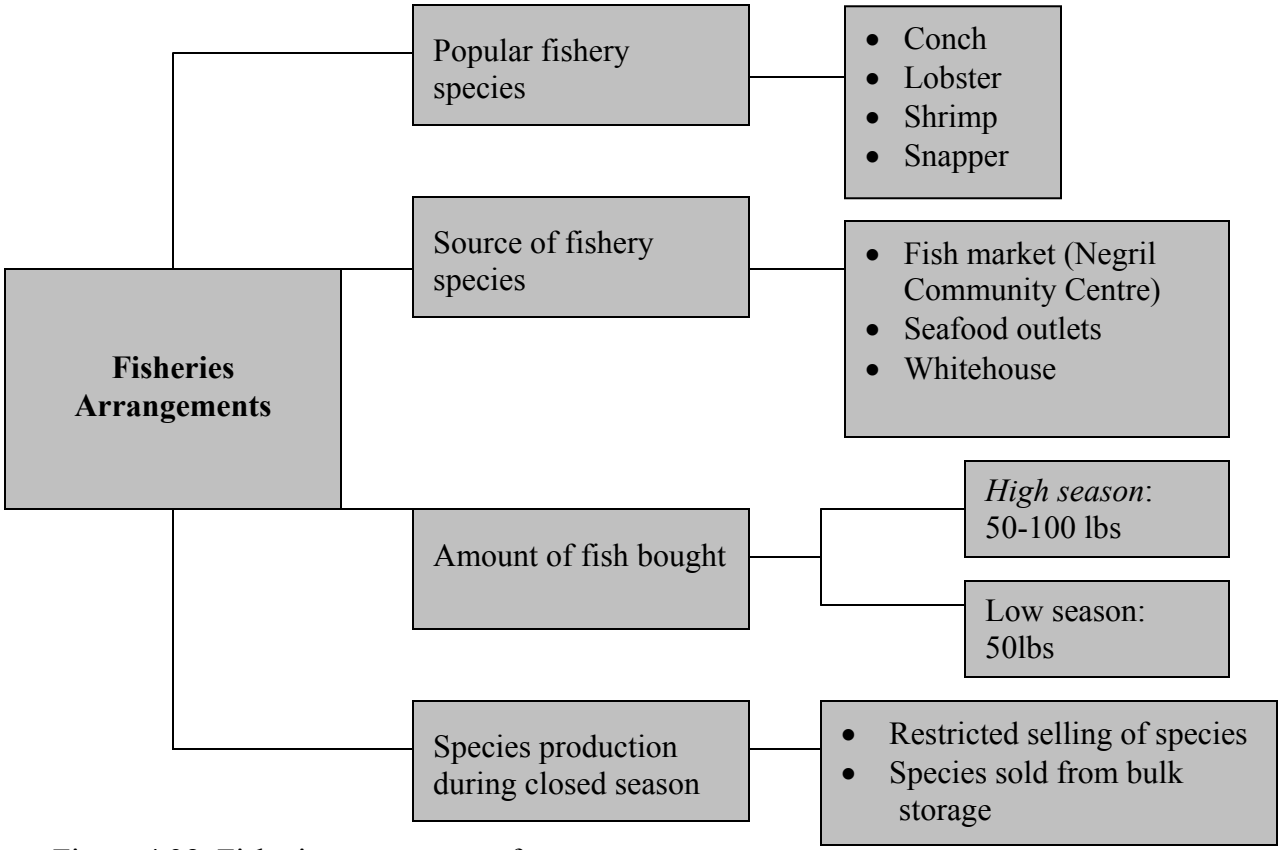

Figure 4.38: Fisheries arrangement for restaurants

4.3 Implications of findings for management

This section examines the information generated (see sections 4.2.2.1-4) to identify any implications that this information will have for management. The implications focused on sustainable livelihoods, governance (management interventions and level of management required) and the importance of communication and participation and the scope for co-management resulting from interviews with key stakeholders and other information sources.

4.3.1 Sustainable livelihoods

NMP communities are dependent on fisheries as a source of income and food. Furthermore they have no other sources of income. With fisheries on a decline, the benefits from fishing will also decline. Alternative options must be found to safeguard the livelihoods of the people. The majority of fishers target mainly reef fish; however, this fishery is on a decline compared to other fisheries. Management could reduce fishing effort on reef fish by providing alternative fish resources for fishermen. According to the charter boat operators, the main offshore species caught are blue marlin, wahoo, barracuda, dolphinfish, yellowfin and blackfin tuna and sailfish. Therefore, there is wide variety of fish species resources which could be tapped into, that reef fishers or traditional near-shore fishers can catch to take the pressure off the reef fisheries. According to Mr. Hanson of NCRPS, this diversity of offshore fish caught by the charter boat fishers can give insight into the diversity of offshore pelagics in the adjacent offshore. This knowledge would guide park managers into where their efforts should be in terms of preservation of related nursery grounds. Charter boat fishers usually travel 5-6 or 6-8 miles offshore. These fishers have seen commercial fishers travel even further offshore. Nearshore fishers can shift to catching offshore pelagics without travelling too far from shore. Other fishers who do not have highly technical boats may be able to use this as an alternative option. Catch rates of fish vary but on good days fishers tend to catch 15-20 fish. This further indicates that the offshore fishery is a feasible option to catch more fish and reduce the pressure on reef fish.

Alternative jobs in communities around the NMP are limited. One alternative income generating option for fishers is charter boat fishing operation. Most of the recreational fishers were former commercial fishers and found offshore recreational fishing as a more lucrative job opportunity. There is more room for fishers however; this type of fishing is expensive.

4.3.2 Governance

4.3.2.1 Management interventions

Illegal fishing practices such as spearfishing and dynamite fishing still exist in the park. Management must target these communities where these practices are prevalent e.g dynamiting in Savanna-la-mar and spearfishing in Green Island. These communities need to be educated on alternative fishing practices. There needs to be improved and strengthen enforcement especially in prohibiting unsustainable fishing practices. Management must seek to increase their human capacity to ensure compliancy of regulations. Furthermore, they could encourage communities to self police their own area since the park is very large. According to Mr. Miller (CREP) fishers in Orange Bay and

Little Bay are self policing their area which is under protection. Fishers should not only ensure that other fishers do not fish in no-fish zones but also ensure, fishers are using the correct mesh size and practising appropriate fishing practices. Moreover, the fines and penalties allotted for violations should be increased and enforced to ensure compliancy.

The socio-economic survey showed that there was too much fishing in areas such as Orange Bay and Davis Cove. Management needs to restrict fishing effort especially in these areas. In Davis Cove, the harbour is not a designated no-fish zone. Therefore these areas need to be protected from fishing especially since the harbour is an area for sheltering the juvenile fish.

The fisheries census showed that the main buyers of fish are the consumers. Not only the fishers must be targeted for effective management but also the consumers who influence the market demand of fish. The public needs to be educated on sustainable fishing and the importance of protecting fisheries for future generations. Sensitisation can change the knowledge and attitudes of the public and stakeholders. Consumers can sensitised on management measures such as closed seasons and refrain from purchasing illegal products. In this case, they begin to indirectly play a role in enforcement. Those involved in the post harvest sector such as restaurants owners need to be sensitised on fisheries issues. If they refrained from selling fishery products during the season, fishers may stop fishing illegally as they are unable to make adequate income. Fishers can be sensitised on the negative impacts of certain fishing gears and refrained from purchasing destructive gears. However, the more sustainable gears should allow them to still profit from the fishing. The majority of fishers should use the gear, otherwise fishers may switch back to the original gear, if they recognise any increase in catch by other fishers using the old gears.

4.3.2.2 Level of management required

Management could only be effective if co-management exist between the primary stakeholders (fisheries) and secondary stakeholders (NCRPS, government, fisheries officers and policy makers). Often fisheries resources fully or overexploited under management by government alone. The Negril Marine Park case is a perfect example. fishers along with NCRPS, government, fisheries officers and policy makers work together. For communities to be more involved in management there needs to be effective communication and transfer of information.

NMP communities stated that they have limited influence on park management and so managers must seek to involve stakeholder in management. Increase in communication can encourage cooperation of stakeholders in management and allow them to participate in management at a higher level. If fishers are informed, they can partake in management and reduce some conflicts arising among themselves, other resource users and the government. It may also increase compliance to park regulations. Furthermore, communities should be involved in the development and implementation of the NMP FMP. The draft of the plan should be presented to the NMP communities to gain their participation through consulting managers on the elements of the FMP. This would ensure there is consensus by stakeholders on the FMP. Bureaucratic impediments could slow down the implementation of the plan and so the FMP should be promoted through

education and sensitizing the public, so it could be seen as the standard fisheries operating system in the NMP.

The communities indicated that NCRPS was responsible for solving the park's problems and the government as having the most overall responsibility. However, fishers are the main resource users and need to take responsibility as well for park problems and management. In this light, there should be shared responsibility in governance of NMP fisheries so management is effective. Management should develop an entity to manage fishery and reduce the pressure on NCRPS to become the sole decision-maker of NMP fisheries. This entity should encompass fisheries stakeholders, park managers and government (fisheries officers, policy makers) on board. Their presence would be more focused on fisheries management, while NCRPS would deal with general park management issues.

Fishers should be empowered to be play an active role in the decision making process and alleviate some of the pressure on the government to take action. Park managers must look at how fishers can cooperation in management and which fishers will participate directly in management. Furthermore, management must seek to ensure that the aforementioned entity is empowered to makes decisions, especially in establishing regulations and enforcement measures. If the NMP depends on the government, the process will remain fixated. Fishers could become stressed due to the inactivity; conflicts could arise and eventually the entity/committee could fall apart due to the lack of respondence from the government and their lack of influence in the decision-making process

4.3.3 Scope for co-management

With communication, participation and empowerment of stakeholders, co-management of the NMP fishery could easily occur. Fisheries co-management seeks collaboration of stakeholders (specifically fishers), along with the NCRPS, government to help manage the fishery resources. The stakeholders involved in co-management are usually organised in formal or informal groups to participate in co-management. In the NMP, the stakeholders are not in any formal or informal groupings. Rather there are disorganised individuals with their own interests at hand. The watersport operators and charter boat fishers have no form of organisation. Moreover, the fishers associations have not been functioning for a while. Commercial/artisanal fishers are the largest and one of the key stakeholders in fisheries and need to be organised to formally participate in the management process. According to Mr. Hanson, 'it is difficult to hold meetings with fishers. It would be more advantageous for fishers to be part of an organisation'. Without the strong local organisation, it can take long in developing fishers capability and participation in fisheries management. Mr. Hanson believes that the dormant Fisher's Co-operative needs to be revived to facilitate involvement of fishers. The charter boat fishers are only a small group of 4 fishers and presently it may not be vital for them to form a group, like commercial fishers.

