CLIMATE RESILIENT EASTERN CARIBBEAN
MARINE MANAGED AREAS NETWORK (ECMMAN) PROJECT

Socio-Economic Monitoring at The Narrows, St. Kitts and Nevis

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Contents

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1 INTRODUCTION

1.1 Climate Resilient Eastern Caribbean Marine Managed Areas Network (ECMMAN) project

The *Climate Resilient Eastern Caribbean Marine Managed Areas Network (ECMMAN)* Project is a four-year (2013-2017), multi-million dollar project funded by the International Climate Initiative (ICI) via The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) grant to The Nature Conservancy (TNC). Involving six beneficiary Organisation of Eastern Caribbean States (OECS) countries, the project is being implemented by The Nature Conservancy (TNC) in collaboration with a consortium of partners. The overall aim of the project is to improve fisheries and conserve and restore marine resources, while providing for sustainable job opportunities in coastal communities. To this end, the project will focus on:

1. Establishing new Marine Managed Areas (MMAs) and strengthening existing ones;
2. Supporting fisher organisations and providing support for new livelihood opportunities;
3. Improving access to data and information regarding management of marine resources; and
4. Instituting sustainable funding mechanisms to support marine management as part of the Caribbean Challenge Initiative (ECMMAN Project Fact Sheet; Media Release, Jan 2104).

This socio-economic assessment of The Narrows is integral to strengthening and informing management within the St. Kitts and Nevis Marine Management Area.

1.2 Socio-economic Monitoring for Coastal Management (SocMon)

Socio-economic Monitoring for Coastal Management (SocMon) is a global initiative being implemented at regional levels with the goal of establishing socio-economic coastal and marine monitoring programmes globally at the site level (Bunce et al. 2000; Bunce and Pomeroy 2003). This globally networked, regionally adapted, practical methodology of socio-economic monitoring works through regional and local partners to facilitate community-based socio-economic monitoring. The Centre for Resource Management and Environmental Studies (CERMES) at the University of the West Indies, Cave Hill Campus is the regional SocMon node for the Caribbean.

SocMon is aimed at helping coastal managers better understand and incorporate the socio-economic context of coastal resource use by various stakeholders into coastal management programs. This is essential for assessing, predicting and managing coastal resource use over time.

This current socio-economic assessment represents the second SocMon assessment initiated at The Narrows. SocMon was first implemented at The Narrows during the period 2008-2010 as part of the CERMES-implemented *Socio-economic Monitoring by Caribbean Fisheries Authorities (Fisheries SocMon)* project (Arthurton and McDonald 2010). The goal of this first assessment – to collect socio-economic data to inform marine conservation and development decision-making – is similar to that of the current ECMMAN SocMon assessment - collect socio-economic and marine resource data to promote sustainable use of resources, management and education in the Narrows. This may allow some comparison of data between the assessments in the future. However it should be noted that the ECMMAN

SocMon assessment was not designed with repeat monitoring in mind. At the time of the initiation of the first SocMon assessment in 2008, The Narrows was only proposed to be a marine protected area (Arthurton and McDonald 2010). The Narrows was chosen specifically due to its importance to numerous management proposals for coastal and marine resources at the time. Nearly a decade on, The Narrows is still considered to be a critical marine area to St. Kitts and Nevis.

1.3 Situation overview

The Narrows is the name of the strait that separates the islands of St. Kitts and Nevis. The area is within the St. Kitts and Nevis Marine Management Area (MMA) which was legally declared on 18 August 2016. The MMA comprises a significant marine and coastal area encompassing a two mile radius around the entire island nation and includes 60% of its nearshore marine shelf. This MMA surpasses the commitment St. Kitts and Nevis made in 2012 by joining the Caribbean Challenge Initiative (http://dmrskn.com/the-narrows/#tab-id-1; https://www.nature.org/ourinitiatives/regions/caribbean/easterncaribbean/eastern-caribbean-st-kitts-and-nevis-marine-managed-area.xml).

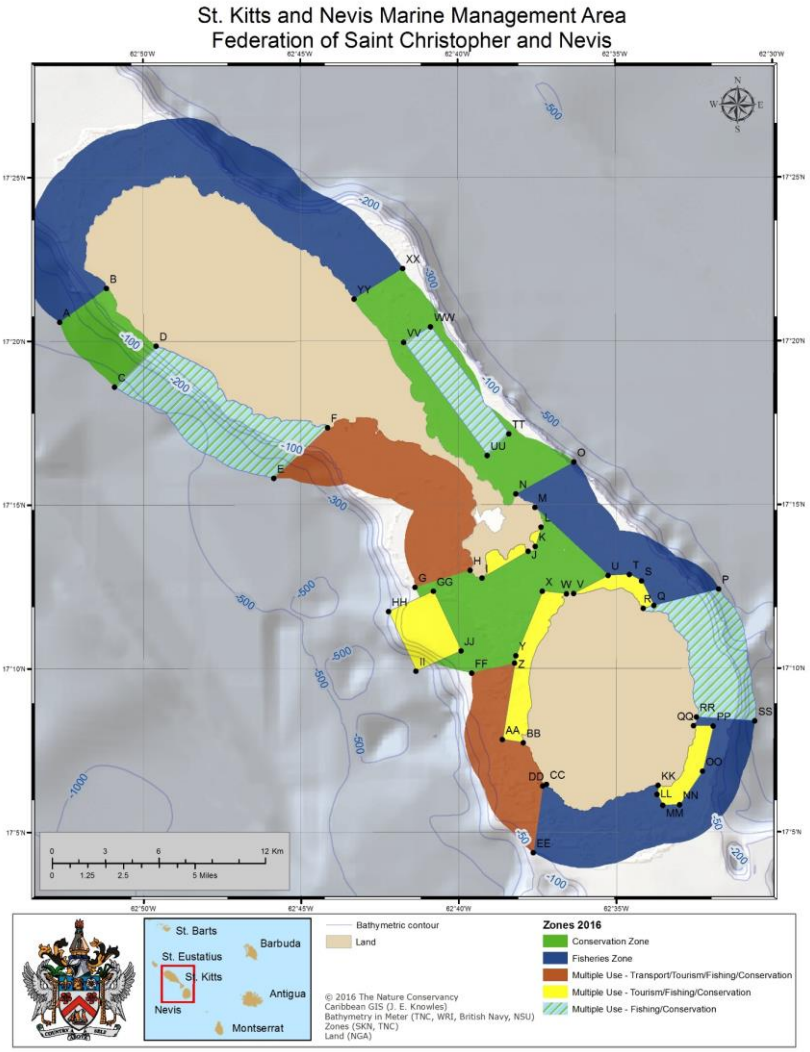

Figure 1 St. Kitts and Nevis Marine Management Area

The Narrows is the first multi-use protected area within the MMA composed of three zones – conservation, fisheries and recreation. It is significant from ecological, touristic and

commercial perspectives. Ecologically it contains the largest and most extensive seagrass bed in the area along with dense and diverse coral communities (including the Monkey Shoals reef) which make it a critical and rich fish nursery and breeding ground for commercial fish species such as the Caribbean Spiny Lobster and Queen Conch. It is therefore no surprise that fishing is one of the most important activities in the area (Arthurton and McDonald 2010). The rich biodiversity of the area also includes abundant reef and pelagic fish, turtles, algae, and resident and migratory birds. The coastal zone of the area comprises mangroves, salt ponds and important turtle nesting beaches for green, hawksbill and the rare leatherback sea turtles. The coastal zone also supports a range of historical and culturally significant sites (http://dmrskn.com/the-narrows/#tab-id-1; Pena 2017).

The Narrows is also of tourism significance with numerous activities including the cross-channel swim (a signature tourism event from to April to May), fishing tournaments and dive wrecks and sites.

Commercially, Newcastle and Jones are important fishing areas. Additionally, the current Seabridge ferry operation from Cades Bay to Majors Bay, is a significant mode of transportation between the two islands. Another use of The Narrows that is becoming increasingly popular is water taxiing.

The Narrows is not without its issues. A number of threats to the area have been identified, and these include unsustainable fishing, coastal development, the invasive lionfish and conflict between water taxi operators and fishers (Pena 2017).

The Department of Marine Resources is moving towards that of a sustainable MMA.

1.4 Goal and objectives for monitoring

The socio-economic monitoring goals and objectives chosen for this assessment were determined at the SocMon capacity building training workshop in November 2016 (see Pena 2017) and adapted and revised from those identified at the first ECMMAN *Eastern Caribbean Coral Reef Monitoring* workshop in September 2015 held in Nevis where The Narrows was used as the study site for demonstration of the practical application of the SocMon methodology. See Pena and Wood 2015.

Table 1 SocMon monitoring goal and objectives for The Narrows

Goal	Monitoring objectives
Collect socio-economic and marine resource data to promote sustainable use of resources, management and education in the Narrows	1. Promote awareness for biodiversity conservation and sustainable use of resources
	2. Determine trends in management effectiveness
	3. Determine trends in socio-economic benefits from resource use of coastal and marine ecosystems

1.5 Organization of report

This report is divided into four sections. Section 1 provides a description of the 'Climate Resilient Eastern Caribbean Marine Managed Areas Network (ECMMAN)' project, SocMon Caribbean, situation overview of the The Narrows and the goals and objectives for monitoring. Section 2 outlines the methods used for gathering the data. The results are provided in Section 3 and Section 4 comprises the discussions and conclusions. Recommendations for management are provided in Section 5.

2 METHODS

2.1 SocMon training

Capacity of the Department of Marine Resources (management authority), other government departments (Physical Planning, Natural Resources and Environment, and the Department of Fisheries) and on NGO (Nevis Historical Society) was built in SocMon via a three-day learning-by-doing SocMon methodology training workshop from 16-18 November 2016 and a two-day SocMon Spatial training from 28-29 November 2016. See Appendix 1 for the list of participants. The workshops followed the format of typical SocMon trainings. Participants were (re-)introduced to the Global Socio-economic Monitoring Initiative, the SocMon approach to participatory, community-based socio-economic monitoring, and the newly developed SocMon Spatial tool which integrates SocMon into participatory GIS (see www.socmon.org, Bunce *et al.* 2000; Bunce and Pomeroy 2003). The format for each workshop was similar to that detailed by Pena and Wood (2015) in Project Report No. 1 and as such will not be repeated here. See Appendix 2 for the workshop programme. The workshops emphasised practical field exercises and teamwork, seeking to simulate real monitoring programmes as much as possible. The Narrows was used as the demonstration study site. Maria Pena, Regional SocMon Coordinator, and Jehroum Wood, SocMon Assistant, facilitated the training workshops.

Overall seven persons received SocMon training. Four of these participants had been involved in the 2015 introductory training in Nevis. Each training workshop included at least one site visit to the respective project site for field scoping.

Critical to each workshop was the drafting of the SocMon site monitoring plan for The Narrows by the end of training. The plan, which formed the basis of the Narrows site monitoring programme was finalised by the SocMon team in 2017 subsequent to the completion of training (Appendix 3). Refer to Pena 2017 for more detailed information on the SocMon training workshops.

2.2 Preparatory activities

During the SocMon methodology training workshop, participants determined that the use of a survey instrument and key informant interviews would be the best methods to collect the required socio-economic data and information. These instruments were drafted and designed by the SocMon team and were reviewed by UWI-CERMES prior to administration. The survey instrument targeted fishers while the key informant interview guide focused on persons knowledgeable about the fishing and tourism sectors (Appendices 4 and 5). Separate interview guides for each sector were produced.

Based on the goal and objectives of the site monitoring plan, 16 SocMon Caribbean variables, and 4 newly designed SocMon variables were chosen for measurement and analysis (Table 2; Appendix 3 for Site Monitoring Plan). It should be noted that the variables chosen initially during the development of the site monitoring plan were refined to this final list on completion of the survey and key informant interview guide.

Due to unusually extended delays in initiating the SocMon assessment as a result of work commitments of SocMon team members, UWI-CERMES sub-contracted Romel Forde (CERMES graduate), to conduct data collection in St. Kitts and Nevis. Local support to Mr. Forde was provided by Winston Hobbs who was contracted by the ECMMAN project. Data collection occurred from 18-24 June in both St. Kitts and Nevis.

A number of measures were taken to prepare for the surveys and key informant interviews. The identification of the primary landing sites flanking The Narrows was obtained through

suggestions from the Department of Marine Resources (DMR). An estimate of the number of fishers utilising these landing sites was also provided, and this information was used to statistically calculate the number of surveys required for each. Mr. Hobson assisted in the compilation of a list with contact information and locations for various individuals that were identified as key informants. In addition, the required maps of the study area for the SocMon Spatial aspect of the data collection were prepared and laminated prior to fieldwork, along with the key informant interview guides and surveys. Data tables and a coding sheet, which were later used for data entry, were also developed prior to data collection.

Table 2 Variables chosen for monitoring

Variable	Variable name
S1/K5	Age
S2/K6	Gender
S4/K7	Education
S7/K12	Occupation
S9	Household income
S10/K14	Household activities/Activities
S11/K15	Household goods and services/Goods and services
S12/K16	Types of use/Household types of use
S16	Perceptions of resource conditions
S17	Perceived threats
S18	Awareness of rules and regulations
S19	Compliance
S21/K31	Participation in decision-making/Stakeholder participation
S24	Perceived coastal management solutions
S25	Perceived community problems
K19	Use patterns
[NEW]	Ecosystem/resource knowledge
[NEW]	MMA/MPA knowledge
[NEW]	Management priorities
[NEW]	Livelihood dependency

2.3 SocMon team

The final SocMon team was chosen from among the participants of the training workshops where roles and responsibilities were agreed upon. It should be noted however that member participation and roles changed during the implementation of the assessment (Appendix 3).

2.4 Key informants

Key informants were located based on the list developed during the preparation stage. The key informant guide was then used to conduct interviews with each key individual. Laminated maps of the study area and markers were provided to each key informant to allow them to highlight areas of significance to them and their livelihoods within The Narrows. A photograph of each map was taken and saved for later incorporation into a GIS for spatial data analysis. There were two key informant guides developed to target the fishing sector and tourism sector. However, due to time constraints and difficulty finding other key informants, only four persons were interviewed, all of which were from the fishing or diving sector. All persons interviewed who were from Oualie fished in the study area.

2.5 Surveys of fisherfolk

The primary data for this study were collected by surveys, which were designed to address the monitoring objectives. The Department of Marine Resources, under the guidance of CERMES, was responsible for the development of these surveys. Only one type of survey was required for this aspect of data collection as only fisherfolk were targeted. The primary landing sites of interest within and flanking the study site and sample size[1] for each (based on estimated numbers of fishers per landing site), were used to guide survey data collection. Efforts were also made in the field to identify any additional landing sites of interest. The data collection period was from 19 – 23 October 2017. Surveys for Nevis occurred from 19 October – 21 October, while the remaining two days of fieldwork occurred in St. Kitts. A total of 38 surveys were completed, 30 for Nevis and eight for St. Kitts. Surveys and key informant interviews were administered where possible at each landing site.

Country	Primary fish landing site	Estimated # of fishers	# of surveys required (sample size)	Actual # of surveys per site
St. Kitts	Basseterre East	45	23	5
	Basseterre West	10	6	2
	Old Road	12	5	1
Nevis	Cotton Ground	10	8	5
	New Castle	25	14	11
	Long Haul	12	10	4
	Indian Castle	45	27	3
	Jessup*	10	-	2

* Jessup was not originally included in sample size estimates as it was considered to be outside of the designated study area. However, due to an encounter with two fishermen knowledgeable of the study area and short data collection period, the interviewer decided to capture the relevant information. One fisher was surveyed from Barnaby and four from Oualie – two sites not classified as primary fish landing sites but sampled for convenience.

2.6 Observation and other methods

There appeared to be an overestimation of fisher numbers for some landing sites. This was revealed both by the local liaison and from visiting various landing sites and speaking to the fisherfolk.

2.7 Data entry and analysis

The data from the surveys were entered into an Excel spreadsheet and then analysed using simple descriptive statistics. The data from the key informant interviews were also entered into an Excel spreadsheet with narrative summaries developed for each question. Due to work commitments and time constraints, the SocMon team was unable to conduct the data analysis. CERMES (Romel Forde and Maria Pena) provided technical assistance with data analysis and compilation of results.

3 RESULTS – SURVEYS

Results are presented under headings corresponding to the assessment objectives:

1. Promote awareness for biodiversity conservation and sustainable use of resources
2. Determine trends in management effectiveness

[1] All samples were calculated using the following assumptions: a 10% margin of error; 95% confidence level and 50% response distribution.

3. Determine trends in socio-economic benefits from resource use of coastal and marine ecosystems

3.1 Promote awareness for biodiversity conservation and sustainable use of resources.

3.1.1 MMA knowledge

The top three features fishers associate the term, 'marine managed area' with are the encouragement of less work and activities (livelihoods) in the area (65.8%), more work and activities (livelihoods) encouraged in the area (55.3%) and protection of coastal and marine resources (52.6%). Equal and fairly significant proportions of individuals (34.2%) associate the term MMA with less access to the area by locals and coral reefs with more life on them than at present. See Figure 2 .

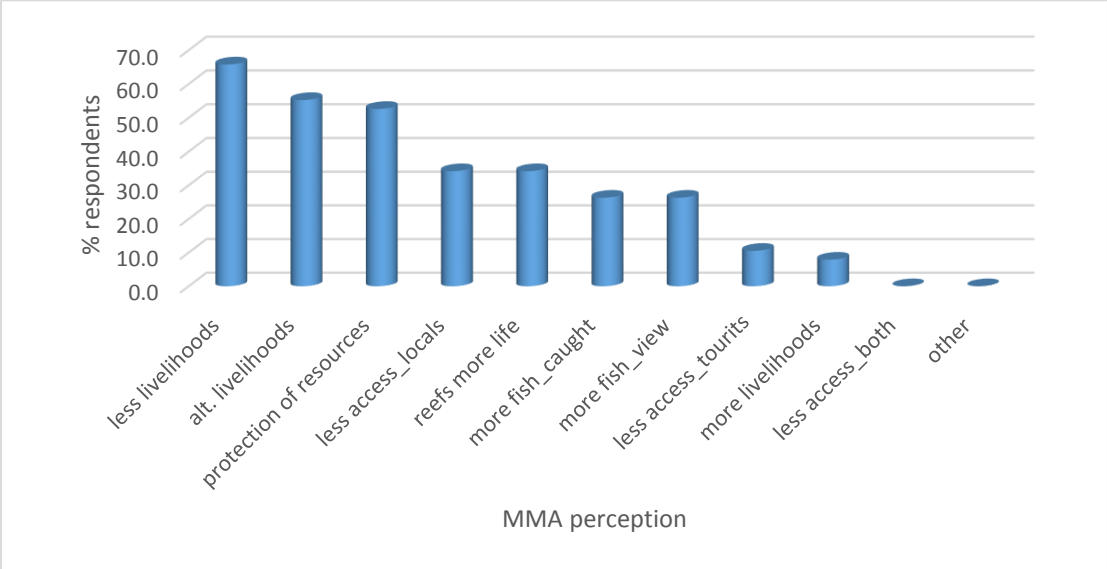

Figure 2 Perceptions of a marine managed area (n = 38)

3.1.2 Awareness of the importance of coastal ecosystems and resources and their protection

Awareness and knowledge of ecosystems and their value, the interdependence of fishing and ecosystems, and the importance of management measurements for sustainable use of resources was particularly high amongst the fishermen interviewed. Equal proportions of fishermen strongly agree and agree that (1) reefs are important for protecting land from storm waves (94.7% combined), and (2) they want future generations to enjoy the mangroves and coral reefs (94.7% combined). A significant majority of persons (63.1%) strongly agree and agree that development should be restricted in some coastal areas so that future generations will be able to have natural environments (Figure 3).

There was a unanimous disagreement by all respondents (100%) that fishing would be better if there were no coral reefs, with 65.8% strongly disagreeing and 34.2% disagreeing. Almost 90% of respondents strongly disagree and disagree with the notion that coral reefs are only important for fishing and tourism (55.3% disagreeing and 34.2% strongly disagreeing). There was also a very high level of disagreement (86.8%) with the idea that seagrass beds have no value to people (60.5% of disagreeing and 26.3% strongly disagreeing). See Figure 3.

The responses were a bit more mixed on the topic of the necessity of mangroves for fishing. Whilst a fairly large proportion of fishers (44.7%) disagreed and strongly disagreed with the

notion that unless mangroves are protected, there will be no fish to catch, just over one-third of persons (34.2%) were uncertain and 21.1% agreed with the statement (Figure 3).

Perceptions in relation to restrictions on fishing to facilitate increase in fish stocks and coral growth was also somewhat mixed although the majority of fishers (50% combined) were in agreement (7.9% strongly agree and 42.1% agree) with the notion that fishing should be restricted in certain areas. It should be noted however that 10.5% were uncertain of their stance, and a fairly large proportion (39.5% combined) strongly disagreed and disagreed with the idea (Figure 3).

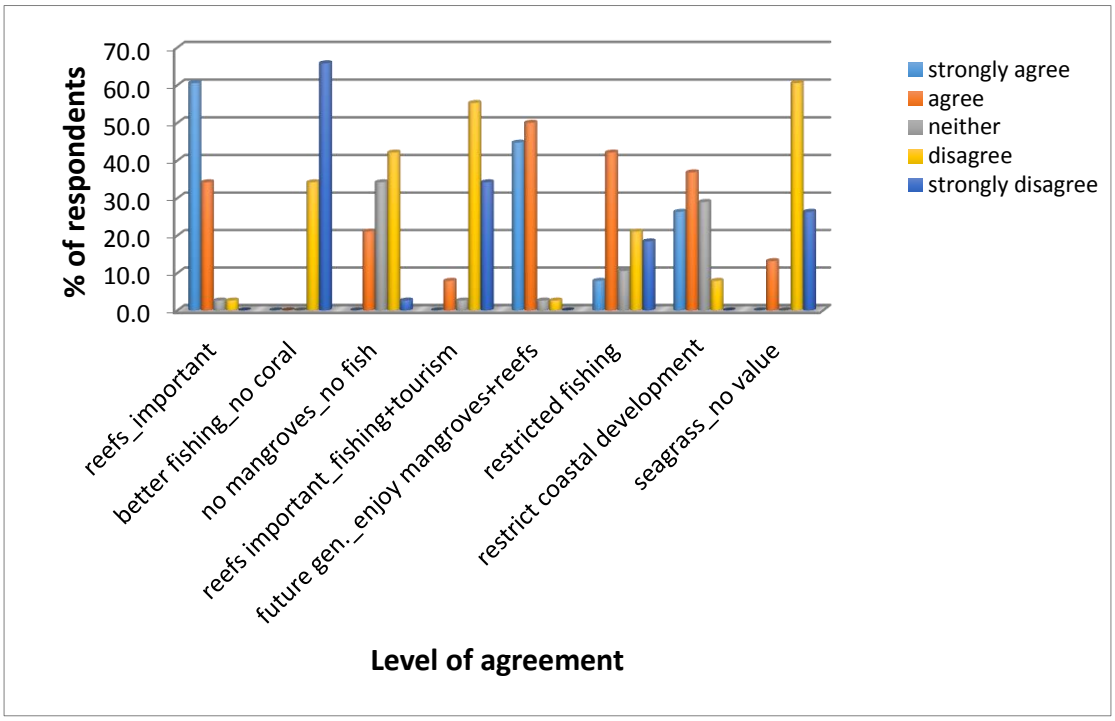

Figure 3 Level of agreement by respondents to various statements (n=38)

3.1.3 Perceptions of and importance of resource conditions

The current condition of seagrass beds and abundance of conch were the most highly rated resources within The Narrows with the majority of respondents 60.5% (all good) and 50% (18.4% very good, 31.6% good), respectively, believing them to be in very good and good condition (Figure 4).

Perceived condition of all other resources were mixed with no clear condition discernible from the responses provided. For example, similar proportions of fishers were either uncertain of the current condition of coral reefs and lobster abundance or felt they were in a very good or good condition – 39.5% in both cases neither good nor bad; 36.8% very good and good for coral reefs; 36.9% very good or good for lobster abundance. Similarly, for reef fish but overall more negative, fishers either felt that abundance of these fish was neither good nor bad (39.5%) or bad or very bad (31.6%). See Figure 4.

The current condition of beaches within The Narrows was the most uncertain of all resources with similar proportions of respondents across all condition categories believing them to be in very good or good condition (31.6%), or neither good nor bad condition (34.2%), or very bad or bad condition (34.2%). See Figure 4.

The majority of fishers surveyed (73.7%) were unable to provide a position on the condition of mangroves in the area (i.e. rated as “don’t know”). However it should be noted that of the minority who were able to comment on the condition of this resource, twice the amount

thought mangroves to be in bad or very bad condition (15.8%) compared to 7.9% who thought they were in very good or good condition (Figure 4).

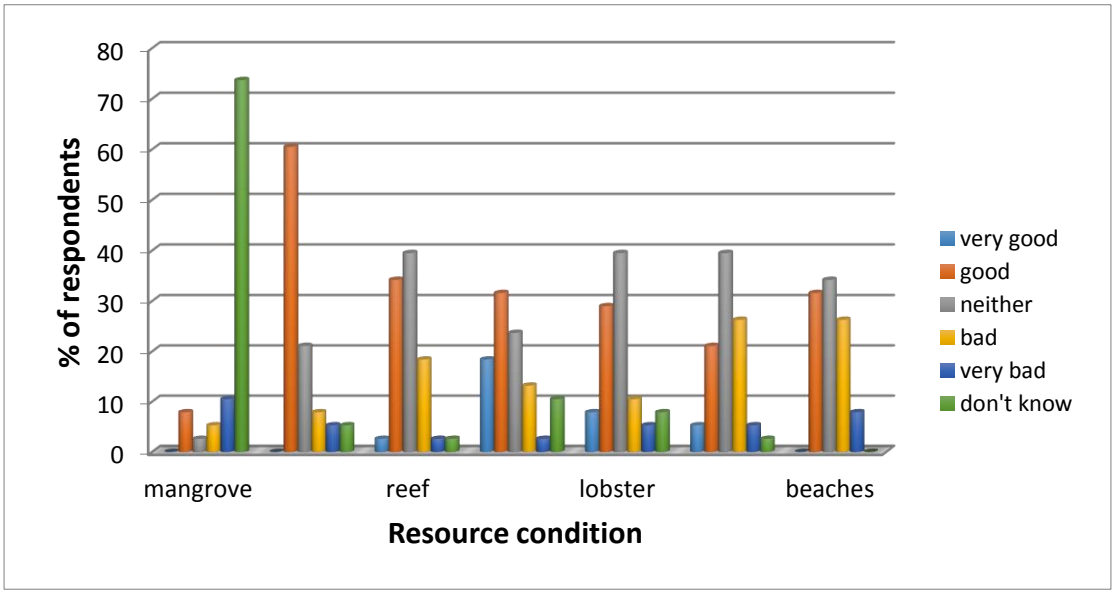

Figure 4 Perceptions of current conditions of resources within the Narrows (n = 38)

The majority of the 38 fishermen surveyed (68.4%) have noticed changes in the condition of these resources within The Narrows over the past 5 years.

Similar to the response for current condition of seagrasses, the overwhelming majority and highest proportion of respondents across all resources (81.5%), believed that this resource was in very good or good condition in 2012. The highest proportion of fishers (77.8%) felt they were in good condition. Whereas the majority of persons ranked current seagrass condition as good (with none ranking as very good), perceptions of past condition of seagrasses saw the inclusion of a rating of very good by a minority of persons (3.7%). See Figure 5.

Conch, lobster and reef fish abundances were all perceived to have been very good and good (combined) five years ago. The majority of respondents in all cases perceived this positive condition of these resources – 74% (conch), 66.6% (lobster) and 55.5% (reef fish). It should be noted however, that fairly significant proportions of fishers – 25.6% for conch and 33.3% for lobster – felt the abundance of these resources could have been rated as neither good nor bad in 2012. Although conch abundance was rated as very good or good by the majority of fishermen in 2012 (74%) and 2017 (50%), the results clearly show a decline in this positive perception between years. A significant negative change in perception (by 29 percentage points) is also observed for both lobster and conch abundance between 2012 and 2017 – 66.6% very good/good lobster abundance in 2012 to 36.9% very good/good in 2017; 55.5% very/good reef fish abundance in 2012 to 26.4% very/good in 2017 (Figure 5).

Whereas there was mixed or uncertain perceptions among fishermen about the 2017 condition of beaches within The Narrows, this coastal resource was clearly thought to be in very good and good condition in 2012 amongst the majority of respondents (63%). No fishermen believed the beaches to be in very bad or bad condition as opposed to 2017 perceptions. The results therefore show a negative change in perception of beach condition from 2012 to 2017. It should be noted that over one-third of individuals (37%) thought beaches were in neither good nor bad condition in 2012 (Figure 5).

Similar to the current perceptions of coral reef condition, most people (51.9%) thought this resource was in neither good nor bad condition in 2012. The results indicate a slight increase in positive perception of condition over the five-year period of interest with more fishermen

believing reefs to be in very good and good condition in 2017 (36.8%) than in 2012 (29.6%). See Figure 5.

As for the 2017 ratings of perceived condition, the majority of fishers surveyed (63%) were again unable to provide a position on the condition of mangroves in the area (i.e. rated as "don't know") five years ago. However, of those who were able to comment on mangrove condition, equal proportions (14.8% in each case) felt they were in very good and good condition, or very bad and bad condition (Figure 5).

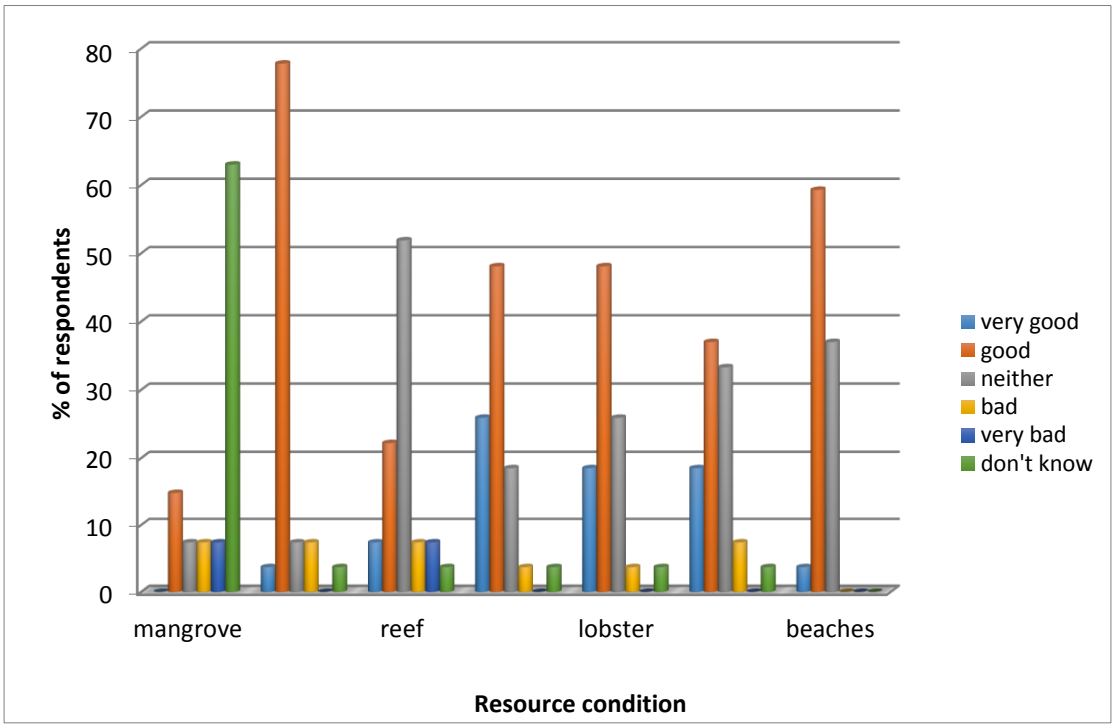

Figure 5 Perception of resource condition within The Narrows 5 years ago (n = 27)

A total of 36 fishermen shared their thoughts on the change in size and abundance of fish and other marine resources in The Narrows over the last 5 years. In general, most respondents felt there had been no change in the size of parrotfish, long-spine black sea urchin, conch and lobster since 2012. Fishers believe that parrotfish, conch and lobster all declined in abundance over the last five years whereas the long-spine black sea urchin was thought to have increased in quantity (Figure 6).

Overall, the majority of fishermen (63.9%) indicated there had been no change in parrotfish size over the 5-year period. It should however be noted that a fairly significant proportion of individuals believe parrotfish had decreased in size since 2012. Similar proportions of fishers believe parrotfish abundance decreased over time, with 63.9% of individuals sharing this view, while 27.8% observed no change in abundance. A minority of persons (5.6%) felt there had been an increase in their abundance (Figure 6).

No change in urchin size was observed by greater than one-third (36.1%) of individuals, while an equal percentage were uncertain of any changes that may have occurred since 2012. Increases and decreases in size were noticed by a minority of fishermen, 13.9% in each case. The majority of individuals (36.1%) observed an increase in urchin abundance over the past 5 years, while fairly significant proportions noticed a decrease (22.2%) or no change (19.4%) in quantity. Some persons (22.2%) were uncertain of the types of changes that may have occurred of the period of interest (Figure 6).

The size of conch was thought to have remained unchanged by most fishermen (50%), while a significant proportion (41.7%) noticed a decrease. None of the fishermen thought there had been an increase in the size of conch. Only a minority of individuals (8.3%) were uncertain of any size changes since 2012. Most respondents (50%) reported a decrease in conch abundance, while only 2.8% observed an increase. Just over one-third (36.1%) of fishermen thought there had been no change in conch abundance over the five-year period. Only a minority of persons were uncertain of any changes in abundance (Figure 6).

Lobster size was mainly thought to have remained unchanged since 2012, with the majority of respondents (50%) sharing this observation. It should however be noted that a significant percentage of fishermen (41.7%) believe lobsters had decreased in size during this time period. No one observed an increase in lobster size and only 8.3% were uncertain of any size changes over the five-year period (Figure 6).

Lobster abundance was thought to have decreased by the majority of respondents (58.3%), while no one observed an increase. Some individuals (27.8%) individuals noticed no change in lobster abundance and 13.9% did not know if there had been any change (Figure 6).