For co-management to be feasible, there should be a supporting institutional framework which would aid fishers and community empowerment. However, for such framework to be implemented there is much reliance on the government.

Enforcement needs to be facilitated for co-management to work. Currently, there is a lack of human resources to manage the park as four NCRPS rangers cannot effectively patrol the large marine park. Secondly, NCRPS rangers are not empowered to make arrests. The initiative put forward, however, nothing has been done. Enforcement agencies need to be incorporated into management plans to participate in management. Additionally, community involvement in management can become increasingly important whereby communities can self-police the area to ensure other community members do not break the law. However, self-enforcement may be difficult especially due to conflicts between fishers and illegal fishers. Some fishers are fearful of confronting illegal fishers because of possible threats. In such a case, there should be legal support for enforcement to protect fishers

Education is an important tool for fisheries co-management to work. Management must educate fishers and other stakeholders on the concept of co-management and the incentives they can receive from collaborating the government and park management in fisheries management. At first co-management may not appear socio-culturally feasible to Jamaicans, as most countries originate from societies where the government manages everything and so society may believe they do not have the confidence to manage the resources. However, it can be relatively feasible if stakeholders are educated and well trained.

Co-management can only be successful if people consider themselves as owning the resource. Ownership is important as this allows fishers to participate and contribute, especially since they know the benefits the NMP fisheries provide for them. They will not want to see the fisheries decline further or the marine habitats destroyed and so are more prone to conserving and protecting their resource. For instance, residents of Orange Bay and Little Bay are very concerned about the degradation of the marine resources and are self policing their area to ensure that others do not fish in the area (pers comm.).

5. DISCUSSION AND CONCLUSION

5.1 Contents of the FMP

The Fisheries Management Plan provides an integrated approach to manage the NMP fisheries. Unlike other fisheries management plans (e.g. Barbados Fisheries Management Plan) the NMP FMP sought the need for co-management of the NMP and its fisheries. For example, the FMP would have local communities assist in the decision-making process. The NMP FMP would be supported by national policies and legal framework to ensure that fisheries are adhering to national and international sanctions. The NMP fisheries overview would assist in understanding how the fisheries operate. The information would help determine the impacts of the fisheries operation on the fishery resources and facilitate any future developments needed to improve the fishing industry. A plan for the individual fisheries is essential as there are several different small-scale fisheries operating within the park. Small-scale fisheries within the park exploit many fishery stocks in the park from coastal pelagics, reef fish, offshore pelagics, deep slope and shellfish. Each fishery should be carefully managed because of the varying fishing pressure exerted on the fisheries, hence different management interventions are required.

The objective of developing a table of contents for the NMP FMP was achieved; however a few limitations to the process of generating this information were identified. The

participants at the workshop for the FMP comprised mainly of persons from the Fisheries Divisions and other key stakeholders (NCRPS, CREP and Negril Area Environmental Protection Trust) were involved in determining the contents of the FMP. Other stakeholders such as fishers should also be involved to allow for transparency, even though they might be unable to provide adequate input in the formulation of the plan. The one day workshop was too short to address the FMP table of contents in detail. A two-three day workshop would allow collaboratin to focus on each of the main contents of the FMP. The FMP did not focus on the post harvest sector such as restaurants and seafood outlets. Even though the interaction of these sectors within the NMP fisheries might be small, it would still be significant because this sector has some influence on the market demand.

5.2 Socio-economic survey

The Negril Marine Park, like many areas around Jamaican waters, has seen a significant decline in fisheries. Offshore and onshore reefs in the NMP have deteriorated in the last five to ten years. Research has shown that overfishing, *inter alia* was one of the causes for the decline in fisheries (Espeut and Grant, 1990; Christophersen *et al.*, 1997 and Garaway and Esteban, 2002). A study by O'Sullivan, 2002 found no evidence that the marine habitat and fishery resources were improving since the park's establishment. The status of marine habitats and fisheries resources would only be known through constant monitoring of the NMP.

The SocMon survey showed that the NMP communities considered the NCRPS to be the most responsible for solving the park's problems, while the government had the most overall responsibility. While communities viewed themselves as having little influence on NMP management, they seldom participate in management activities such as meetings and workshops. Some studies showed communities were actively involved in establishing fishing zones and some became community wardens to patrol the replenishment zones where fishing was banned (Garaway and Esteban, 2002; Garaway and Esteban, 2003 and Thacker and Hanson, 2003). This highlights the need to obtain data from different sources to obtain a more holistic view on park management. It is also important that management incorporates the views of resource users in handling park problems. Resource users are directly involved with the resources and so are important for supporting and sustaining park management.

NMP communities are heavily dependent on marine resources. According to Bedasse, (2004), fishing has always played an important role in the economic, social and cultural lives of Jamaica. The areas around the NMP are no exception. The fisheries-oriented communities do not only depend on fish as a source of income but also as a source of food. Results showed that over 75% of those interviewed were fishing and fish was consumed approximately every day. It may be difficult to persuade these fishers to change to alternative occupations especially the older fishers who have been fishing for many years.

Alternative income generating strategies are influenced by social acceptance and financial feasibility of the alternative options. Results from the survey indicated that alternative livelihood options for the NMP communities are limited due to a lack of financial resources. According to the survey farming is considered a secondary

occupation and this is supported by Christophersen *et al.*, (1997). The 1997 study showed that small-scale farming was seen as a supplemental form of income for fishermen where most crops were sold locally or consumed by family and friends. However, the study also showed that Negril fishermen would typically opt to increase their fishing effort to remain fishermen instead of abandoning the profession and becoming farmers or doing something else to make a living. Alternative job options should be related to the fisher's current occupation and knowledge base to be successful. These options must also be appealing, otherwise the older fishers may be reluctant to change from fishing to alternative job. A preliminary financial analysis on alternative livelihoods for Negril fisher families (Christophersen *et al.*, 1997) suggested that alternatives such as fish farming, seamoss farming and sustainable tourism are financially feasible options. One of these alternatives [seamoss (Irish moss) farming] was introduced to serve as a source of supplemental income in Little Bay. According to Carl Hanson (NMP manager), one person was able to harvest the sea moss but eventually he lost interest and did not invest any further in the project.

Respondents made no effort to train for new occupations and they found training to be unnecessary since most of the respondents were over 30 and may be reluctant to change to an alternative occupation, especially if they were in the fishing occupation for many years. Therefore the park must focus on either training the younger fishers in a new fishing technique or training them for a new occupation. New occupations can include but not limited to, tourism, alternative types of fishing and aquaculture/mariculture. Additionally a system must be employed to prevent others from joining the traditional fishermen occupation and introduce them to more alternatives. Alternative but sustainable fishing practices should be encouraged in the park, especially for older fishers who may be reluctant to change their occupation. Furthermore these fishers can be introduced to the concept of complimentary livelihoods. For instance, if the season is closed to fisheries, fishers can partake in other job opportunities such as sport fishing. This way fishers can have temporary means of getting income, while government seeks to reduce the fishing effort.

There is a possibility that resource users can cooperate with each other. The SocMon survey confirmed that the respondents believed that fishing and tourism in the NMP were compatible, especially since both support income generation and employment. Also they believed that fishers could work together through cooperating and sharing ideas. However, other studies (O'Sullivan, 2002 and Francis, 2002) seemed to illustrate antagonism between tourism and fishing and rising conflicts among fishers within and outside the NMP fishing communities. While the survey indicated there is a likelihood of cooperation among fishers and fishers and tourism, this may be the point of view of those who were not involved in any park conflicts. In such as case, the areas where there is conflict and cooperation in the NMP must be identified.

Although the survey was adequate, several limitations need to be addressed. The survey sampled eighty-eight individuals from the NMP and was created to get an idea of the communities' perception on NMP management and was not statistically representative. Statistically representative surveys help the NCRPS to make better decisions regarding the lives of the majority of fisherfolk. In this sense, the government will not have the representative views of the majority community but only the views of minority who may

have their own interests. Secondly, the survey seemed to target more males than female interviewees. Although males seem to directly depend on the resource for extractive uses, females are primarily the fish consumers and play an active role in fishery through fish vending and fish scaling. The third limitation is that the survey did not focus on enforcement and compliance. This is important for management to be successful. A number of illegal activities still take place in the park, this is because people were either ignorant of the rules or they failed to comply. The few limited rangers that patrol the large area may only provide minimal information on compliance of the regulations. The survey could determine whether management measures were effective and what needs to be enforced.

New approaches can be applied to the SocMon surveys for the NMP. Additionally, park managers should conduct a survey related to fisheries management with their main target audience as the fishers. This would be useful for the fisheries management plan. As park managers receive more feedback from the community, they can manage the park more effectively. Surveys should be short, to prevent disinterest from the target audience and prevent unanswered questions. If detailed information is needed, perhaps the survey could be split into two parts and conducted over different periods of time. A socio-economic survey for the NMP should be conducted and updated in the next three years to identify any differences in the communities' perceptions of the park's management.

The socio-economic information on NMP communities provides fisheries and park managers with an understanding of the social, cultural and economic characteristics of the people in the NMP. This information can help verify who will be affected by fisheries management interventions and identify alternative livelihood options. This information will allow the FMP to assist managers to balance fisheries management with the communities' needs for food security and livelihoods. Fisheries management cannot work effectively if fishers and those involved in fishery related activities are being disadvantaged, especially in cases where harvesting of resources is mainly for subsistence use. Socio-economic information is also useful for the FMP as it allows managers to focus on priorities which will allow for improvement of fisheries management in the NMP.