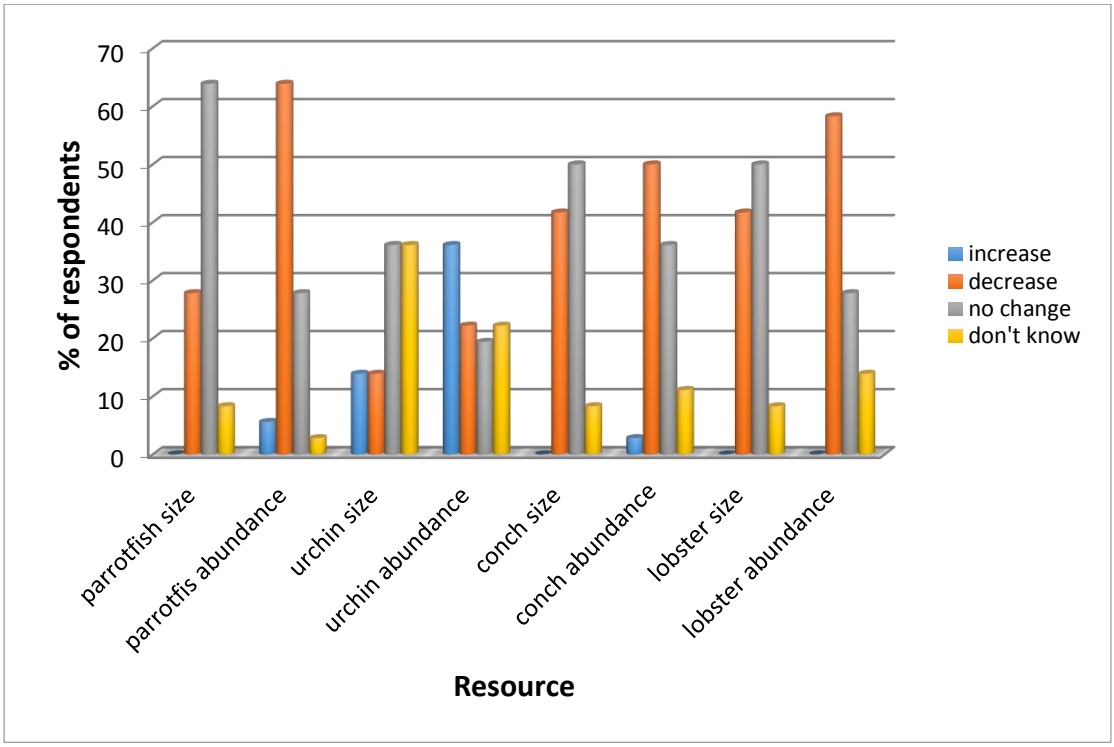

Figure 6 Perceived changes of fish and other resource size and abundance in The Narrows over the past 5 years (n = 36)

The main suggestions provided by respondents for the improvement of resource conditions within The Narrows are provided in Figure 7. The two top suggestions, which accounted for 14.7% of responses each, were the establishment of protected areas and the implementation of (fishing) size restrictions. The implementation of fishing seasons was also suggested by 8.8% of respondents. Other suggestions include the establishment of a marine managed area, the installation of artificial reefs, the installation of protective structures to reduce erosion and the implementation of gear restrictions. These remaining suggestions each accounted for 5.9% of responses.

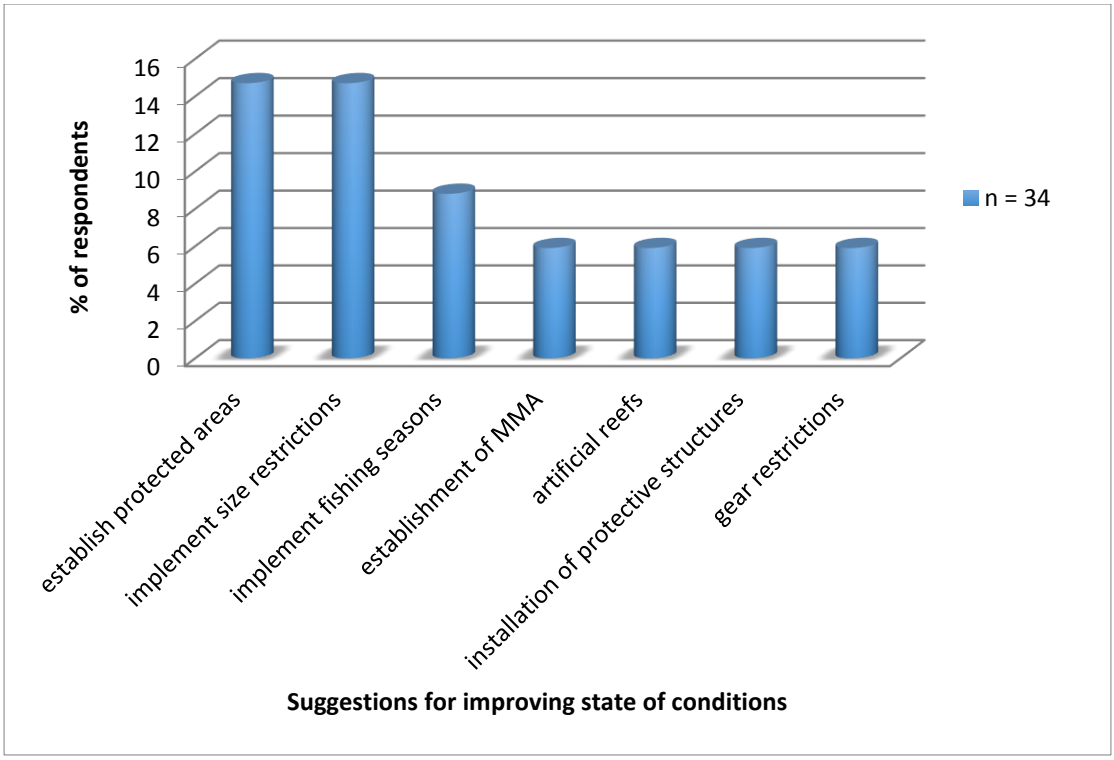

Figure 7 Suggestions for improving the state of conditions within the Narrows (n = 34)

The overwhelming majority of fishermen (97.2% combined) rated the importance of the condition of the marine environment – coral reefs, mangroves, water quality, beaches etc. – to their livelihoods, relaxation and existence value as very important and important. Only a minority (2.8%) thought resource condition was neither important nor unimportant to them (Figure 8).

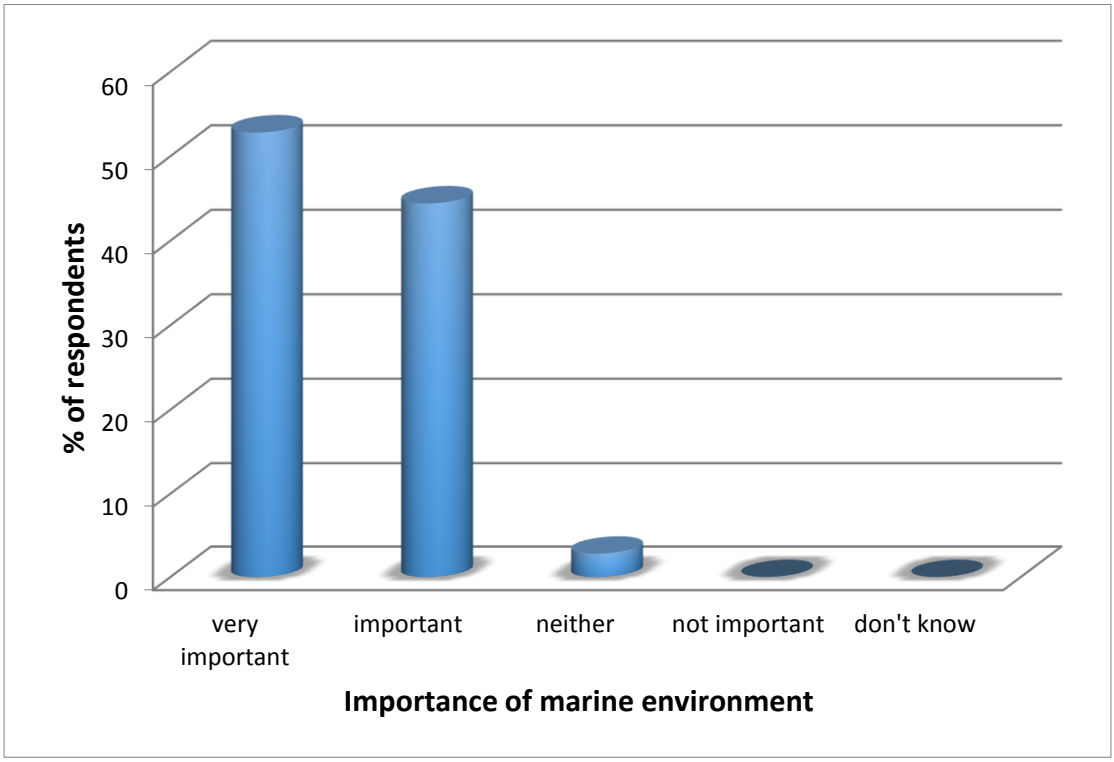

Figure 8 Importance of the condition of the marine environment to fishermen

3.1.4 *Perceived problems affecting The Narrows and suggested solutions*

From a list of six possible problems, fishermen perceive unsustainable fishing (61.1%), climate change (50%) and user conflict (38.9%) as the main issues affecting The Narrows. Based on the responses, all of the problems provided in the pick list constitute problems in the area. It should however be noted that a reasonable proportion of fishermen (19.4%) provided six additional problems – sediment runoff from quarries, lionfish invasion, coastal erosion, sargassum influx, sand dredging and anchor damage (Figure 9).

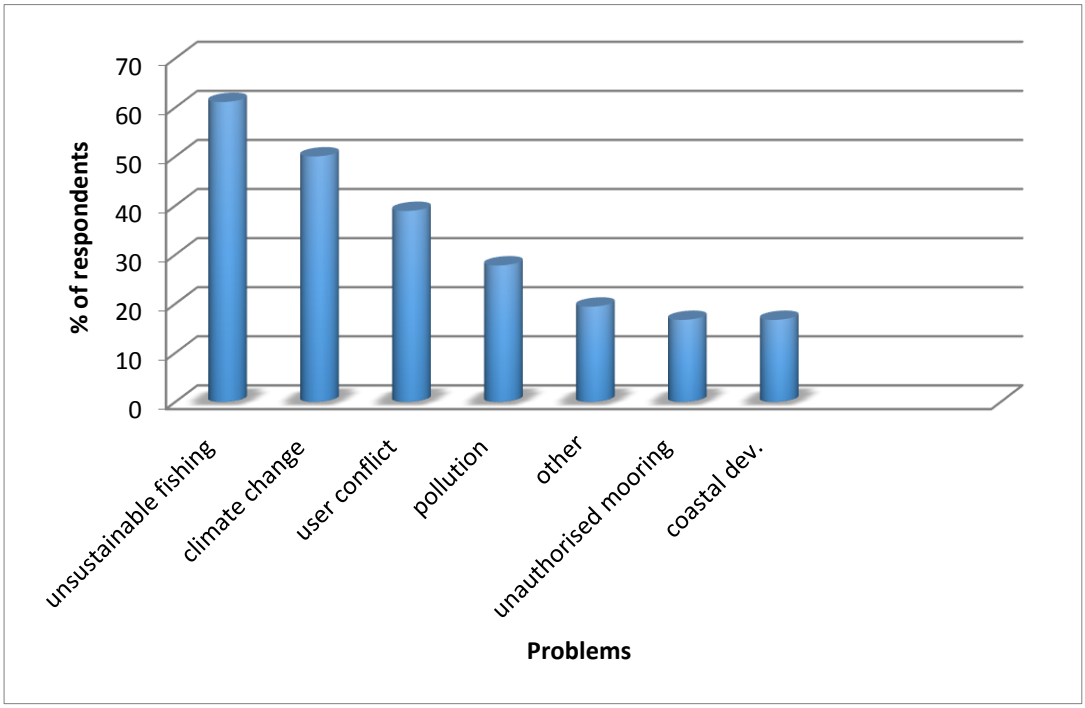

Figure 9 Problems perceived to be affecting The Narrows (n = 36)

Suggested solutions to the problem of unsustainable fishing were grouped into ten solutions. The top four solutions included: the establishment of a marine managed area (25%), the implementation of size limits (20%), banning of spearfishing with SCUBA (15%) and an increase in net size (10%). See Figure 10. Other suggestions included the implementation of fishing seasons, a ban on seine fishing, the enforcement of zonation, a temporary ban on certain fish species, monitoring of fishermen and general enforcement of rules and regulations.

Solutions to the other identified problems were provided by only a minority of fisheries interviewed. Three persons (7.9%) identified the placement of breakwaters to protect the coastline from erosion; dredging sand onto the bank or shore; and restrictions (*unspecified*) as possible solutions to the problem of climate change. Eleven percent of fishermen believe that that user conflict within the area can be solved by the enforcement of a speed limit for boats in certain areas to prevent accidental cutting of trap ropes; heavy fines for individuals who tamper with traps they do not own; restricting the placement of traps too close within the bay area; and implementation of separate zonation for traps and marine transportation. Two persons believed that cessation of coastal development and restrictions (*unspecified*) could solve the problem posed by coastal development within The Narrows. More beach cleanups and restrictions (*unspecified*) were proposed by two fishers to alleviate the perceived pollution issue. Only one individual thought that restrictions (*unspecified*) would be important in solving the problem of unauthorized mooring within the area.

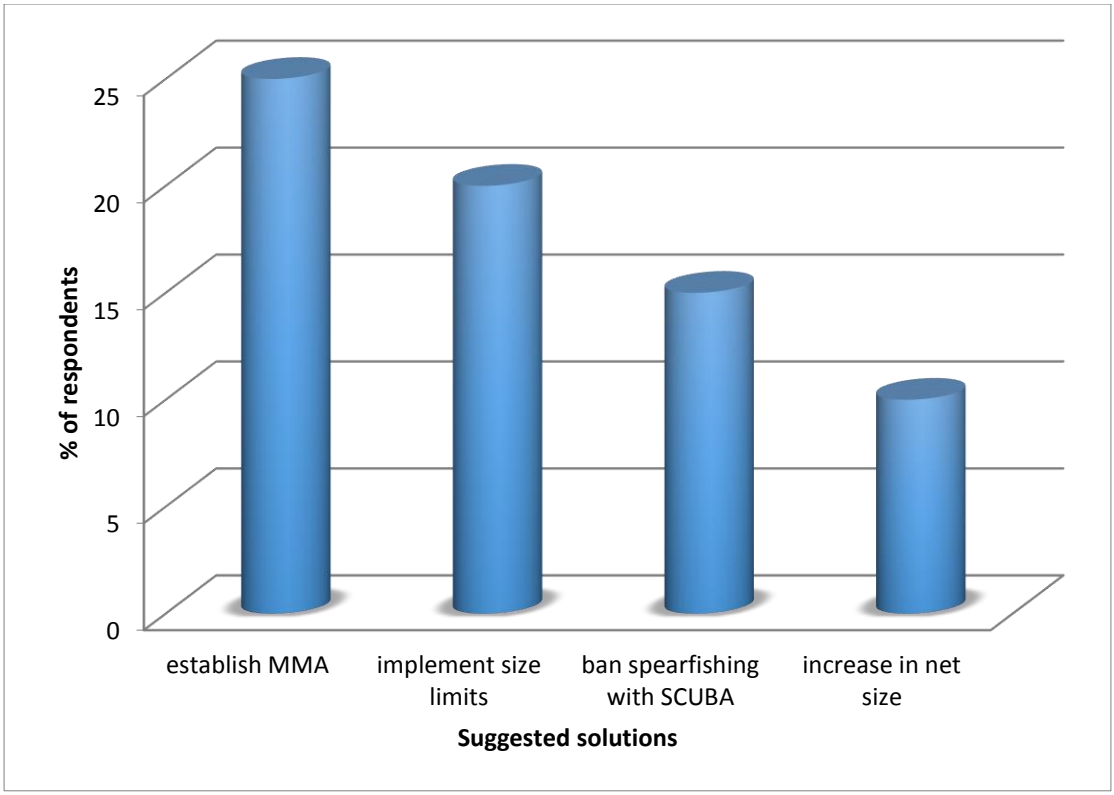

Figure 10 Suggested solutions for unsustainable fishing in the Narrows (n = 20)

Development of barriers which prevent sediment from entering beaches, a bigger effort to eradicate lionfish from reefs and the addition of moorings to prevent the need to drop anchors were mentioned by 7.9% of fishers as solutions to sediment runoff from quarries, lionfish invasion and anchor damage, respectively.

3.1.5 Support for resource management: parrotfish, long-spined sea urchin and coral reefs

Respondents were asked if they would support temporary measures to help increase the population and recovery of parrotfish in The Narrows. The majority of these respondents (86.1%) were supportive of a range of management measures while the remaining 13.9% were not (Figure 11).

Of the range of possible management measures provided, implementation of size restrictions (58.1%), and closed areas for research (54.8%) were most highly supported. The implementation of fishing seasons (45.2%) and gear restrictions (38.7%) were also supported by a fairly significant proportion of fishermen. Campaigns to help increase awareness, education or outreach (12.9%), catch limits (3.2%) and the notion of leaving it to nature (3.2%) were not strongly supported (Figure 12).

Those fishermen not in favour of management of parrotfish within The Narrows, believed there was a high abundance of parrotfish in the area and thus there was no need for intervention (60%); were uncertain about the benefits of parrotfish to reefs (20%); and felt that the species was too much of an important source of income to support any management measures (20%). See Figure 13.

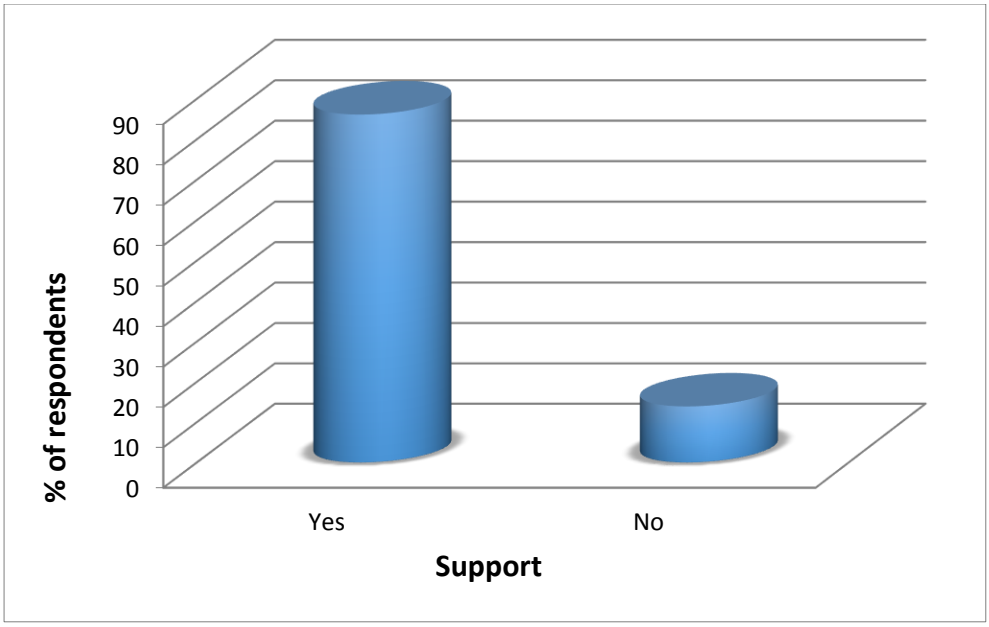

Figure 11Level of support for the management of parrotfish in The Narrows (n = 36)

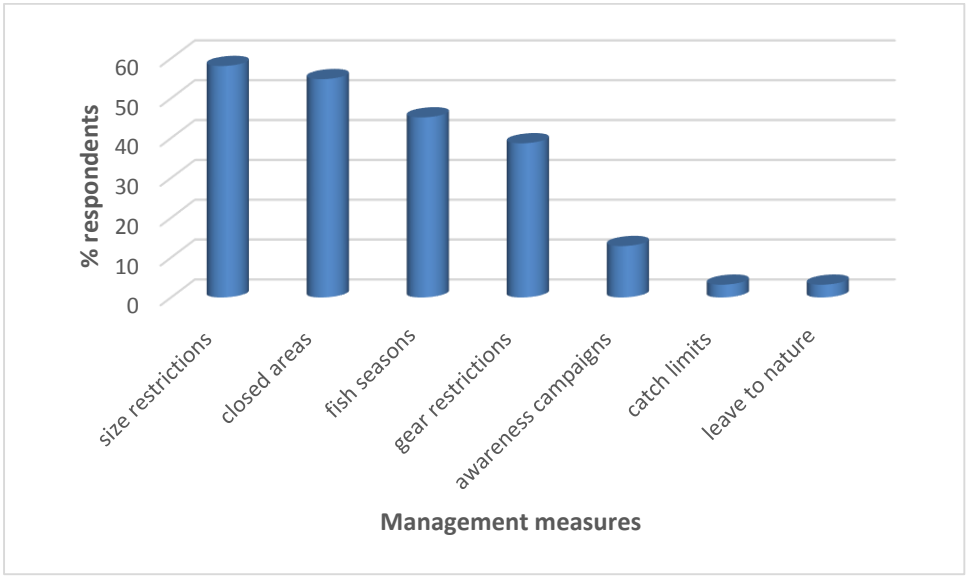

Figure 12 Level of support for proposed parrotfish management measures (n = 31)

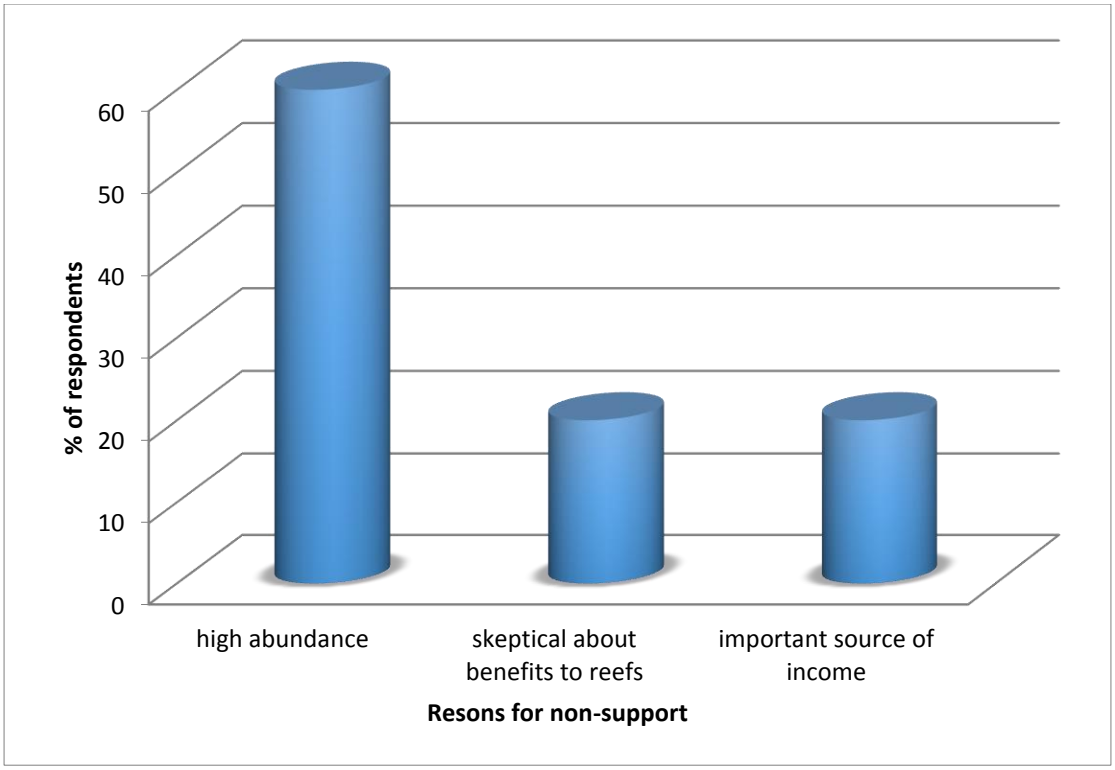

Figure 13 Reasons for not supporting the management of parrotfish (n= 5)

The majority of fishermen surveyed (94.4%) were highly supportive of management efforts to help the long-spined (black) sea urchin recover, while the remaining 5.6% were not (Figure 14).

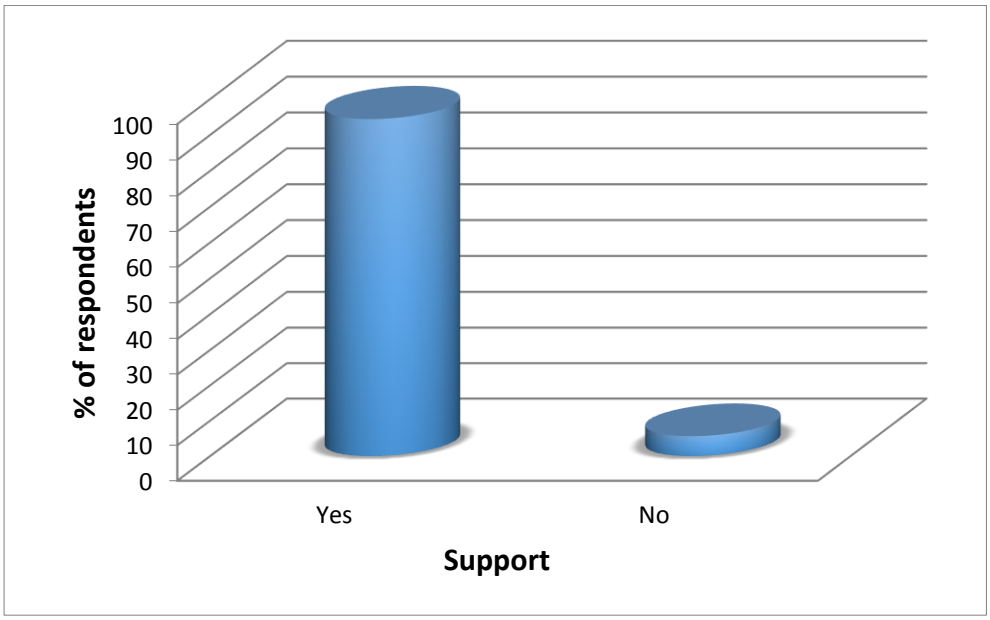

Figure 14 Level of support for long-spined sea urchin management (n = 36)

Transplantation of urchins from reefs with good abundance to those with poor abundance and laboratory rearing to replenish reefs were the suggested management measures that were most highly supported by over 50% of fishermen in both cases – 55.9% for transplantation and 52.9% for lab rearing. A smaller but somewhat significant proportion of individuals (29.4%) were in favour of setting aside marine protected area zones for

restoration. The management measure that was least favourable amongst fishermen (17.6%) was that of the idea of leaving all efforts to nature (Figure 15). Those who did not support management measures to protect urchins justified their stance by stating that this species was more of a danger to humans if the population was allowed to become too high, and were skeptical about the impact of the long-spined sea urchin on coral reef health.

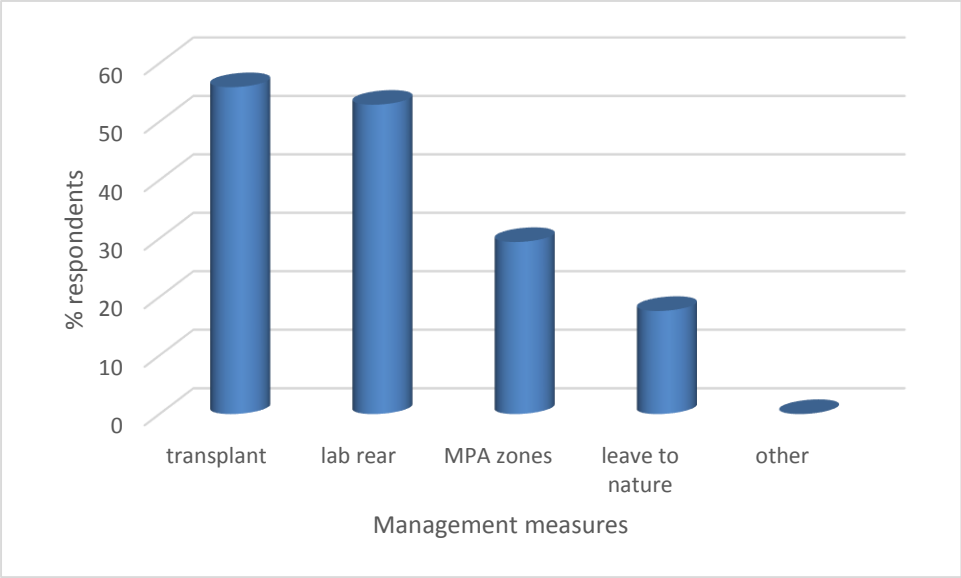

Figure 15 Level of support for proposed black sea urchin mangagement measures (n = 34)

Reef management was highly supported; all of the fishermen surveyed stated they would be in favour of measures to help protect them. Five of the six proposed management measures were favoured quite highly by fishermen. Coral gardening or restoration (58.3%) and closed areas (52.8%) were two of the most frequently supported reef management measures among fishermen. Significant proportions of individuals also favour gear restrictions (44.4%), fishing seasons (38.9%) and size restrictions (33.3%). The least suggested reef management option was that of leaving it to nature, which only accounted for 5.6% of responses. No other suggestions for management were provided by fishermen (Figure 16).

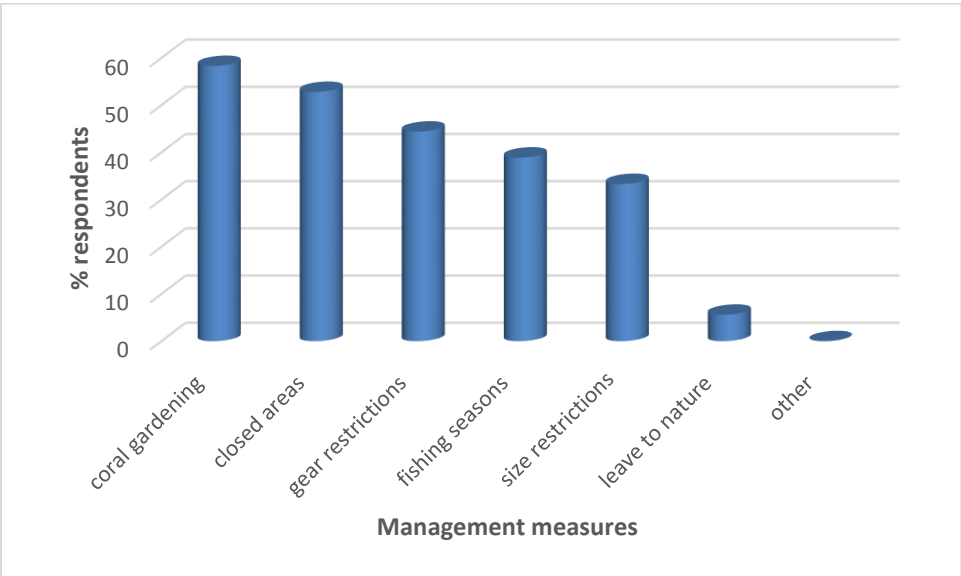

Figure 16 Level of support for proposed reef management measures (n = 36)

3.2 Trends in management effectiveness

3.2.1 Awareness of, and compliance with, rules and regulations

Fishermen claim to be most aware of rules and regulations related to fishing (86.1%), coastal development (83.3%), tourism (55.6%), and marine transportation (52.8%). A smaller but somewhat significant proportion of individuals (30.6%) are aware of rules and regulations pertaining to quarrying. Fishermen are least acquainted with agriculture rules and regulations (11.1%). Fishers were unable to provide other rules and regulations for other activities they are familiar with. See Figure 17.

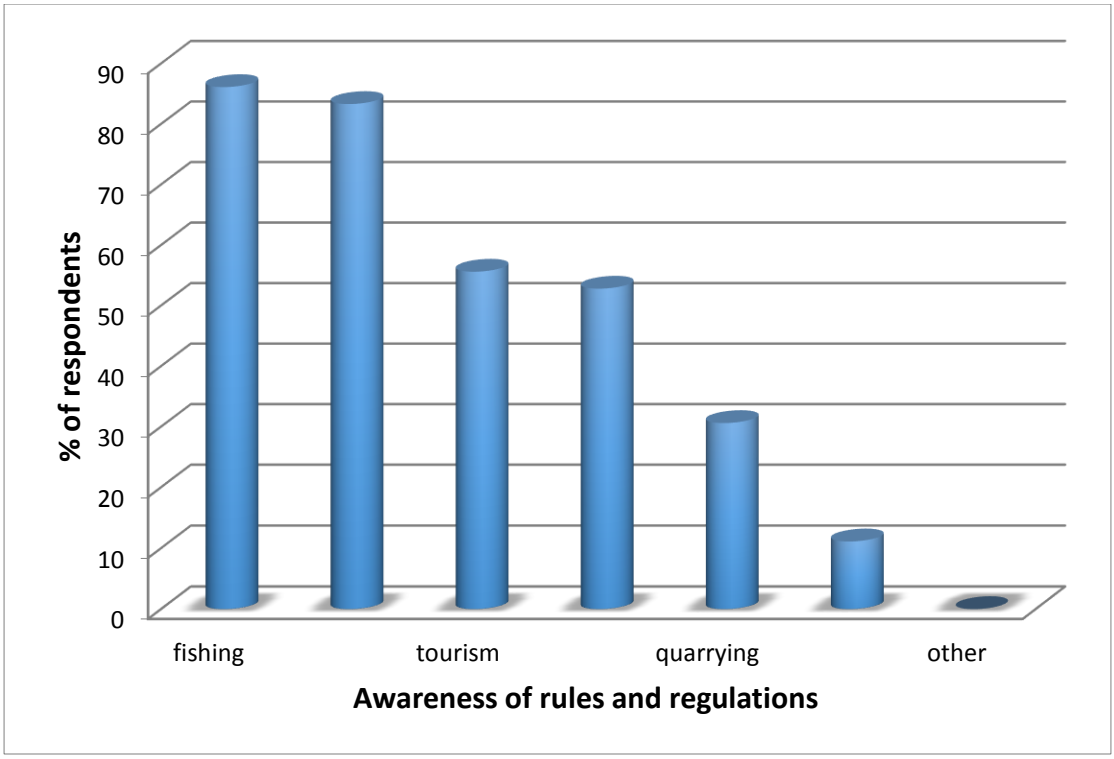

Figure 17 Awareness of rules and regulations for various activities within The Narrows (n = 36)

Of all the activities undertaken within The Narrows, the greatest majority of fishermen (77.8% combined) believe there is full and good compliance with rules and regulations pertaining to coastal development. Compliance with rules and regulations relevant to marine transportation was also thought to be full and good by a fairly significant proportion (44.5%) of fishermen surveyed. It should however be noted that one-third of fishermen were uncertain of the level of compliance with marine transportation rules and regulations. 69.4% of fishers combined believe that people's compliance with fishing rules and regulations is poor or none at all. The majority of fishermen were least able to provide an opinion on the level of compliance with rules and regulations within the agriculture and quarrying sectors; 86.1% of persons in both cases were unaware of the level of compliance. The level of compliance within the tourism sector was also found to be largely unknown by a significant proportion of fishers (41.7%). See Figure 18.