5.3 Fisheries census

Results from the fisheries census indicated that the NMP fisheries were much like the Jamaica fisheries in relation to fisheries characteristics and operations. As found in CFRAMP studies, there were more unregistered than registered fishers and the majority of fishers were captains/owners of their vessels. Most fishers were fishing for about 10 years and over and they might be reluctant to change to alternative jobs especially if they cannot see the immediate benefits.

Spearfishing is prohibited in the park and the census indicated that spearfishing occurred in the park around the time the park was established. Most of these spear fishers originated from Green Island. Some spearfishers up until today still exist in the park. There needs to be a verification of the number of spearfishers in the park. Fishing for subsistence is important to the livelihoods of these communities and fishers will use spears to obtain food. Some fishers fished mainly for subsistence and not commercial use and therefore fishers were forced to ignore the rules to obtain food.

Not much investment is placed into the fishing vessels. Comparatively, most NMP fishers had dugout boats 5-10 metres powered by oars, while most of the vessels around Jamaica were made of fibreglass and mechanized (Grant *et al.*, 2001). The fishers in the NMP do not have the financial resources to improve their vessels especially since fishing does not provide adequate capital. In this case, fishers mainly fish for subsistence.

Most NMP fishers were actively involved in fishing using lines as their main fishing method; while Jamaican's fishers mainly used pots. Lines were simple gears and fishers could ensure they get a catch. Fishers have to wait a few hours before hauling the pots and at times they caught nothing. At times, other fishers damaged the traps of some fishers and this was reported to be one of the major problems in fisheries experienced in the park.

Most fishers used the stipulated mesh size (1.25 inches for nets and pots) in accordance with the Fishing Industry Regulations (1976). Fishers were probably aware that using a smaller mesh size would tend to catch juvenile fish and prevent these fish from developing and reaching maturity. However, the mesh size of nets and pots must be monitored regularly as results showed that some fishers continued to violate the law by using smaller mesh sizes for some china nets (e.g. 1 inch mesh). According to a fisheries officer, the Fisheries Division is looking at increasing the mesh size to 1.50 inches. Although 54% of fishers used mesh size more than 1.25 inches, this proposed regulation might not be accepted by the 40 % of fishers using mesh size of 1.25 inches, since the mesh size would reduce their catch.

The distance travelled from the mainland is between two to six miles offshore. This was probably the most economical zone for fishers to fish. It is also out side the boundaries of the NMP. Perhaps most of the fishers are nearshore either because the market demands nearshore species or perhaps their boats are not adequately suited to travel far distances offshore or fishers maybe unfamiliar with the offshore fishery.

Reef fish were the main targeted species in the NMP. Even today, reef fish continue to be the most targeted species around Jamaica (Grant *et al.*, 2001) and there continues to intense overfishing of the reef fish (Jones *et al.*, 2004). Offshore pelagics and snappers are also common targeted species; however, the fishing effort is not as great as for the reef fishery. Fishing seasons could be allotted for fish to regulate the fisheries and prevent further over-exploitation of the fisheries. Also fishers could be encouraged to switch to other fish resources before the reef fishery becomes totally exhausted.

Consumers influence the market demand for fish. Results from the fisheries census on marketing arrangements confirmed that consumers buy most of the fish caught while some of the fish may be kept by the fishers. Commercial fishers will only harvest the fish that consumers will buy and so the fishers continue to harvest reef fish. In the NMP, the market for selling fish to restaurants/hotels, wholesale vendors and processing plants is merely small-scale, as an insignificant portion of the fishers sell their catch to these markets. Most of the fish supply to these markets may either imported or from other fishing locations outside of the NMP (e.g. Whitehouse).

Fishery information pertaining to fisheries characteristics, operations and productivity are crucial to the development of the NMP FMP. It allows the s development of effective management interventions to maintain and enhance fish populations. The information

helps determine the importance of the fisheries to the livelihood of coastal communities so plans can be implemented for alternative strategies. Any management intervention devised may not only limit the people's ability to obtain income but also prevent them from providing food for their families. The plan could also take immediate action where fisheries conflict and issues arise. Additionally, it could help compliance of management measures and indicate the need to propose further management measures especially if the fisheries are being negatively impacted.

5.4 Fisheries Management Plan consultation meetings

Fishers are aware of the threats to the fisheries and nursery habitats. Therefore there is likelihood that fishers will make an effort to reduce further impacts on the fisheries. Many solutions were proposed by the fishers to halt the fishery problems. However, some of these solutions were not successful. The Fishermen's Cooperative was developed to represent fishers but problems occurred between the administrative staff and the fishers. If another organisation will be created, the element of transparency is important. Enforcement measures should be strengthened to ensure compliancy of all fisheries regulations, especially with the establishment of the FMP.

Some conflicts of interests which arose at the meetings, regarded regulations and in terms of net mesh size, and enforcement measures such as fines/penalties and permits. This information could provide the government and management on the enforcement issues which should be addressed within the FMP. There were contrasting views on management of these issues and so the fisheries authority (FA) and park management must decide how they will approach enforcement measures. The FA should determine whether management will be left to the decision of the park managers (NCRPS) or whether fishers in collaboration with managers will be involved in the process organised in a fishery advisory board or committee. The FMP could therefore incorporate the purpose of the committee and the process of dealing with fishery conflicts.

Dynamite fishing is a prevalent problem in the NMP, where outside fishers partake in this practice. The consultation meeting in Savanna-la-mar provided the characteristics of dynamite fishing. With this information, authorities would know who to target and where advocacy should be occur to prohibit this practice.

Despite the usefulness of the meetings to the FMP, there were many limitations to be addressed. Primarily, fishers were not adequately informed about the meetings, as the notice time for the meetings were too short while other fishers did not even notice nor have seen the flyers posted advertising the meetings. This limited the number of fishers who attended the consultation meetings. Some fishers refused to attend the meetings, even though they were aware of the meetings scheduled. This indicated that the fishers did not understand the importance of the meetings and significance of their input to management.

More effort must be placed in persuading fishers to attend the meetings by signifying their importance of protecting fisheries and the benefits or even possible impacts on their livelihoods and their valuable input. Constant communication with fishers is vital and this can be achieved through a community liaison or respected member of the community or fishing beaches. Meetings should be announced weeks in advance until the day of the meeting scheduled so the fishers are constantly aware of the meetings and can make a

greater effort to attend. Meetings should be publicized through several media and the communication methods used should take into consideration the literacy levels of the community and the time of day. For example meetings should not be publicized mainly in the morning, as most fishers make day trips during 8 am to 12 pm.

Consultation meeting facilitators should ensure that the target audience has a means of transportation to attend the meetings; otherwise the attendance at the meeting would be low. The consultation meetings should be conducted in areas where fishers would generally congregate and are comfortable. They are more likely to participate within a familiar environment. For example, the consultation meeting in Negril was transferred from NCRPS building to the fishing beaches and this resulted in a high attendance of fishers.

The NMP FMP will assist managers in proposing measures to address the many fishery problems experienced throughout the park. The need to incorporate fishers into the decision-making process is essential to effective fisheries management.

5.5 Charter boat fishers interview

Research was limited on the small charter boat fishery in the NMP, as only four recreational fishers could be found in Negril. Fishers need to find alternative fish resources to take the pressure off the reef fishery and charter boat fishing appeared to be a lucrative option. However charter boat fishing industry is relatively expensive.

Charter vessels are larger than the artisanal vessels in the NMP with one of the largest boats at 42 feet. Much money is invested in this small industry. Charter boat fishery targeted mainly offshore pelagics, while artisanal fishers targeted reef fish in the NMP. Thus the charter boat industry does not put pressure on the reef fishery. The charter boat fishers mainly use rod and reel as their main gear. This gear is less destructive to the ecosystem and can result in fish catch of desirable species.

Some fishers are exploring new alternative fishery resources. Artisanal fishers have been spotted travelling 10 -15 miles and even 20-30 miles offshore. The majority of these fishers are from the North of the park i.e. Orange Bay, Green Island, Lucea, and a minority from Negril. Some of these boats are smaller than charter boats and travel long distances. The decline in nearshore demersal fisheries has probably forced these fishers to move further offshore to search for better fishery resources.

The charter boat fishery has become a profitable business. Fishers not only make money from each fishing trip but also from selling the offshore pelagics caught. One fisher estimated that he made JM$10,000 to JM$12,000 during his good weeks. It is also marketable to hotels and local consumers; this makes it an available niche. Artisanal fishers could tap into this viable market but other factors should be considered. For example, the charter boat fishing is an expensive business and fishers must consider finances for fuel, boat servicing, insurance and other commodities. Thus fishers must have access to a substantial amount of income before pursuing the charter boat fishing business. Furthermore, fishers could have a partnership with an investor to support their business. Additionally, the carrying capacity of charter boats should be considered. If there are too many charter boat fishers could result in overcrowding of the area and subsequently result in conflicts between them and other watersport fishers.

The interview with the charter boat fishers helped to determine the other resource users and their impact on fisheries in the NMP. Information on the charter boat fishers is important as it sets the stage for a new industry within the fisheries. This small industry generates a significant income for charter boat fishers and can be used as an alternative option for commercial fishers. In the FMP, charter boat fishers could be recognised as one of the key stakeholders, separate from commercial fishers, and should be integrated in the management process.

5.6 Restaurant owners interview

Most NMP fishers are targeting reef fish. However the post harvest sector is buying other fishery products such as conch, snapper, lobster and shrimp. This may indicate that there is no relationship between the tourism sector and fishers, in relation to buying fish. Most of the fishery products are obtained from outside sources. However a minority is bought from fishers, particularly those who fish for snapper. A further investigation is needed to determine the percentage of fisher obtained from artisanal fishers in the NMP compared to those from other areas and imported fish. This could give a better indication on the importance of the NMP harvest sector to the postharvest sector.

One restaurant claimed to buy and sell conch and lobster during the closed season. Research needs to be conducted to determine if this is trend for most of the hotels/restaurants and whether this sector also needs to be educated on the protection of fisheries, like the fishers.