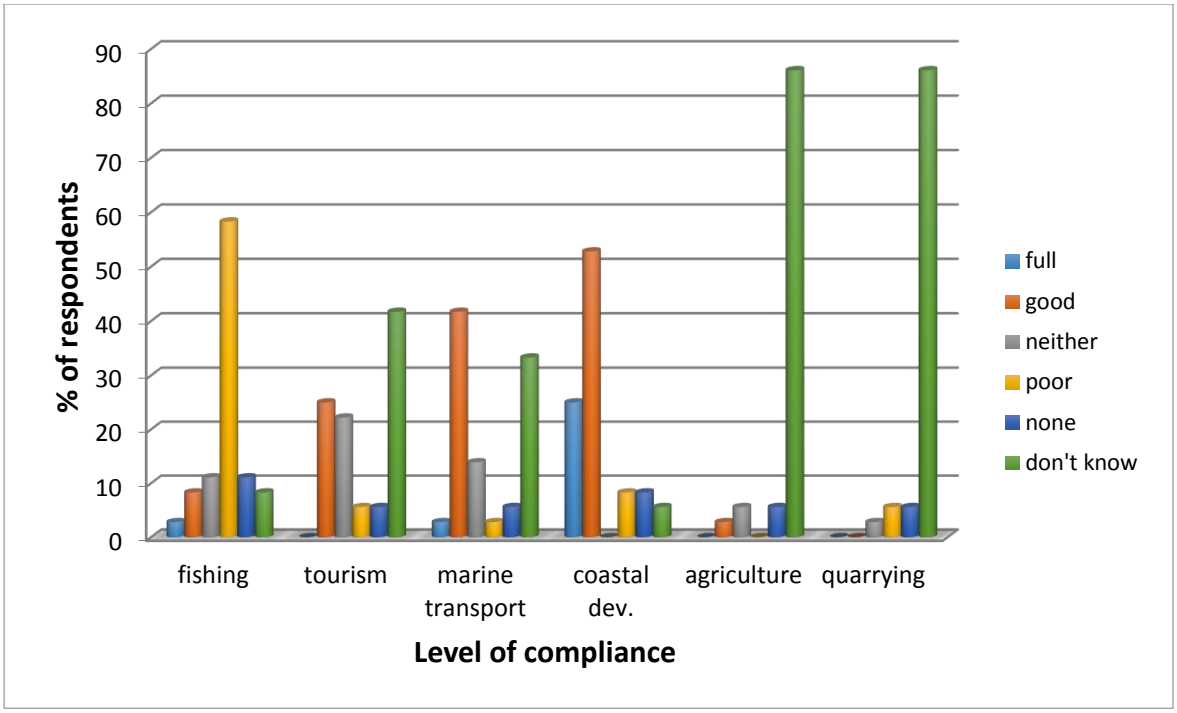

Figure 18 Perceived level of compliance with rules and regulations (n =36)

3.2.2 Stakeholder participation in management

Views were almost equally divided amongst fishermen in terms of their thoughts on whether enough was being done to encourage stakeholder participation in co-management of The Narrows. While the majority of fishers (52.8%) felt enough was not being done, a very significant proportion (47.2%) felt otherwise; that sufficient was being undertaken to encourage management participation.

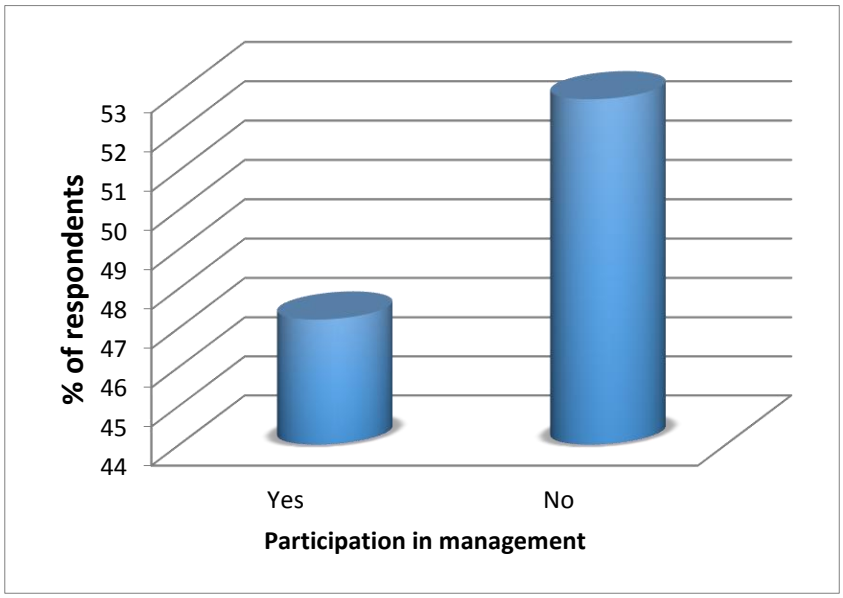

Figure 19 Perceptions on whether enough is being done to encourage stakeholder participation in co-management of the Narrows (n = 36)

Fisher participation, and that of members of their household, in meetings, workshops or other events organized specifically to address co-management of The Narrows is high. Most fishers and their families (72.2%) had attended such events.

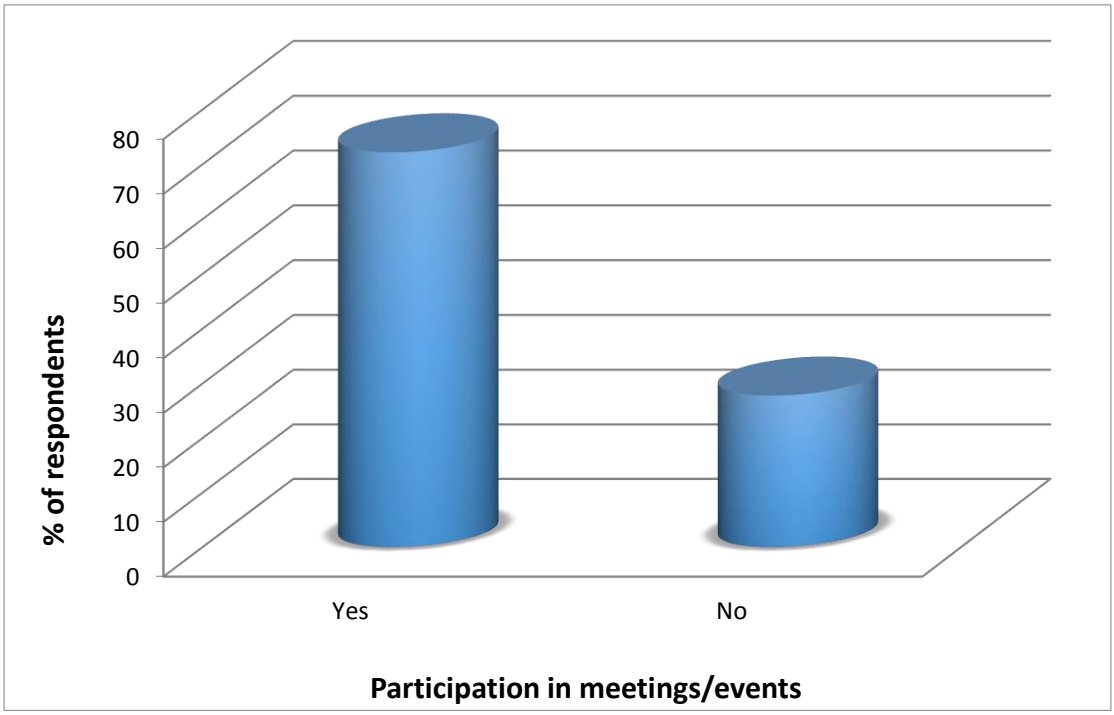

Figure 20 Level of participation in events addressing co-management of The Narrows (n = 36)

3.2.3 Community activities impacting The Narrows and their solutions

Information on community activities affecting The Narrows was only provided by 2.6% of respondents. Of these seven individuals, greater than half (57.1%) listed beach picnics and parties as a problem due to the garbage that is left behind after such events. Equal proportions of persons (14.3% in each case) mentioned the issue of land clearing to provide parking for an annual spearfishing tournament, the poker run and quarry mining. Further data collection is required to provide a greater understanding of this stakeholder group's perceptions of community impacts on the area (Figure 21).

Fishermen recommended five ways of addressing the problems affecting The Narrows. Most individuals (33.3%) believed an increase in (garbage) disposal bins was required to tackle the issue of garbage as a result of beach picnics and parties. The installation of a barrier to trap sediment runoff, an increased awareness of the impacts of pollution, restrictions on littering and the enforcement of rules, were also recommended by each of 16.7% of fishers (Figure 22).

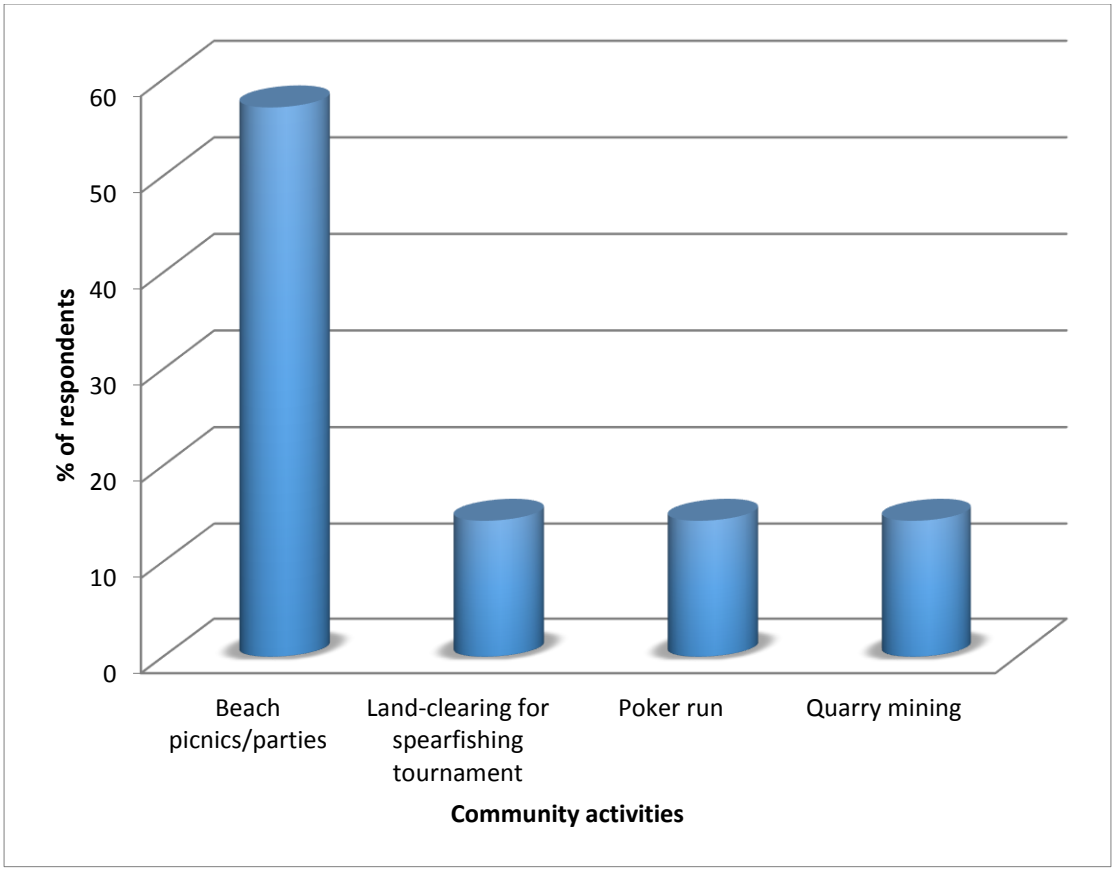

Figure 21 Perceived community activities affecting The Narrows (n = 7)

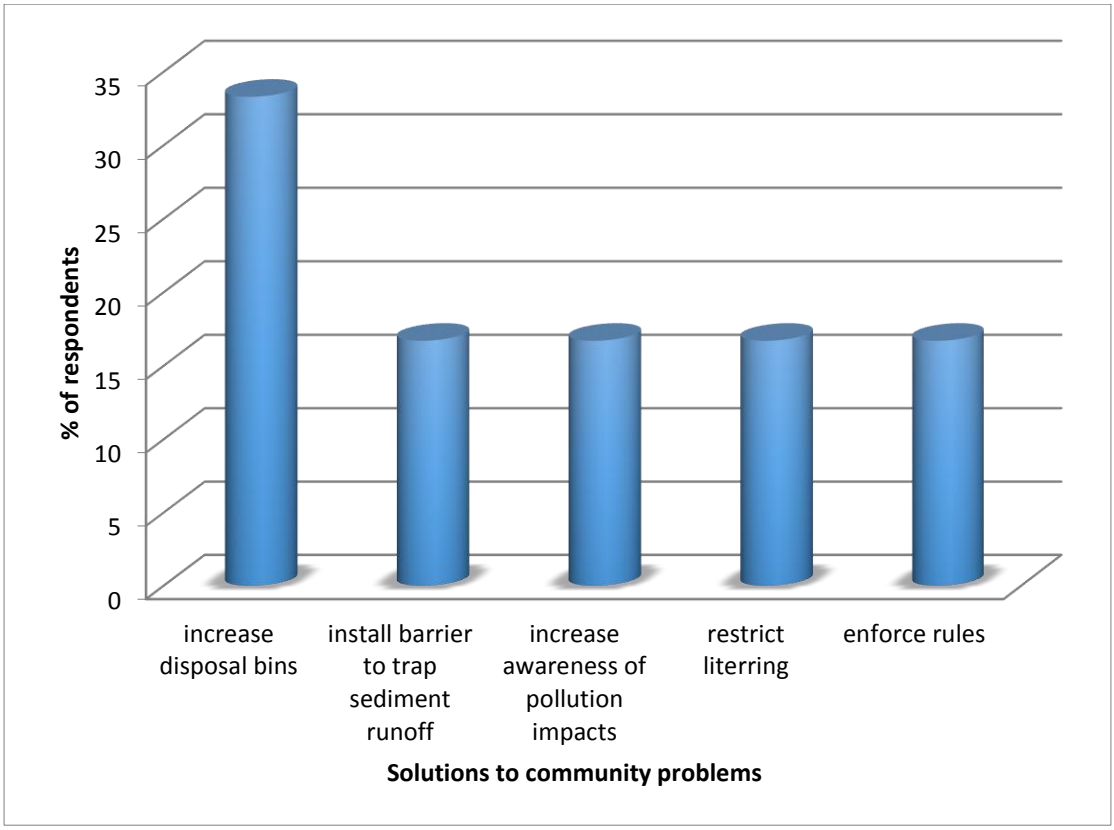

Figure 22 Solutions recommended for the identified community problems affecting The Narrows (n = 6)

There are two main management priorities that fishers believe the authorities responsible for managing the Narrows should focus on - enforcement of rules and regulations (19.4%) and the implementation of gear restrictions (8.3%). Other focal areas for management include a reduction in overfishing, a ban on spearfishing with SCUBA, preparatory enforcement training, the establishment of a marine managed area and the implementation of size limits (5.6% each). See Figure 23.

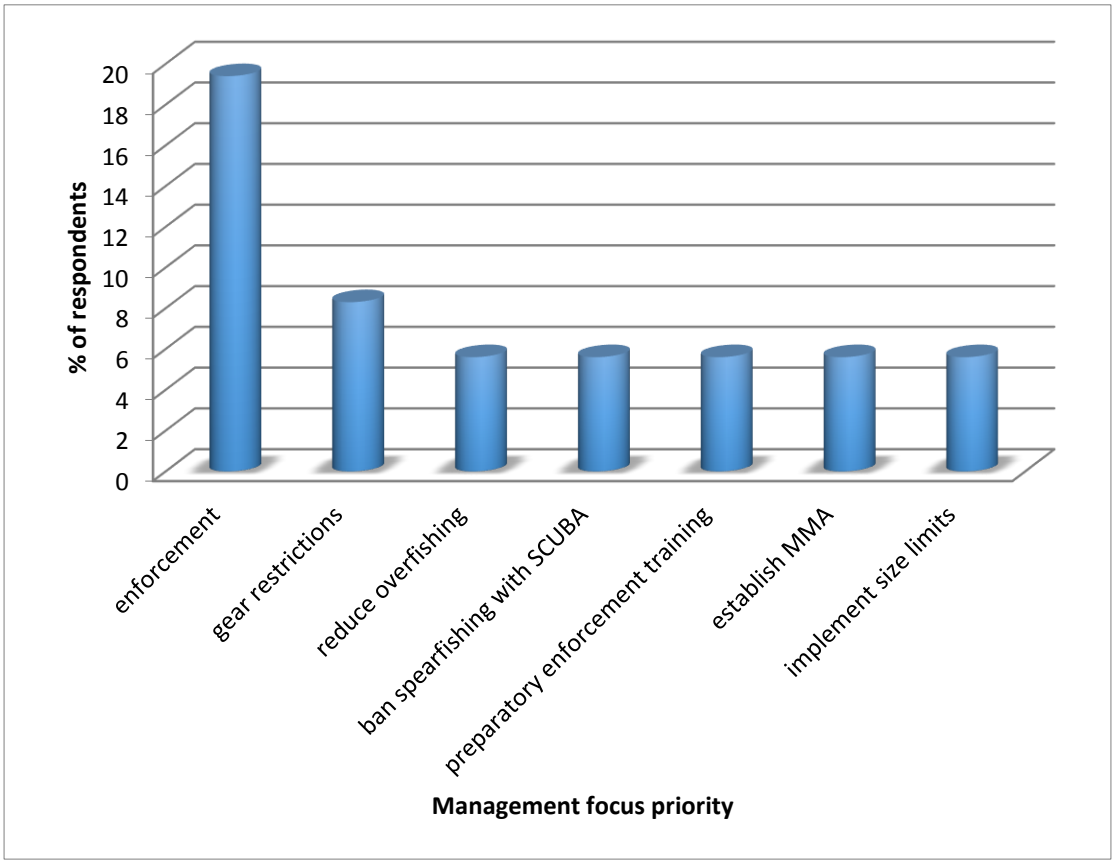

Figure 23 Focal areas fishermen expressed as requiring management priority

3.3 Trends in socio-economic benefits from resource use of coastal and marine ecosystems

3.3.1 Role and length of time in the fisheries sector

The fishermen surveyed combine a number of roles in the fishing sector. In addition to being fishermen, 65.8% are also boat owners, 63.2% are boat owners, 55.3% are also vendors, and only one individual (2.6%) is a mechanic (n= 38).

Of the 38 individuals surveyed, the majority (26.3%) had been involved in the fishery between 40-49 years. Fairly similar proportions had been in the sector between 30-39 years (23.7%) and 20-29 years (21.1%). Individuals who were in the fishing sector for the least number of years (0-9) and the most number of years (60-69) were in the minority, with each representing 2.6% of respondents. Respondents who were involved in the fishing sector between 50-59 years were also in the minority, accounting for 5.3% (Figure 24).

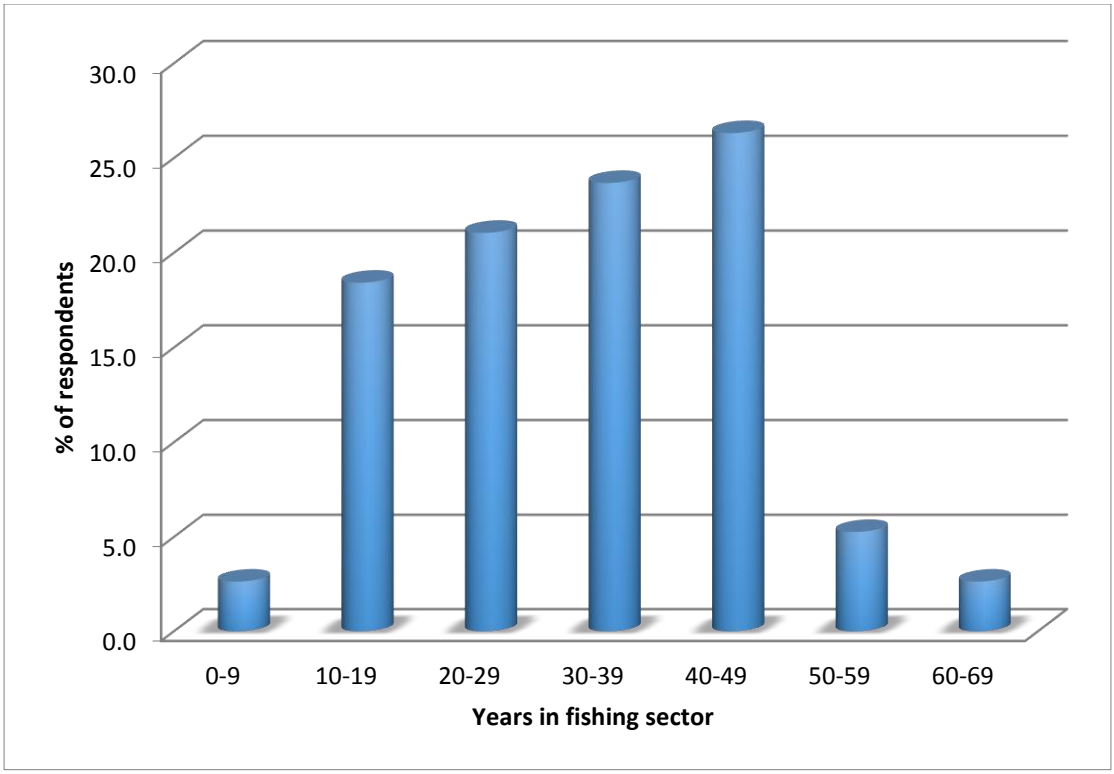

Figure 24 Number of years individuals were involved in the fishing sector (n = 38)

3.3.2 Social and socio-economic activities within The Narrows

When asked to list all of the activities that fishermen or their household members participate in for relaxation within The Narrows and surrounding areas, swimming was found to be the major activity, accounting for 42.1% of responses (figure 27). Smaller proportions of individuals snorkel (18.4%), dive (15.8%) and boat (10.5%) in the area. Fishers and their families use The Narrows the least for exercise (7.9%), watersports (5.3%), beach parties (5.3%) and recreational fishing (2.6%). See Figure 25.

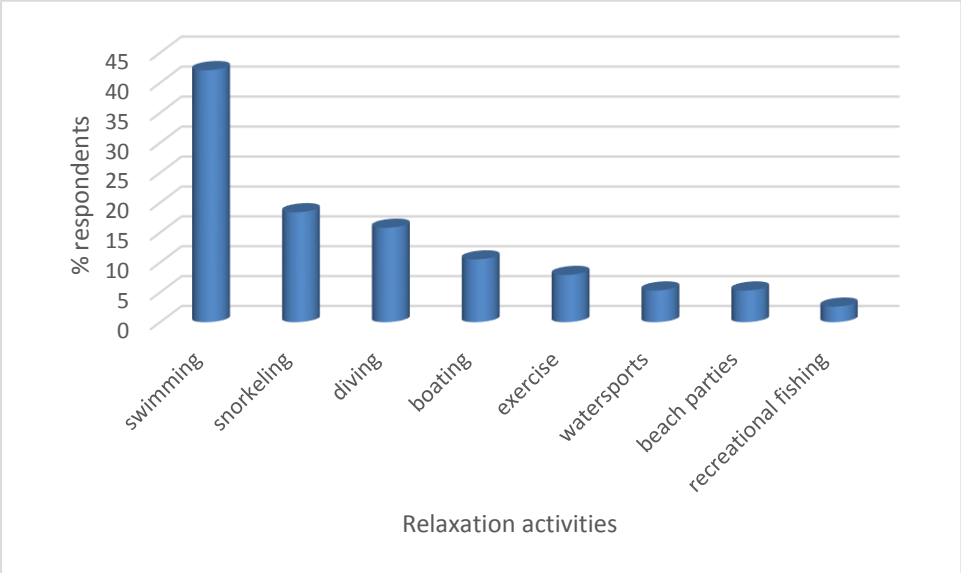

Figure 25 Relaxation activities within the Narrows and surronding areas (n = 38)

Respondents were asked how they, or members from their household, make a living from resources (coastal and marine) in the study area. Fishing was found to contribute to the livelihoods of all of the respondents and was thus the main and most important livelihood activity (Figure 26). Significantly smaller proportions of persons are dependent on the area for watersports operation (7.9%), water taxi services (7.9%), dive operations (5.3%) and tour guiding (5.3%). Fishers and their families do not make a living from either craft vending or day charter operation.

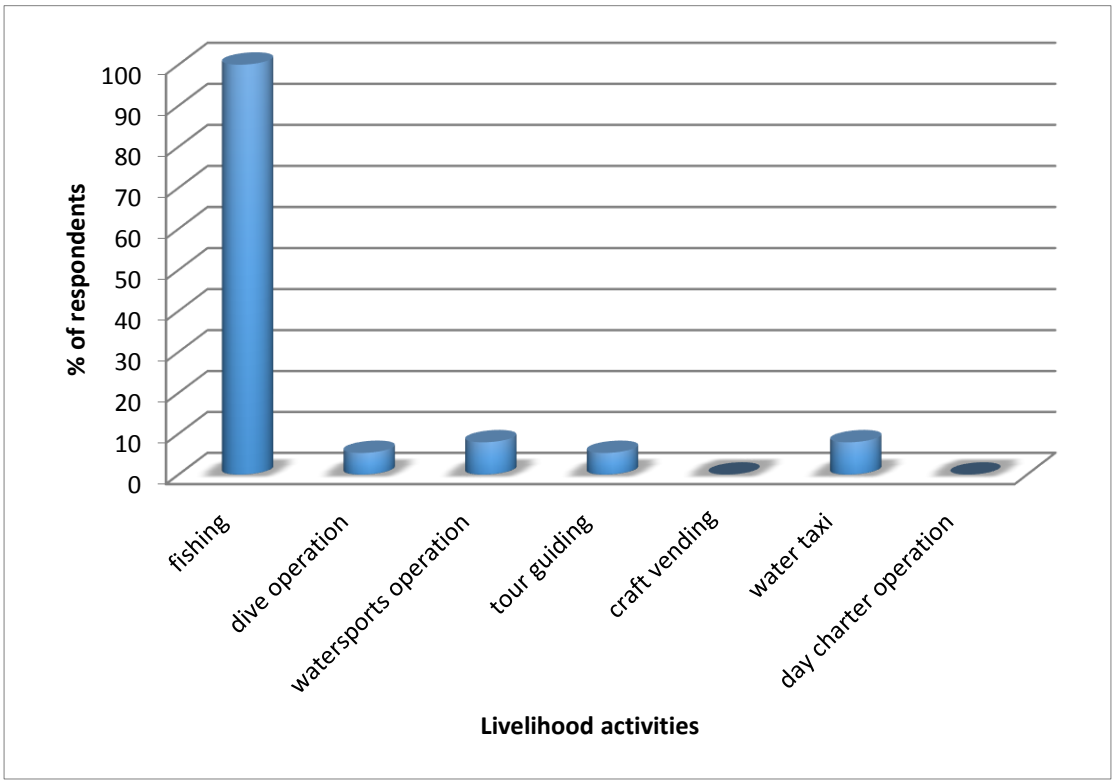

Figure 26 Ways in which fishers and their families make a living from the resources within The Narrows (n = 38)

Figure 27 shows the average days per week fishermen and/or their household members spend making a living from the resources within the Narrows. The majority of individuals (53% combined) spend an average of two to three days per week earning a living from the resources in The Narrows. 15.8% of respondents earned a living one day per week, while 10.5% earned a living everyday (7 days) per week on average. Individuals who earned a living 5 and 6 days per week both accounted for 7.9% of respondents.

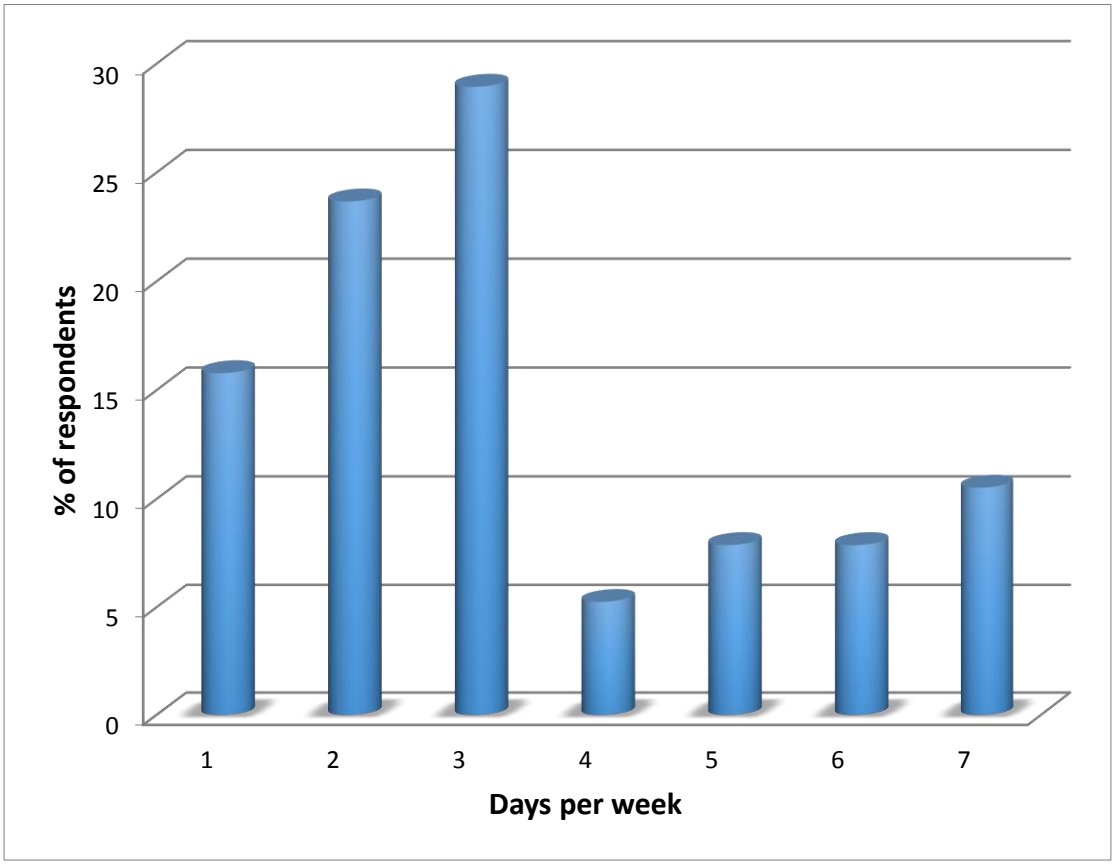

Figure 27 Average number of days per week spent earning a living within the Narrrows (n = 38)

3.3.3 Catch, fishing gear and fishing loctaion

Of the 15 species caught by fishermen, the top five species include snappers (20%), doctorfish (16.7%), and lobster, grunts and mahi mahi (8.3% each). See Figure 28. Fishermen were asked to provide information on the types of fish caught by quantity, weight or value. Twenty-three out of the 38 persons surveyed provided fish catch data by quantity, while four provided species catch by weight and three provided the information in terms of value. Eight did not associate catch with any of these indicators.

When disaggregated by quantity, snapper (28%), doctorfish (16.3%) and mahi mahi (9.3%) are the most commonly caught species (Figure 29). Although not statistically significant, the results for fish catch by weight and value are provided for completeness. The most commonly caught species by weight were noted to be wahoo, broadmouth grunt and doctorfish. By value, lobster, broadmouth grunt and swordfish were noted as the most important.

The variety of snapper caught by fishermen include red, yellowtail, queen, gold eye and silk snappers. White mouth and broad mouth grunts comprise the species of grunt caught.