There were a few limitations of this interview. Only two restaurant owners were interviewed. This was not a adequate sample to make any detailed inferences. Further interviews should be conducted to have a better understanding about the post-harvest sector and their influence on fisheries in the NMP specifically in Negril. Further interviews could also aid in determining if compliance is an issue with this sector. If this is so, management will have to focus its efforts not only on fishers but also the consumers and buyers.

Regarding the FMP, information on the post-harvest sector is essential for fisheries management. This sector encompasses all those who are involved in the handling of fish from the time it is caught, until it reaches the consumers. This sector indirectly employs people in the fishing industry. A collapse of major fisheries could have a domino effect and those who directly and indirectly depend on fishery resources. This information is useful for the FMP: the stakeholder involved in the post harvest sector chain can be identified and these stakeholders could play a role in the fish quality assurance and safety. Secondly, management can implement measures to protect the chain of stakeholders involved, in respect to livelihoods. More information is needed on the post harvest sector and how they impact on the remainder of the fishing industry.

5.7 Implications for management

Alternative options may be difficult to allocate especially as many NMP fishers depend solely on fishing as a livelihood and fishers maybe reluctant to change to a new occupation after fishing for so many years. Contrary to this, a study by Pomeroy and Goetze, (2003) indicated that the introduction of alternative options had been successful in a community dependent on fisheries. The Glover's Reef Marine Reserve has

introduced various economic alternatives in areas of sportfishing and tourism. However, due to differences in culture it may not be as easy to persuade fishers into these new occupations. Conversely, the 2003 report indicated that one difficulty with introducing alternative livelihood activities was that the skills and confidence needed for organizing the activities should be compatible with the independent minded nature of the fishers. There is some scope for co-management of the NMP and fisheries. According to Tokrisna *et al.*, (1997), co-management is feasible in societies where fishing is the only source of income. Fishers will recognise the value of fishery resources and are willing to participate in sustaining their resource. According to a report by International Center for Living Aquatic Resources Management (ICLARM) *et al.*, (1997) the sense of ownership caused a change in behaviour and attitudes of fishers in San Salvador towards resource management. Additionally, even though communities were responsible for managing the resource, conflicts with violators needed support from government. Self-enforcement by fishers throughout the NMP communities may also require support from the government to be effective. This could be useful for those fishers who are fearful of confronting other fishers practising illegal fishing practices. Although NMP fishers may have the local knowledge to assist management, they do not have scientific knowledge. However, fishers can be trained to use this information and eventually management power can be devolved to the fishers and other key stakeholders. The devolution of power has been successful in many cases such as in Canada, Norway and the Philippines (Pomeroy and Berkes, 1997).

5.8 Conclusion and Recommendations

In this paper a table of contents for the Fisheries Management Plan for the Negril Marine Park was developed whereby all key fisheries stakeholders (Jamaica Fisheries Division, NCRPS manager, affiliates of CREP and NEPT) gave their input and agreed on the outline of the FMP. The FMP would encompass the national policy and legal framework, a description of the NMP fisheries, fisheries management arrangement, the fisheries management context for the NMP and management and implementation plans for specific fisheries and aquaculture. The paper showed how information for the contents of the FMP could be generated through various participative methods and how this information can be applied and made useful for the development of the NMP FMP. In addition, the paper showed how the information generated can be used by park managers to help manage the fisheries in the NMP. It distinctly explained the need for alternative options (jobs, fish resources and fishing practices) to ensure sustainable livelihoods and the various management interventions (reduce in fishing effort, prohibit destructive fishing practices, implementation of precautionary measures and education) which should be devised. The paper also emphasised the need for shared governance of the NMP and fisheries, which could be achieved through increased communication and participation of stakeholders. Co-management may not currently appear to be a realistic goal; however it is possible if participatory strategies are implemented such as communication, participation and empowerment of stakeholders.

The formulation of the NMP FMP is an adequate management intervention for the protection of fisheries and the livelihoods of the fishing communities. However there are several setbacks to the implementation of the NMP FMP. The lack of resources (human resources, technical capacity and funds) available to the Fisheries Division and NCRPS

especially regarding enforcement could cause deficiencies in management. The bureaucratic impediments involved in establishing regulations can be quite lengthy and tedious. Furthermore, it would be complicated to co-manage a large marine park under all these limitations.

The set of recommendations formulated below were proposed phases in the development of the NMP FMP. These recommendations were meant to assist fisheries management and facilitate the development of a FMP. The focus was on improving communication, eliciting participation between park managers and stakeholders and developing new strategies for sustainable and alternative livelihoods.

Table 5.1: Recommended activities to facilitate for the development of the NMP FMP

Activities	Procedure
Development of outreach programmes	-Programmes could raise awareness about the park, the need to protect fisheries and the importance of public participation. -Programmes should provide the public with clarification and education on co-management and the benefits they will obtain from this type of management arrangement. And building communities' capacity.
Enhance communication and ensure transparency	-Communication should be enhanced through regular community meetings in the fishing villages/beaches, educational programmes. -Communication mechanisms ought to be designed to cater to the literate and illiterate members of society.
Encourage stakeholder group development and participation	-Stakeholders (fishers, charter boat fishers, restaurant owners) should develop organizations to represent their groupings. -The organization would groups to collectively express their concerns and ideas to the government. It would also adequately allow participation between the government and fisheries stakeholders.
Establish co-management arrangements with a small community	-Co-management should be initiated on a small-scale with a receptive community willing to help manage the park and has demonstrated their ability to manage the park (e.g. Orange Bay). -Tangible benefits such as an increase in fish catch, improvement of livelihoods should be recognized before co-management can be extended to other communities. Other fishers may be more willing to participate after recognising the benefits of partnerships with government and park managers.

Develop a NMP fisheries multi-agency body	-An empowered group comprising of government, stakeholder groups and representatives from the surrounding fishing settlements should be delegated the authoritative unit. -Unlike the NCRPS, their focus would mainly be on fisheries management and developing fisheries regulations and dealing with conflicts.
Facilitate community development programmes for alternative livelihoods	-Community development programmes should be developed to train fishers for new job opportunities such as farming, tourism, alternative types of fishing or aquaculture/mariculture. These maritime jobs are more consistent with fishers' culture and knowledge base. -Loans or other forms of sponsorship could be provided by the government support their business. Subsidies could also be provided. -Fishers should develop business partnerships with each other in alternative jobs so they both benefit through shared returns.

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7. APPENDICES

7.1 Appendix 1: Individual & Household Survey for NMP by NCRPS

This survey is being done by the non-governmental organization that manages the Negril Marine Park so as to improve how the area is managed. Any information you give cannot be traced back to you. You will not be personally identified in any reports. So that you know what is going on, you will be invited to a meeting where the information from the whole survey will be presented. After a few years you may be asked questions again to see if things have changed.

Date yyyy – mm – dd Settlement

Record questionnaire number, settlement, respondent identity and address on separate sheet

Write DK = do not know and NR = no response as appropriate by the question where necessary

---

This survey asks the head of the household about his or her opinions, and about other people in the household. I would like to speak to the head of the household or the person closest to head.

1. What is your relationship to the head of the household?

[ ] head of household
[ ] wife / husband of head
[ ] common law partner of head
[ ] child of head / head's spouse / head's partner
[ ] parent of head / head's spouse / head's partner
[ ] brother / sister of head / head's spouse / head's partner
[ ] other relative of head / head's spouse / head's partner
[ ] other (explain) __

The Negril Marine Park stretches along the coast from the mouth of the New Savannah River, by Broughton, in the south to Davis Cove in the north … and out to sea for two miles from the coast. This is what it looks like on a map … and this is where we are now. Discuss if necessary.

[SHOW MAP, KEEP NEARBY TO REFER TO, TELL PERSON THEY CAN KEEP IT AFTERWARDS]

2. Have you heard about the Negril Marine Park before now?

[ ] yes … In about what year did you first hear of the NMP? _____
[ ] no

The Negril Coral Reef Preservation Society, or NCRPS for short, is the non-governmental organization responsible for managing the Negril Marine Park along with the government.

3. Have you heard about the Negril Coral Reef Preservation Society, or NCRPS, before now?

[ ] yes … In about what year did you first hear of the NCRPS? _____
[ ] no

In order to better manage the NMP the NCRPS needs to know how people use the area now.
We would like to know how you and others in your household, that includes all of the people who live in this house, use the Negril Marine Park and its coastline for both work and pleasure.

4. What activities do you and others in your household do in the Negril Marine Park and along its coast for work or fun?

5. Can you describe this activity in a bit more detail?

6. Does this activity typically generate income, or not?

7. Where along the area of the Negril Marine Park does the activity mostly take place?

Q4	Q5	Q6	Q7
Activity done in NMP e.g. fishing, tourism	Specifics of activity e.g. snapper, diving	Income from it Put Yes or No	Location of activity e.g. Orange Bay, whole area
a.			
b.			
c.			
d.			
e.			

8. What, in your own opinion, should be the main purpose of the Negril Marine Park?

9. Thinking back from when you first knew of it, has the Negril Marine Park been beneficial?

[ ] Yes

→ How?

[ ] No

→ Why?

10. The marine resources of the area include the beaches, seagrass and mangroves, reefs and fisheries. How would you generally describe the condition of each of these marine resources based on the locations in the NMP that you are familiar with (tick choice, write DK or NR).
    a. ten years ago (1995)
    b. five years ago (2000)
    c. today (2005)?

	10 (a) Beaches	Ten years ago — 1995	Five years ago — 2000	Today — 2005
5	very good			
4	good			
3	neither good nor bad			
2	bad			
1	very bad			

	10 (b) Seagrass beds and mangroves	Ten years ago — 1995	Five years ago — 2000	Today — 2005
5	very good			
4	good			
3	neither good nor bad			
2	bad			

1	very bad			

	10 (c) Coral reefs and shallow reef fisheries	Ten years ago — 1995	Five years ago — 2000	Today — 2005
5	very good			
4	good			
3	neither good nor bad			
2	bad			
1	very bad			

	10 (d) Offshore, deep water, fisheries	Ten years ago — 1995	Five years ago — 2000	Today — 2005
5	very good			
4	good			
3	neither good nor bad			
2	bad			
1	very bad			

11. Thinking about these marine resources of the park (beaches, seagrass, mangroves, reefs, fisheries), what are the three main problems that you have observed with these resources?

12. What are the three main solutions that you recommend to solve the three problems?

Q11 Nature of problem	Q12 Recommended solution
1	
2	
3	

13. What, if anything, have you seen done that has really improved the NMP in any big way?

---

14. Whose responsibility is it to solve problems within the Marine Park ? (tick all that apply)

[ ] Government agencies e.g. NEPA, Fisheries Division
[ ] Negril Coral Reef Preservation Society (NCRPS)
[ ] Negril Area Environmental Protection Trust (NEPT)
[ ] Negril-Green Island Area Local Planning Authority (NGIALPA)
[ ] Parish Development Councils (Hanover and Westmoreland)
[ ] Fishermen, watersports operators etc. who work inside the NMP
[ ] Businesses like hotels, tour operators, around the marine park
[ ] Other people who live or farm in the area around the marine park
[ ] Other (not listed) Identify_____

15. Which of the above would you say should have the most responsibility for taking decisions about managing the marine park? (tick only one)

[ ] Government agencies e.g. NEPA, Fisheries Division
[ ] Negril Coral Reef Preservation Society (NCRPS)
[ ] Negril Area Environmental Protection Trust (NEPT)
[ ] Negril-Green Island Area Local Planning Authority (NGIALPA)
[ ] Parish Development Councils (Hanover and Westmoreland)
[ ] Fishermen, watersports operators etc. who work inside the NMP
[ ] Businesses like hotels, tour operators, around the marine park
[ ] Other people who live or farm in the area around the marine park
[ ] Other (not listed) Identify_____

16. How much influence do you think that you can have on how the NMP is managed?

[ ] Very much influence
[ ] Much influence
[ ] Some influence
[ ] Little influence
[ ] No influence at all

17. Have you ever participated in any meeting, workshop or other event organized by NCRPS or any other agency to get your input into matters related to the Negril Marine Park?

[ ] Yes
→ Describe?

[ ] No
→ Reason?

18. What would cause you to contribute to decisions concerning how the NMP is managed?

19. If there was no Negril Marine Park tomorrow, just the regular sea coast without a park, would it make a difference to you?

[ ] Yes
→ How?

[ ] No
→ Why?

20. Various types of fishing and tourism are two of the main uses of the Negril Marine Park. Do you think that fishing and tourism can thrive well together in the NMP to provide livelihoods?

[ ] Yes
→ How?

[ ] No
→ Why?

21. What do you think about the amounts of fishing and tourism that you see in the whole NMP?

	Q21	Amount of fishing	Amount of tourism
1	Way too much		
2	Too much		
3	Just right		
4	Too little		
5	Way too little		

22. Do you think that fishermen of various ages, types of fishing etc. can work together among themselves to solve fishery problems in the marine park?

[ ] Yes
→ How?

[ ] No
→ Why?

23. About how many times a week do you normally have a meal that includes seafood (fish, lobster, conch)? Times per week ____

24. Of the seafood that you eat over the course of a month, in what order would you rank where that seafood came from according to the amount of it that you have eaten? (insert 1, 2, 3)

[ ] From within the Negril Marine Park
[ ] From Jamaica, but outside of the Negril Marine Park
[ ] From outside of Jamaica, imported seafood

25. Based on these three sources of the seafood that you eat, where do you mostly buy each?

Source of seafood consumed	Where seafood is mostly purchased
From within the Negril Marine Park	
From Jamaica, but outside of the NMP	
From outside of Jamaica, imported seafood	

In order to relate your information to the 2001 national census and other studies that describe the Negril area we need to get some basic information on the household in which you live.

26. Sex of respondent (observed)

[ ] Male [ ] Female

27. What is your date of birth? _____
yyyy – mm – dd

28. How old were you on your last birthday? _____ years old

29. Which is the last type of school that you attended?

[ ] 1. none
[ ] 2. primary (all-age to 10y)
[ ] 3. secondary (past 11y)
[ ] 4. post-secondary / technical
[ ] 5. university
[ ] 6. Other _____

30. What is your religion, if any, or the denomination that you belong to?

[ ] 1. Anglican
[ ] 2. Jehovah's Witness
[ ] 3. Moravian
[ ] 4. Rastafarian
[ ] 5. Seventh Day Adventist
[ ] 6. Baptist
[ ] 7. Methodist
[ ] 8. Pentecostal
[ ] 9. Roman Catholic
[ ] 10 Other _____

31. What job or type of work is your primary or main source of income?

_____

32. What job or type of work is your second most important source of income?

---

33. How many other people, including children, live in this household (under this roof)?
___people

34. For each person >16 in the household, please answer similar questions to those I just asked

Question # →	Q26	Q28	Q29	Q30	Q31	Q32
Relationship of household member to respondent	Sex M / F	Age ##	Educate Use code #	Religion Use code #	Primary income source (write out)	Secondary income source (write out)

35. What are the 3 most important occupations, or types of work, of household members >16 in order of the amount of income that they bring in to the household over the year?

1st.

2nd

3rd

---

36. What else, if anything, brings income into the household, including from overseas sources?

---

37. Are there additional sources of household income that you would rather not describe?
[ ] Yes
[ ] No

38. What other income-generating activities do members of the household want to get involved in, but have not yet got involved in the particular type of work?

39. For each alternative income-generating activity, what is the main reason why it has not been done yet by household members?

Q38 Alternative income-generating activity	Q39 Reason for not pursuing it yet

40. Are you or others in the household currently being trained for any specific new occupation?

[ ] Yes
→ What?

[ ] No
→ Why?

41. How long has the household been located in this settlement?
Years ago_____ Year date_____

42. If, over the past 5 years, members >16 have joined the household from somewhere else, or left the household to go and live somewhere else,
   a. where have they come from?
   b. where have they gone to?

Q42 a. Where members joined from	Q42 b. Where members left to go to

43. What organizations, of any kind, do people in this household belong to?

Self or relationship of household member to respondent	Kind of organization e.g. fishing cooperative, church group, sport team	Name of organization (if known)

44. Which is the best way to get information to you about the Negril Marine Park?

[ ] Television [ ] Radio
[ ] School [ ] Workplace
[ ] Flyers/posters [ ] Newspapers
[ ] Area liming spot [ ] Organization (Name)
_____
[ ] Other

(Please describe)

_____

45. If you wanted to get information about the Negril Marine Park to the attention of the NCRPS management of the park, what would you do to ensure it is successfully communicated?

---

46. To compare your area to others around the Negril Marine Park we ask you about property
    a. Material(s) of outer walls [ ] wood [ ] concrete [ ] metal
    b. Material(s) of roof [ ] wood [ ] metal [ ] tile
    c. Material(s) of floors [ ] wood [ ] concrete [ ] tile
    d. Does household own [ ] land [ ] house [ ] boat [ ] car
    [ ] TV [ ] refrigerator [ ] stove [ ] stereo
    e. Main source of lighting [ ] electricity [ ] kerosene [ ] other
    f. Main source of water [ ] piped into house [ ] piped into yard [ ] standpipe

47. The ability to make choices is often determined by household income. What do you think is the household's weekly, monthly or annual income from everyone's sources of income?

Weekly income	Monthly income	Annual income
[ ] less than 1,000	[ ] less than 3,500	[ ] less than 40,000
[ ] 1,000 – 1,499	[ ] 3,500 – 5,999	[ ] 40,000 – 79,999
[ ] 1,500 – 5,999	[ ] 6,000 – 24,999	[ ] 80,000 – 299,999
[ ] 6,000 – 9,999	[ ] 25,000 – 39,999	[ ] 300,000 – 499,999
[ ] 10,000 – 19,999	[ ] 40,000 – 79,999	[ ] 500,000 – 999,999
[ ] 20,000 – 29,999	[ ] 80,000 – 129,999	[ ] 1,000,000 – 1,499,999
[ ] 30,000 – 59,999	[ ] 130,000 and over	[ ] 1.5 million – 2,999,999
[ ] 60,000 and over		[ ] 3 million and over

48. Is there anything else that you would like to say about the NMP that I have not asked about?

---

49. Is there anything you would like to know about the NMP? I will pass along your questions.

_____

_____

50. Would you attend the meeting where the results of the survey will be presented? [ ] Y [ ] N

On behalf of the NCRPS — Thanks very much indeed for your assistance. Please keep the map

7.2 Appendix 2: Results from socio-economic monitoring survey

These are the additional data that were produced from the socio-economic survey and were not considered relevant to fisheries management based on the criteria.

- Demographics

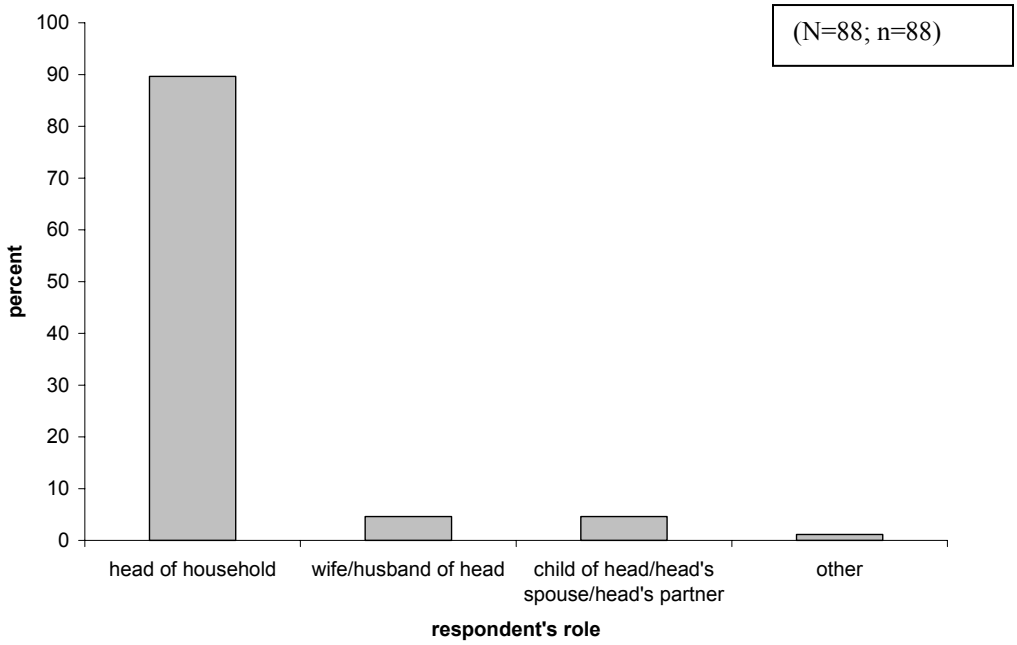

Figure 7.1: Respondent's role in household

- Local perception on the park's management and its benefits

Of the respondents, 90.9% heard about the NMP while only 73.9% heard about the NCRPS.