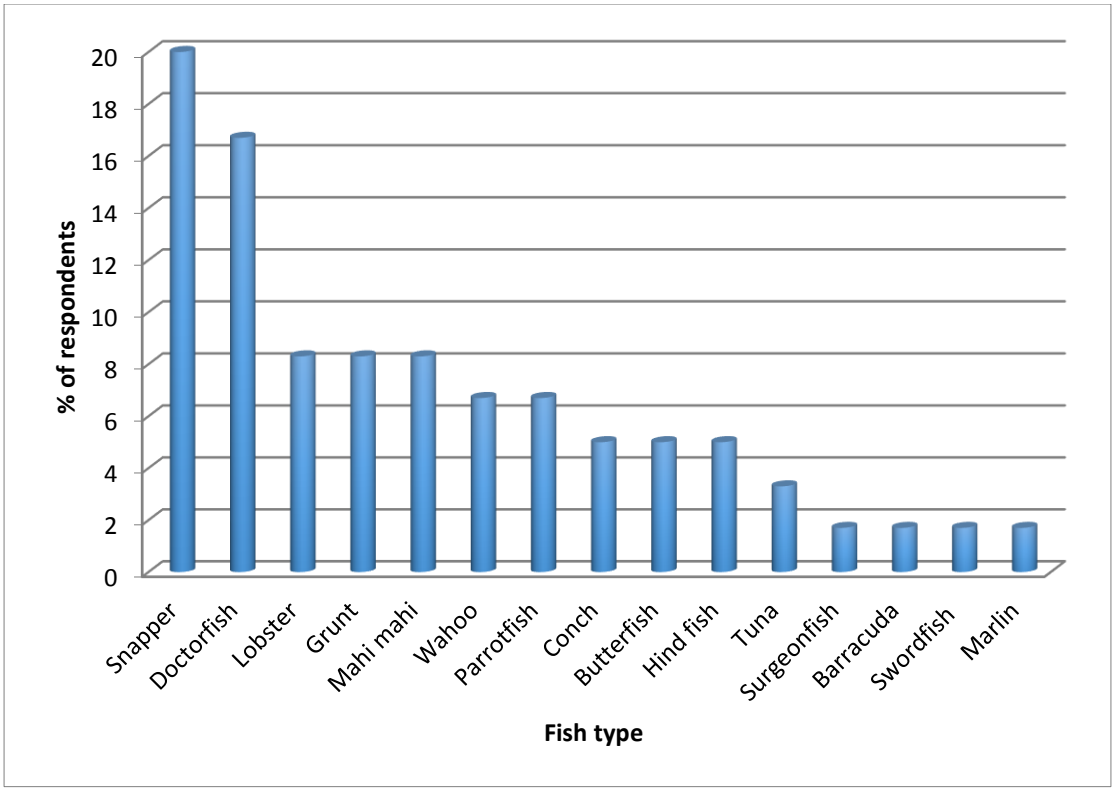

Figure 28 Range of fish species caught by fishermen in the Narrows (n = 60)

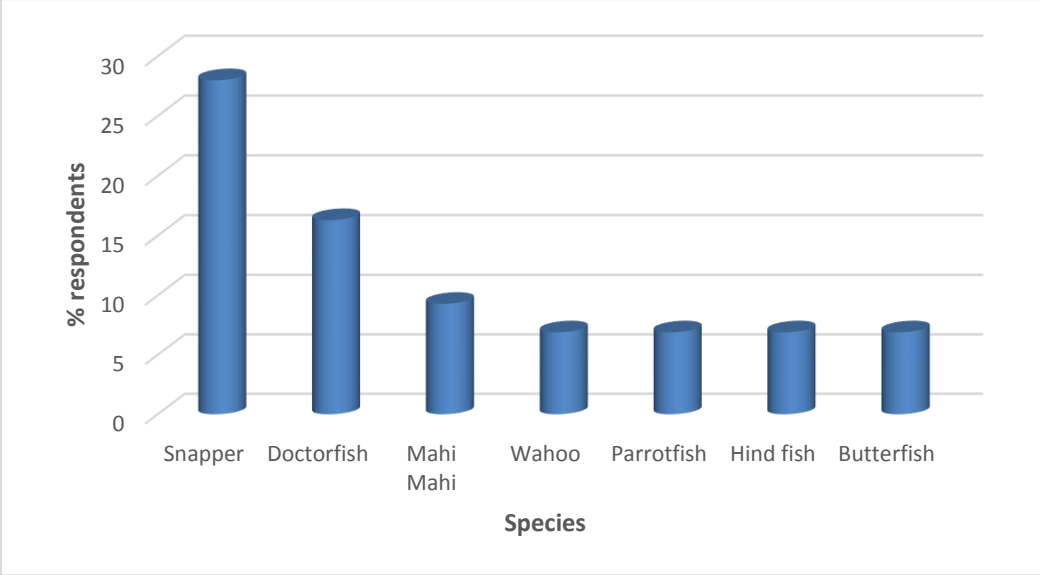

Figure 29 Range of species caught by quantity (n= 43)

Fishermen were also asked to provide information on the types of gear used to catch these species. The three most common types of gear used are traps (46.5%), lines (27.9%) and dive gear (11.6%). Smaller proportions of fishermen spearfish (7%), use Fish Attracting Devices (FADs, 4.7%) and seine nets (2.3%).

Respondents were asked to state the locations where they obtain the majority of their catch. The most common fishing location was open water, with 50% of fishermen using this area (Figure 31). The reef was the second most common location, accounting for 45.2% of fishing locations, while the bay was the least used by respondents, with only 4.8% fishing in this area.

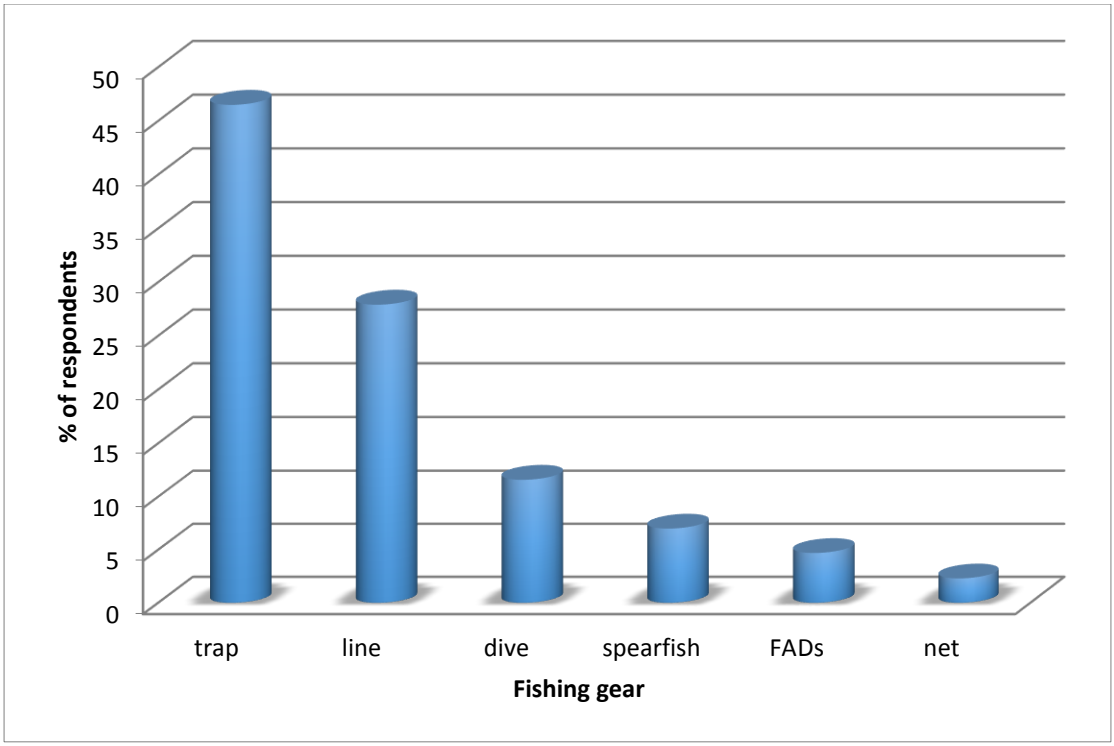

Figure 30 Type of fishing gear used by fishermen in The Narrows (n = 43)

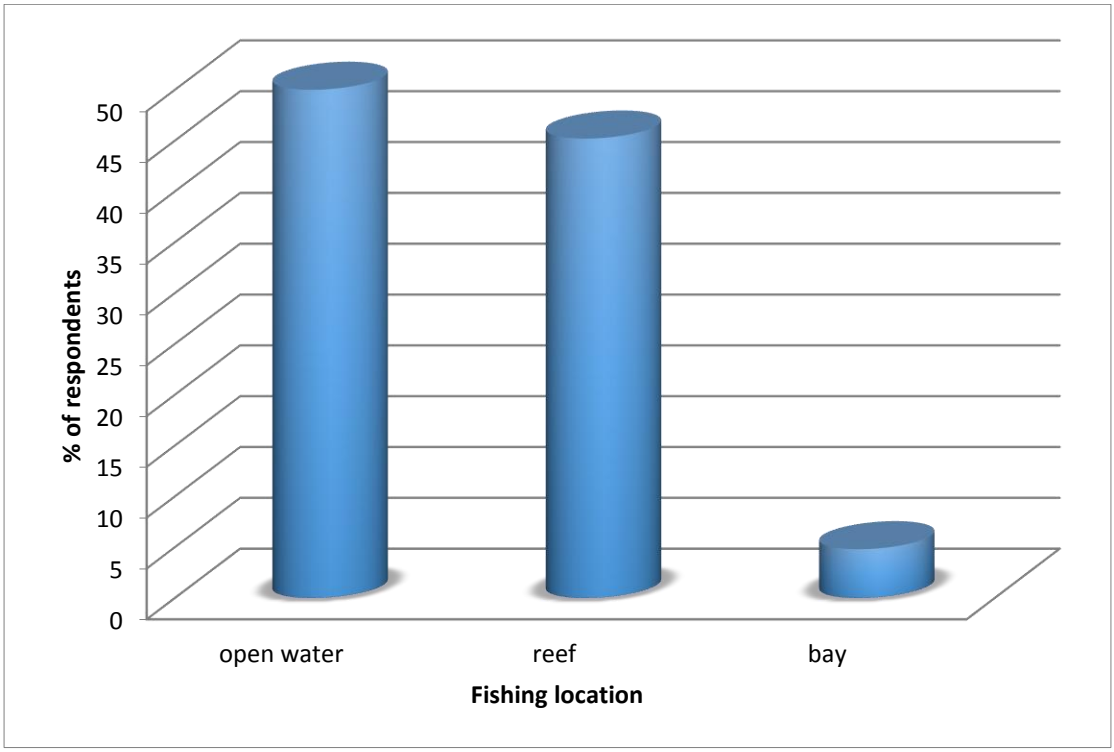

Figure 31 Fishing locations used by fishermen in The Narrows (n = 42)

3.3.4 Perceived change in number of people using The Narrows and change in catch

Fishermen were asked to describe any change in the number of people using the Narrows for various activities over the past five years (Figure 32). The majority of respondents surveyed perceived increases in numbers of persons engaging in watersports (73%), spearfishing (62.2%), turtle watching (51.4%), diving (43.2%), snorkeling (40.5%) and sailing/yachting

(37.8%). With respect to diving, snorkeling and sailing/yachting, it should however be noted that fishermen's views on change in usage of the area was somewhat mixed. Although most fishermen (43.2%) felt there had been an increase in the number of people diving, there those who thought there had been no change in usage of the Narrows five years ago (37.8%). Similarly, an equal proportion of persons to those who perceived an increase (i.e. 40.5%) felt that the number of persons engaged in snorkeling remained the same since 2012 (40.5%). Additionally, a similar proportion of fishers (35.1%) to those who believed there had been an increase (i.e. 37.8%) were uncertain (did not know) about any change in usage (Figure 32).

Perceived decreases in the number of persons using the Narrows were observed overall by the majority of fishers for beach seining and turtle fishing activities (75.7% each), pot fishing (67.6%), and line fishing (43.2%). It should however be noted that there was some division in perceived usage related to line fishing, in which a fairly significant proportion of respondents (32.4%) believed there were more persons engaged in this activity currently than in 2012 (Figure 32).

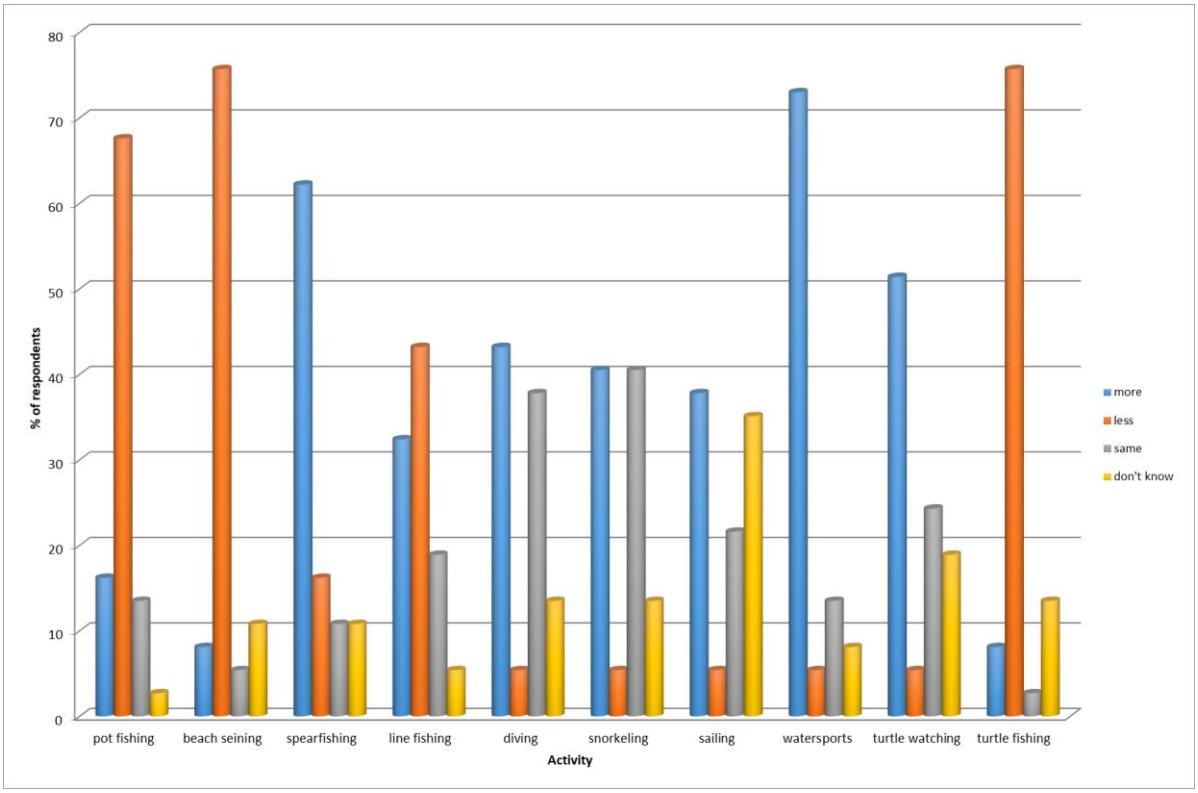

Figure 32 Perceived changes in usage of The Narrows (n = 37)

When asked to describe the trend in their fish catch over the past five years, the majority of fishermen (63.2%) stated a decline, while 28.9% observed no change and 7.9% noticed an increase (Figure 33).

Fourteen varied reasons were provided by fishermen to explain their trends in catch over the past five years. Of the top four reasons, overfishing was given by the majority of fishers (20%) as the main cause changing fish catch. 12.8% of fishers believed that climate change, habitat degradation (particularly of coral reefs) and fishing knowledge (knowledge of good fishing grounds and locations, experience) were also responsible for perceived trends (Figure 34).

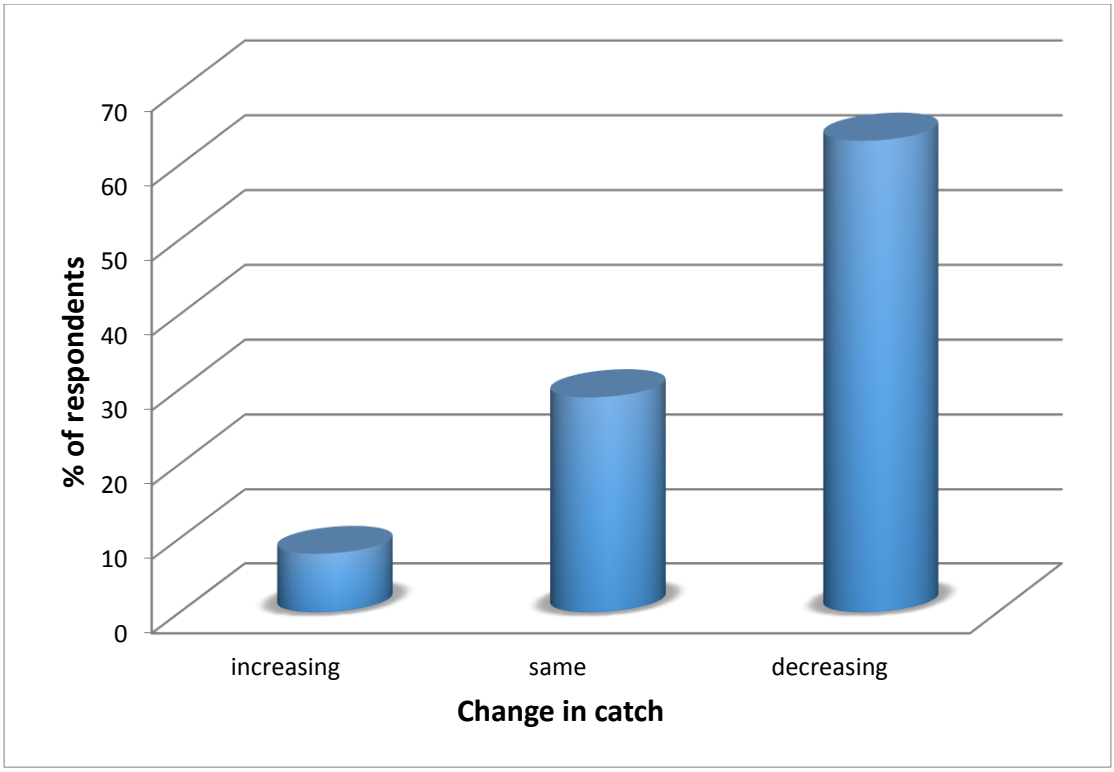

Figure 33 Trends in fish catch within the last five years (n = 38)

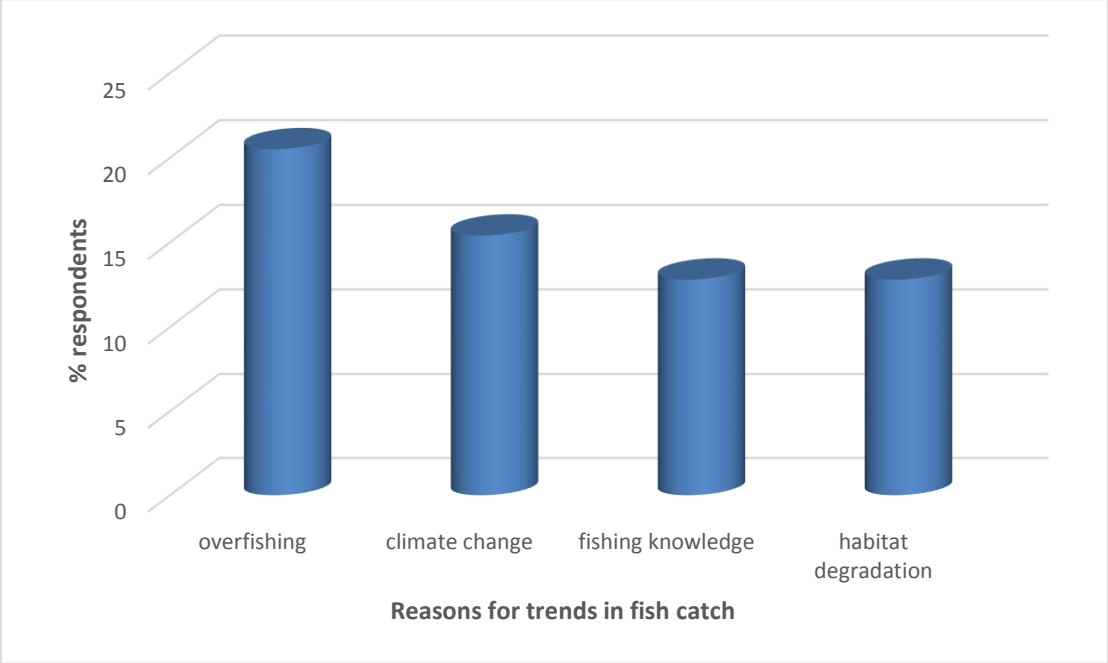

Figure 34 Suggested reasons for changes in fish catches observed over last 5 years (n = 39)

3.4 Demographics

3.4.1 Gender, age and education level

All respondents surveyed were males, the majority of which (36.8%) were between 50-59 years old. Combined, most fishermen fell within the 40-59 age range (60.5%). Only a minority of fishers interviewed were between 20-29 years old (2.6%) or 70-79 years old (7.9%). See Figure 35. The highest level of education attained by most of the respondents (47.4%) was that of a primary level, while a fairly significant proportion (39.5%) had received up to a

secondary level of education. The attainment of an A-level/college/associate degree was lower in comparison with only 10.5% of individuals achieving this, while just 2.6% had a university degree (Figure 36).