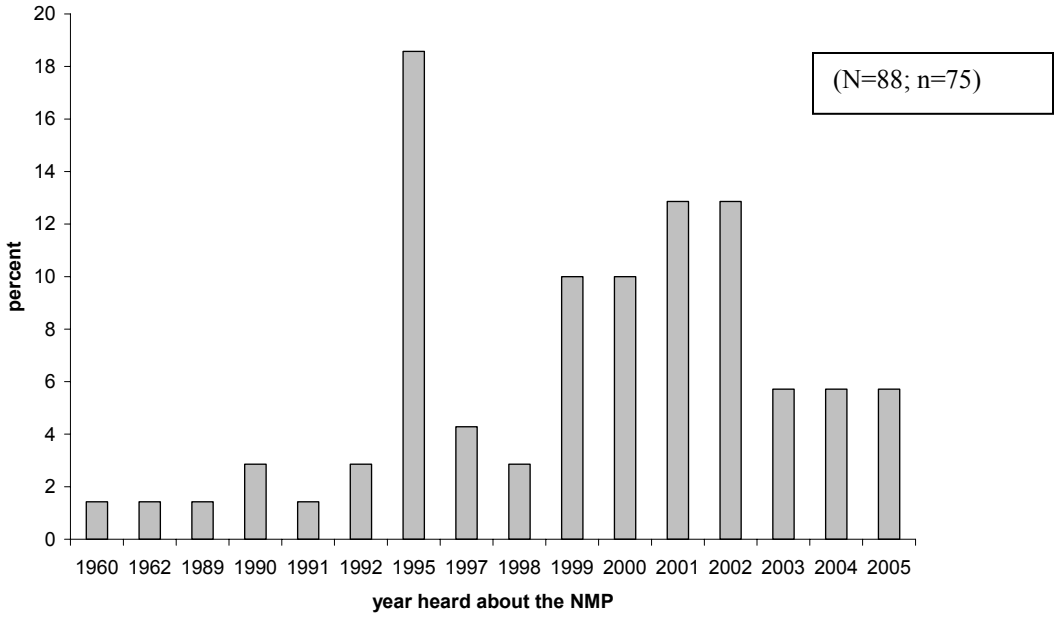

Figure 7.2: Year heard about Negril Marine Park

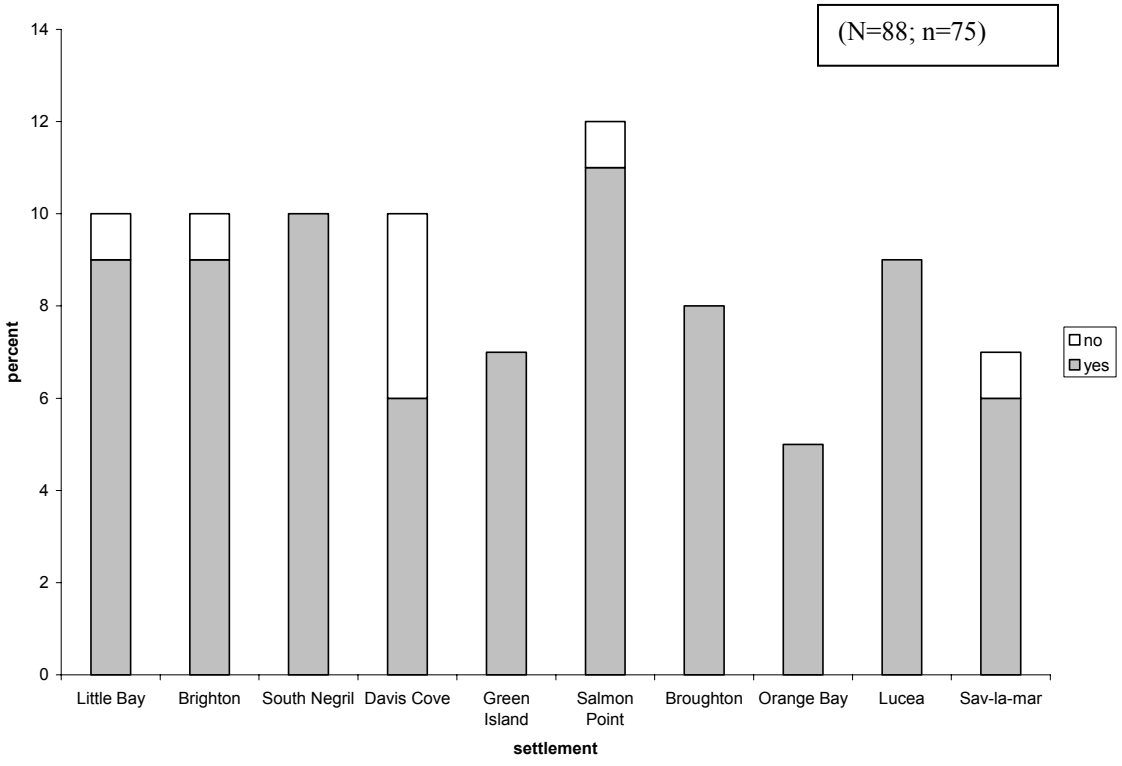

Figure 7.3: The year heard about NMP throughout settlements

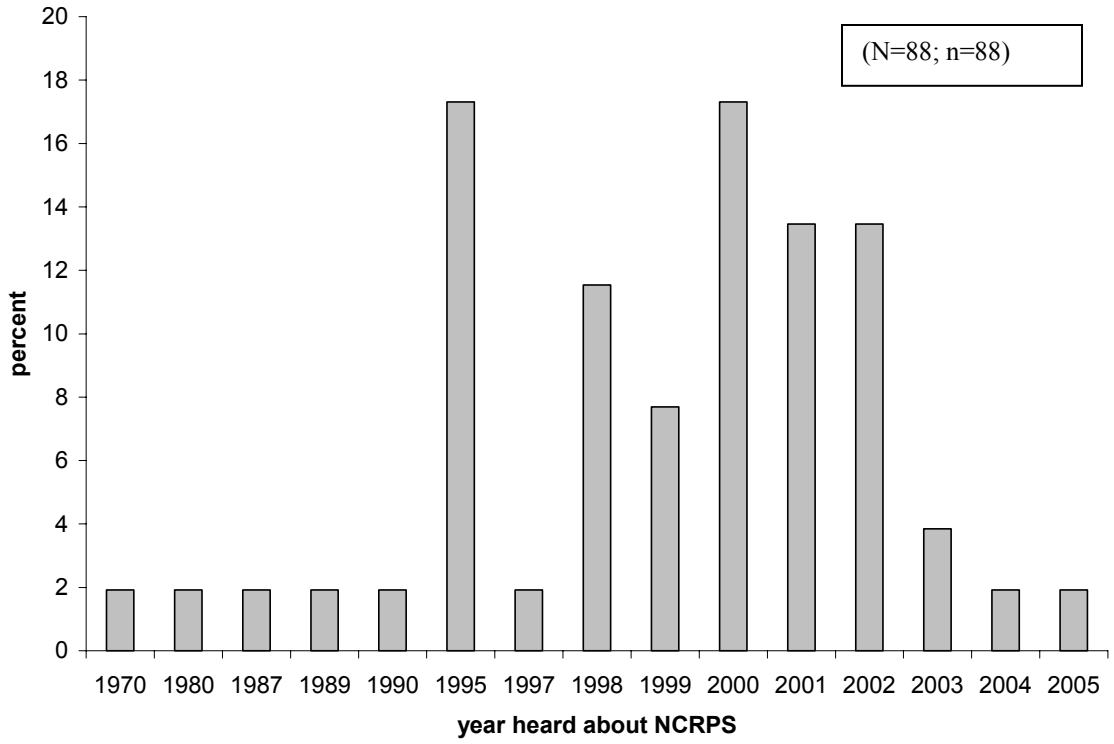

Figure 7.4: The year respondents heard about NCRPS

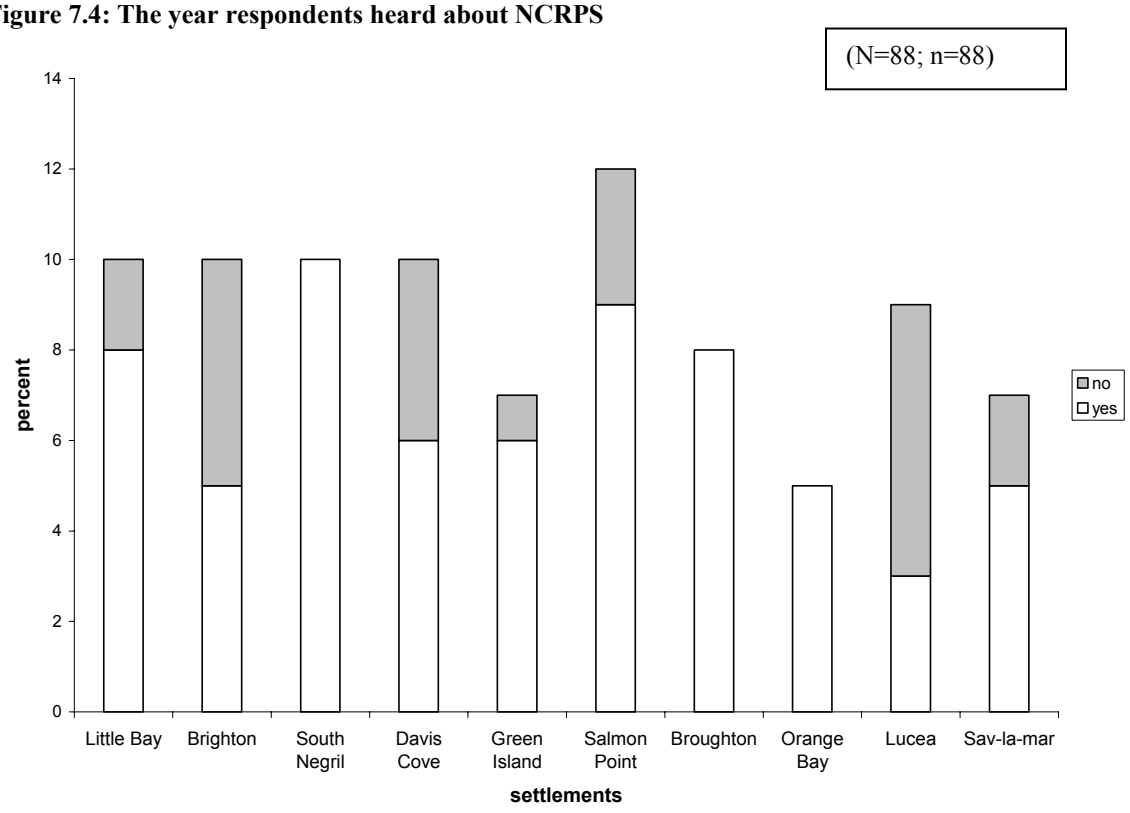

Figure 7.5: The year heard about NCRPS throughout the settlements

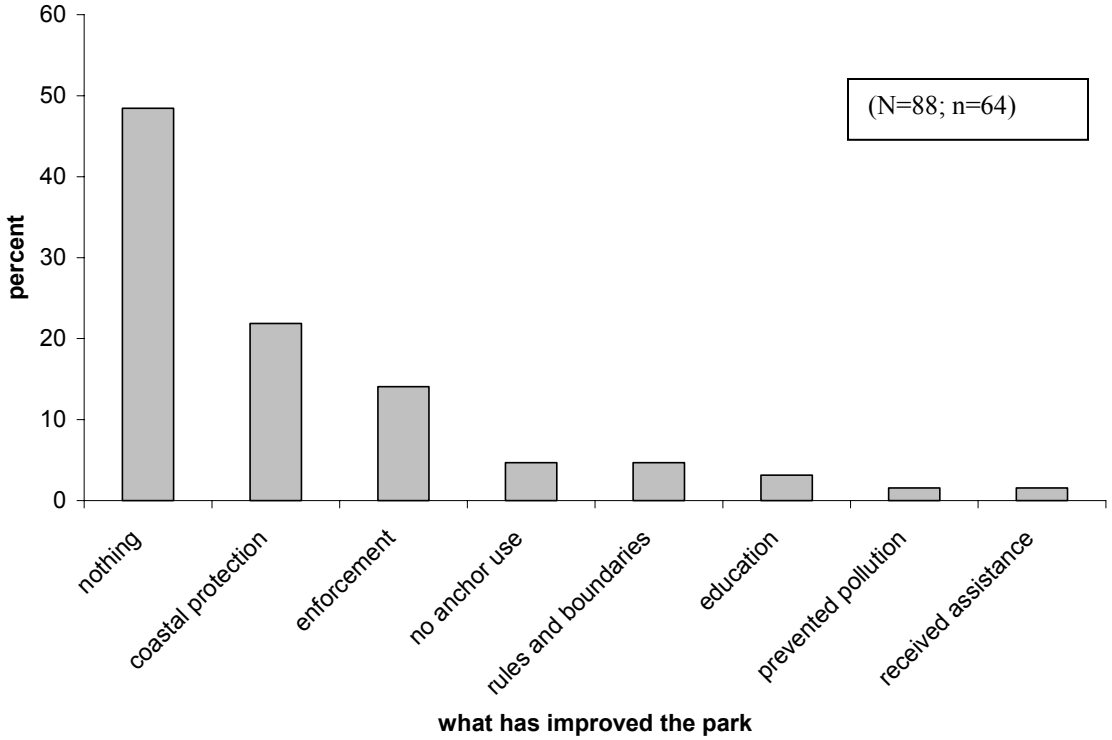

Figure 7.6: Respondent's views on what has improved the park

Of the respondents 73.6% believed that having the park made a difference.

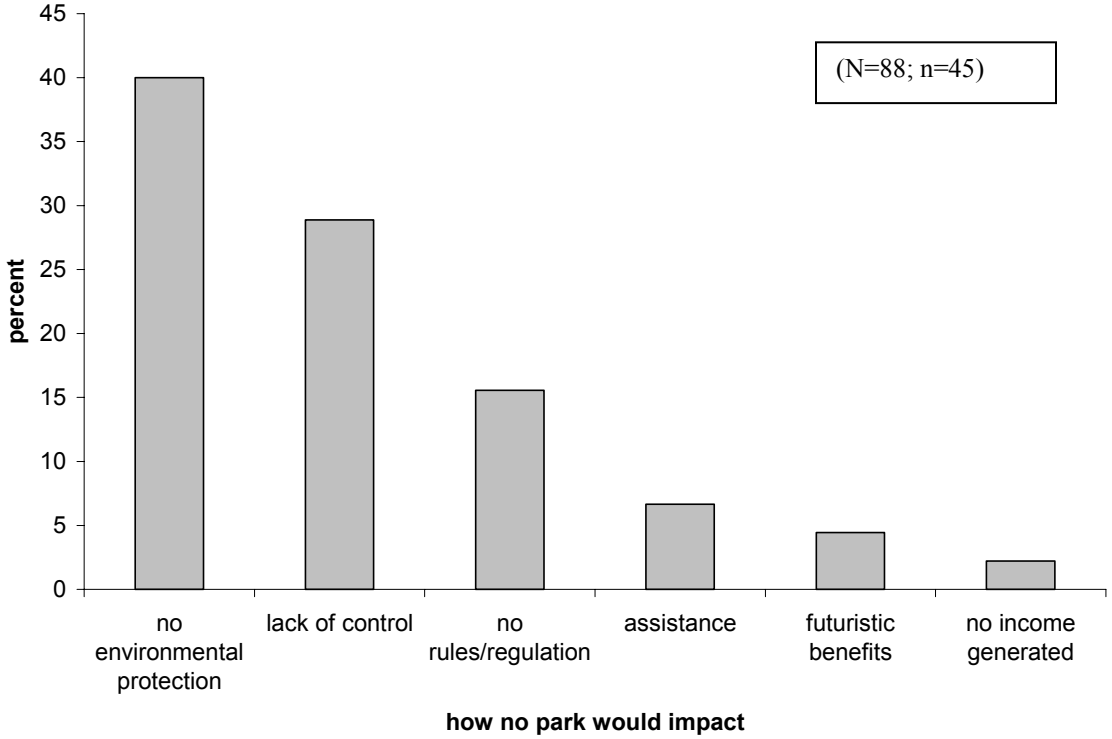

Figure 7.7: Reasons why having no park would have an impact

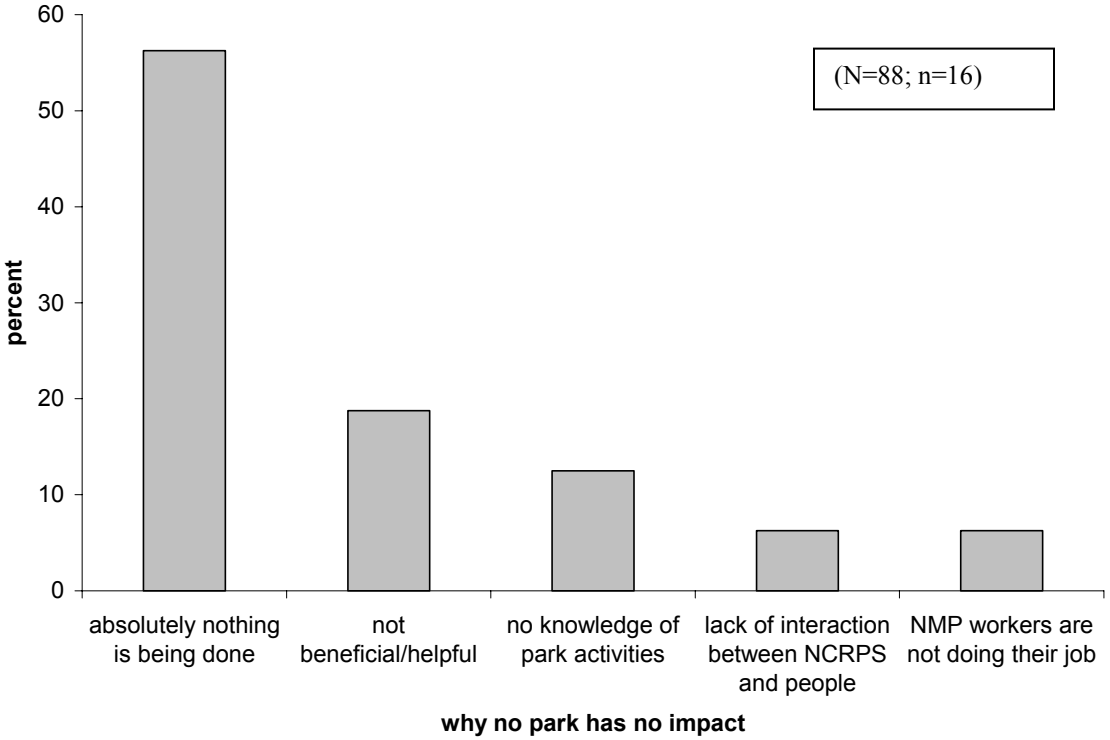

Figure 7.8: Reasons why not having the park would not have an impact

7.3 Appendix 3: Census of Boats in the Jamaican Fishing Industry

Appendix 2

CENSUS OF BOATS IN THE JAMAICAN FISHING INDUSTRY

FC - 002

Parish code		Constituency Code		Enumeration District			Questionnaire No.			-	

Interviewer: ___/___/___/___/ Date: ___/___/___ Interview Site _____

INTERVIEWER INSTRUCTIONS

If a Spear fisherman (and fishers fishing without a boat), Do Section 1 and Sections 6 to 9

SECTION 1: INFORMATION ON RESPONDENT

1.1 Name of Respondent: _____

1.2 Nickname of Respondent: _____

1.3 What Is your role in the fishery? [1] Captain [2] Owner *Go to Section 2* [3] Owner/Captain *Go to Section 2*
[4] crew [5] Spear fisherman Other (specify)_____

1.4 Sex: [1] Male [2] Female 1.5 Date of Birth: _____

1.6 Home Address: _____

1.7 Home Telephone: _____

1.8 Are you a registered fisher? [1] Yes [2] No Fishers Licence Number: _____

1.9 How long have you been fishing? _____ Period [ ] 1=days 2=weeks 3=months 4=year

1.10 Which is the last school you attended? [1] None [2] Primary [3] New/Junior Secondary
[4] Traditional/Technical/Comprehensive High [5] College/University

SECTION 2: INFORMATION ON VESSEL OWNER AND USERS

2.1 Name of Vessel Owner: _____

A2 - 1

2.2 Nickname of Vessel Owner: _____

2.3 Sex: [1] Male [2] Female 2.4 Date of Birth: _____

2.5 Home Address: _____

2.6 Home Telephone: _____

2.7 Are you a registered fisher? [1] Yes [2] No Fishers License Number: _____

2.8 How longhave you been fishing? _____ Period [ ] 1=days 2=weeks 3=months 4=year

2.9 Which is the last school you attended? [1] None [2] Primary [3] New/Junior Secondary
[4] Traditional/Technical/Comprehensive High [5] College/University

2.10 How many vessels do you own? [ ]]

2.11 Are any of your boats [1]rented [2]leased [3]lend to any other users than present crew? [4]No
If no, skip to Section 3

2.12 How many groups of users? [ ]]

2.13 Please give me the names/nicknames and fishing beach of the groups of users:

Names of Group 1	Nicknames	Fishing Beach	Licence Number	Role

Names of Group 2	Nicknames	Fishing Beach	Licence Number	Role

SECTION 3: INFORMATION ON VESSEL

3.1 Name of Vessel: _____

3.2 Is this vessel registered? [1] Yes [2] No Vessel Registration Number: _____

3.3 Which beach is the boat registered at? _____[ ]] Parish _____[ ]]

3.4 What is the size of this boat: Length: [ ]] feet Width: [ ]] feet Depth: [ ]] feet

3.5 What is this boat made of? [1] Dug out [2] Plywood [3] Steel
[4] Fibreglass [Other] (specify)_____

3.6 Which colour(s) is this boat painted? outside_____ inside_____ deck_____

3.7 How is your boat powered?
(a) Non-mechanized: [1] Oars [2] Sails [3] Other *(Skip to 2.7)*
(b) Mechanized: [4] Outboard [5] Inboard [6] Other (specify) _____

3.8 Please list the brand and horsepower of the engines are used on this boat:

Engine	Brand Name	Horsepower
1		
2		
3		
4		

3.9 When was this boat last used for fishing? [ ] this week/month [ ] last month *Go to 3.11*
[ ] earlier this year [ ] long time

3.10 Why is the boat not in use? _____

_____

(TERMINATE INTERVIEW)

3.11 Where do you moor/parked/anchor the boat? _____[ ]] Parish _____[ ]]

3.12 Which beach do you sell the catch? _____[ ]] Parish _____[ ]]

SECTION 4: INFORMATION ON THE CREW

4.1 What is the regular size of your crew? [ ]]

4.2 How many additional workers do you have on the vessel? [ ]]

4.3 How often do you change crew? Times [ ]] Period [ ]]
Period class: 1 = day 2 = week 3 = fortnight 4 = month 5= year 6 = seldom 7 = never

4.4 Please give me the name of the captain of your vessel and his license number:

[Self] [Other] _____ Fishers Licence Number: _____

4.5 Please give me the names/nicknames and fishing beach of your crew:

Name	Nickname	Fishing Beach	Licence Number	Role

SECTION 5: FISHING OPERATIONS

5.1 What operations are this boat involved in? ***Select all that apply***
[1] Small-Scale fishing [2] large Scale fishing [3] Fish for fun [4] Fish for family [5] Buy fish to sell

[Other] (specify): _____

5.2 How is this boat primarily used? [1] Carrier [2] Packer [3] Big Head [4] Fishing [5] Charter [6] Taxi

[Other] (specify): _____

5.3 Do you fish within Jamaican waters (shelves, Pedro and Morant Banks)? [1] Yes [2] No

5.4 Do you fish outside Jamaican territorial waters (Baja Nuevo, Serrano, Alice Shoal)? [1] Yes [2] No

5.5 Exactly where do you fish? Primary _____ [ ]]]]

Secondary _____ [ ]]]]

SECTION 6: FISHING PRACTICES

6.1 Do you normally fish on weekends? [1] Yes [2] No On holidays? [1] Yes [2] No

6.2 What time of day do you usually land your catch? _____ [ ]]]]

Why? _____ [ ]]]]

6.3 How far is your main fishing ground from your fishing beach?

Distance [ ]]] Measure [ ] *Miles = 1 Km = 2 Other (Specify)* _____

6.4 What is the average amount of gas used per trip? Amount [ ]]] Measure [ ] *gallon = 1 litre = 2*

6.5 Please describe the types of trips the vessel make:

Type of Trip	Duration	Purpose	Trips per Week	Gear Type	For Purchasers Only		
					Trips/ Month	# boats bought from at Cays	Average wt fish/ trip

Type Codes
1 = Day
2 = Night
3 = Day/Night

Duration Codes
1 = 2 trips/dy
2 = 1 trip/day
3 = 2-3days/trip
4 = 4+ days/trip

Purpose Codes
1 = fishing only
2 = purchase fish
3 = purchase & fishing
4 = taxi
Other (specify)
_____

Gear Codes
1 = nets
2 = lines
3 = dive
4 = pot
Other (specify) _____

6.6 How long has the boat been involved in present activities? _____ Period [ ] *1=days 2=weeks 3=months 4=year*

6.7 In what container do you store fish while at sea? ***N.B. Please specify units.***

	Type	Number of	Storage Capacity (lbs/kg fish)
1	Basket		
2	Built-in Ice Box		
3	Freezer		
4	Portable Igloo		
5	Bottom of Boat	1	
6			

6.8 How is the fish kept from spoiling while you are at sea? **(*Tick all that apply*)**

[1] Cover with banana leaf [2] Cover with wet crocus bag [3] Ice [4] Gutted

Other (specify) _____ [ ]

SECTION 7: GEAR SPECIFICATION

IF PURCHASER ONLY, go to question 8.1

7.1 What is the main fish type this vessel is targeting? _____ [ ]]]]

7.2 What is the main gear type this vessel uses? _____ [ ]]]]

7.3 Could you give me an idea of all the gear used on this vessel and how it is used.

NETS

Type	# of Nets	Mesh Size	# of shoots per trip	Weight of the net(s) *Wt. Code 1=Kg 2=lb*		Hours spent fishing per trip	Average catch per trip in past 12 months	Main fishing ground
China								
Beach Seine								
Sprat Net								
Trammel								
Cast Net								
Lobster Net								
Shove Net								
Trawl Net								
Bait Net								

LINES

Type	# lines used per trip	# of hooks per line	Line test	Hours spent fishing per trip	Average catch per trip in past 12 months	Main fishing ground
Troll Line						
Hand Line						
Palanca						
Drop Line						
Rod&Reel						
Long Line						

DIVING

Type	Spear Gun	Hawaiian Sling	Hand, Grab	No. of Dives per trip	No of Divers per trip	Time under water per trip	Average catch per trip in past 12 months	Main fishing ground
SCUBA								
Hooka								
Free Lung								

POTS

Type	Z-Traps	Jack Pots	Crab Traps		
Average Size					
# of pots soaking					
# of pots on land					
# of pots being built					
Mesh size					
Soak Time (days)					
Average Catch/Trip					
Life Expectancy					
Main fishing ground					

SECTION 8: CATCH CHARACTERISTICS

8.1 Please indicate the types of fish the vessel lands (or purchase) on a typical trip.

Type of Fish	Code		% of catch	Boat price per lb

SEASONALITY

8.2 Which months are high/low season, bad/good weather?
[1] low season [2] high season [3] bad weather [4] good weather

Type of fish		J	F	M	A	M	J	J	A	S	O	N	D
	S												
	W												
	S												
	W												
	S												
	W												
	S												
	W												
	S												
	W												

S = Season W = Weather

SECTION 9: MARKETING ARRANGEMENTS

9.1 What percentage of your catch/stock is sold to:

List fish types at top on horizontal axis.

(Note: Catch must add up to 100%)	Lobster						
Retained by Fisher							
Given to Family and Friends							
Sold to Carrier Boats							
Sold to Wholesale Vendors							
Sold to Retail Vendors							
Sold to Hotels & Restaurants							
Sold to Processing Plants							
Sold to Consumer							

COMMENTS: _____

7.4 Appendix 4: Interview guide for charter boat fishers

1) How many fishing trips per day do you make?
2) How long are the fishing trips?
3) What distance is travelled during the trips?
4) What types of species are caught (and their seasonality)?
5) What do you do with the fish caught?
6) What are the usually catch rates?
7) What type of fishing gear is used?
8) Do you have any marketing strategy for your business?

7.5 Appendix 5: Interview guide for restaurant owners

1) What is the demand for fish?
2) Who are your suppliers of fish? Local or import?
3) Where do your suppliers get their fish from?
4) What type of species fish do you purchase?
5) How much fish do you usually purchase?
6) Is fish sold to consumers all year round or is it seasonal?
7) Are you aware of closed seasons for conch and lobster?