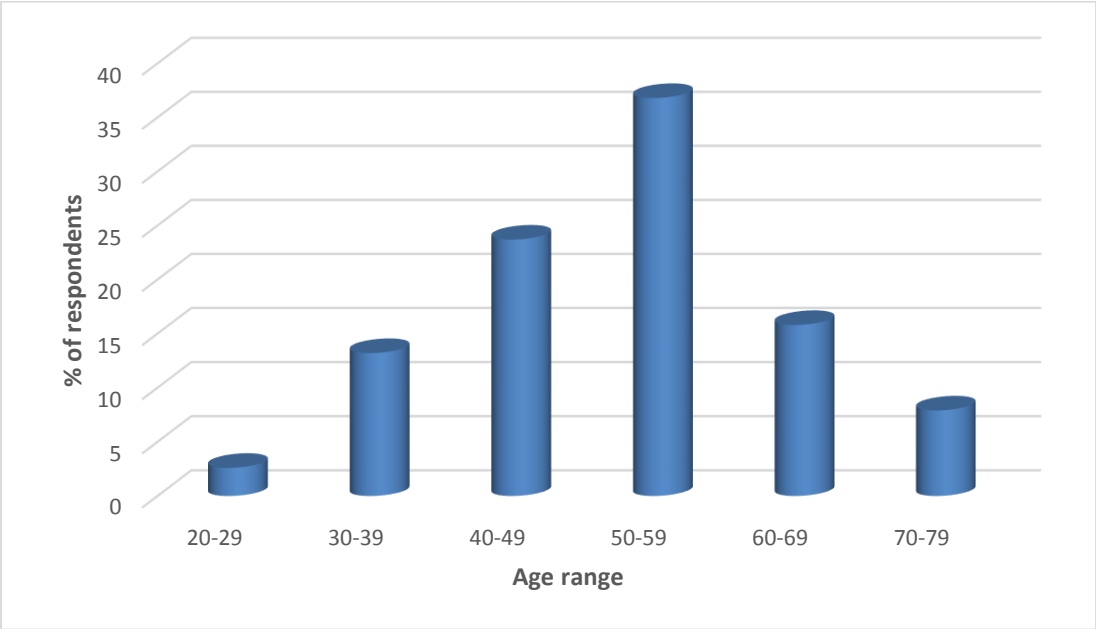

Figure 35 Age composition of respondents using a 10-year range (n = 38)

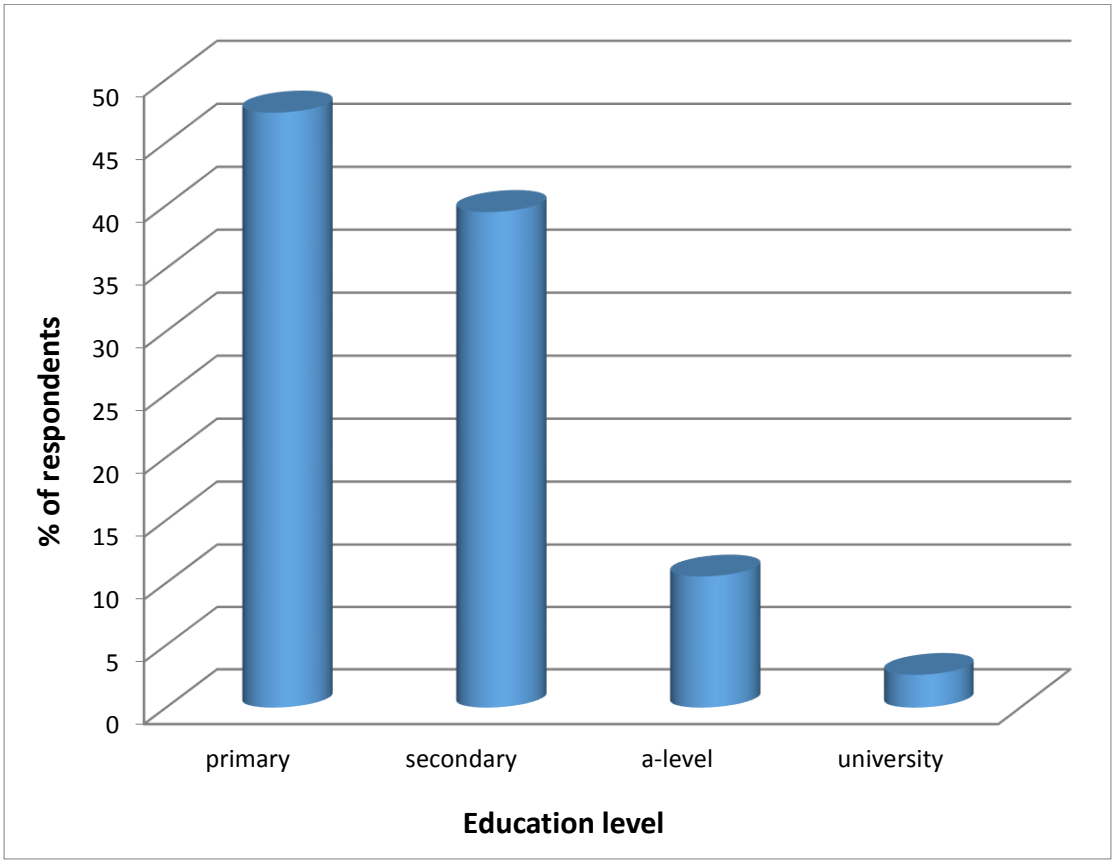

Figure 36 Current level of education (n = 38)

3.4.2 *Primary and secondary income sources*

The majority of respondents (60.5%) indicated fishing to be their main source of income. A smaller percentage of persons (13.2%) indicated that skilled construction trade (including masonry) was their primary income source. Government work and skilled industrial trade (including plumbing and landscaping) were each found to be the main source of income for 7.9% of respondents each. The remaining sources of income included the hospitality service (bartending), agriculture, business (vehicle rental) and income from pensions, all of which accounted for 2.6% each (Figure 37).

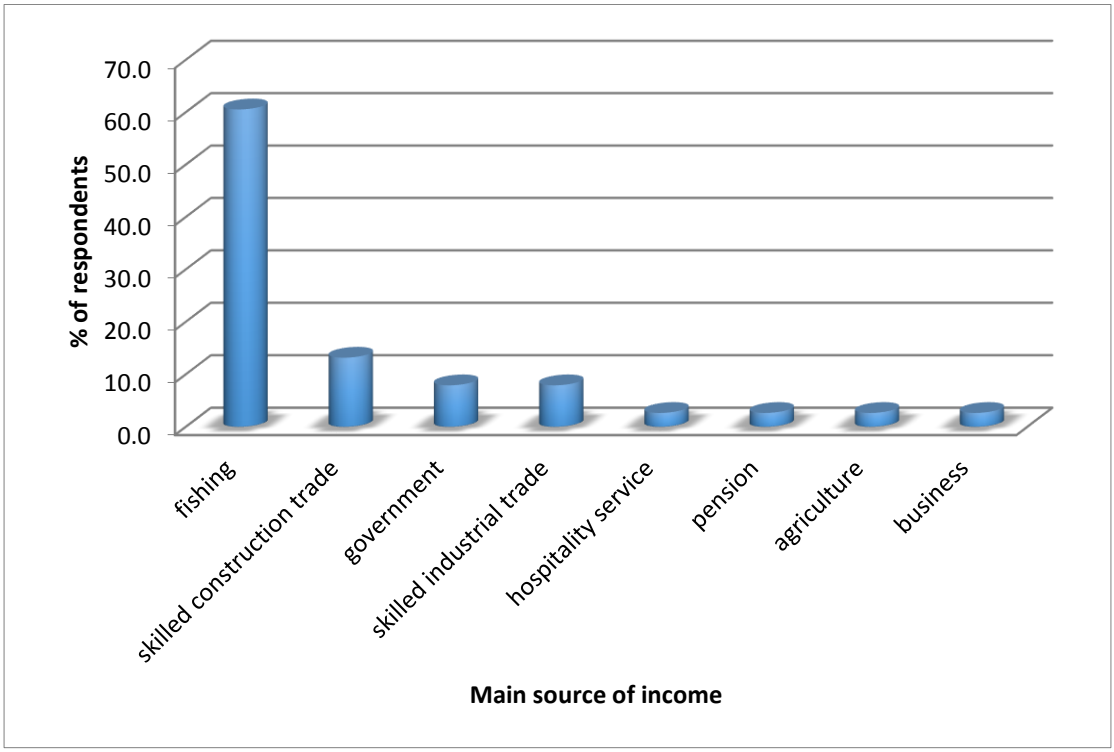

Figure 37 Activities which provide the main sources of income for respondents (n = 38)

Fishing was found to be the secondary source of income for most persons interviewed (39.5%). Almost one-quarter of all persons surveyed have no secondary source of income (23.7%). The skilled construction trade provides 18.4% of respondents with another source of income. Only a minority of persons depend on the skilled industrial trade and business (5.3% each); and transportation services (drivers), dive industry (SCUBA tank filling) and agriculture (2.6% each) as other income sources (Figure 38).

Figure 39 shows the proportion of respondents' income that is derived from activities within the Narrows. The majority of fishers (34.2%) derive 75%-100% of their income from activities within the Narrows, while 23.7% earned less than 25% of their income from the area. 21.1% of individuals reported to earning 25%-50% and 51-75% of their income from The Narrows.

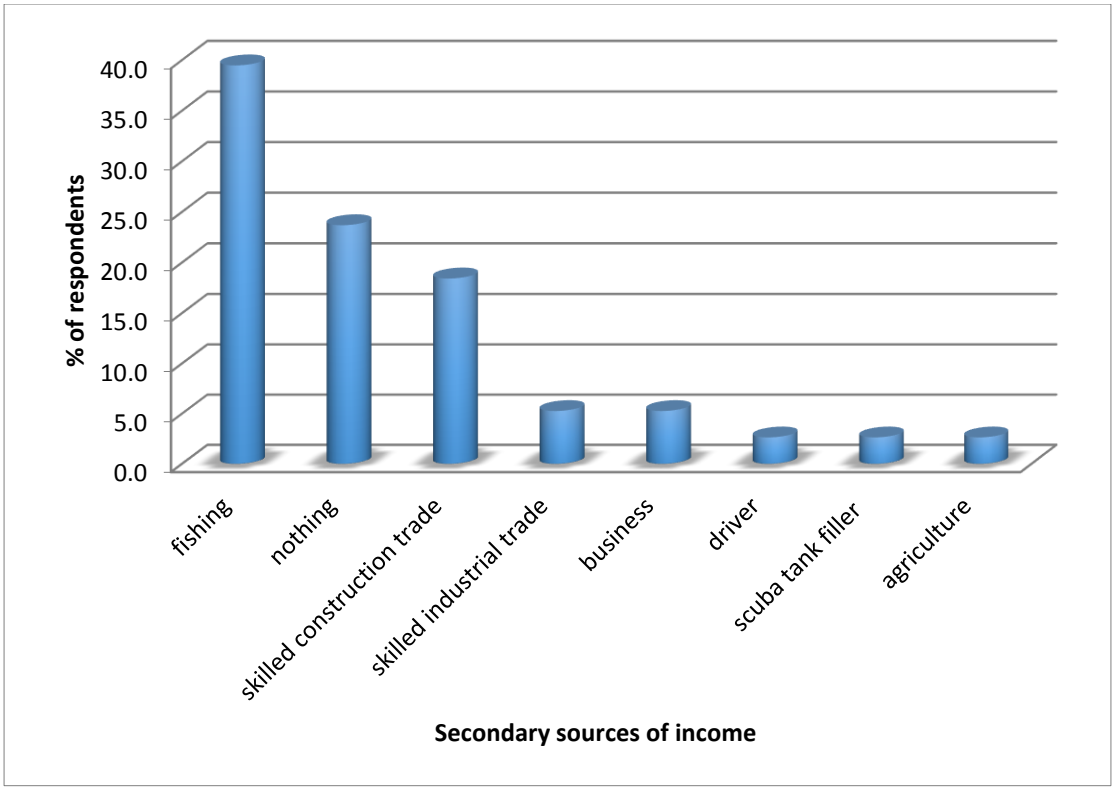

Figure 38 Secondary sources of income (n = 38)

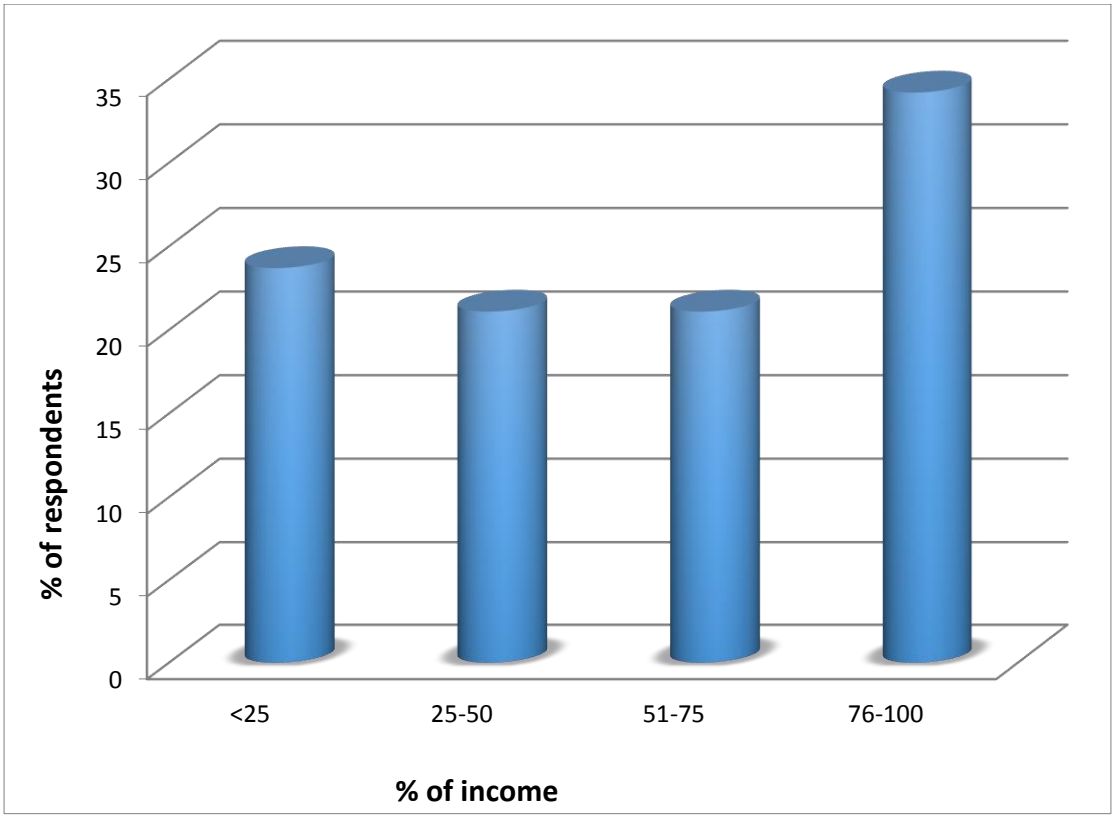

Figure 39 Proportion of respondent income derived from activities in The Narrows (n = 38)

4 RESULTS – KEY INFORMANT INTERVIEWS

The key informant interviews were conducted to gather data to inform the development of SocMon Spatial outputs. However, since only four key informants were interviewed and challenges with data collection, data analysis and spatial analysis limitations were experienced, the SocMon Spatial component of this study was inconclusive.

The major challenge experienced with spatial data collection was the lack of time to complete this component of the assessment. Given the prioritisation of the fisherfolk surveys within the five-day site visit, and the difficulty in locating enough fishers to reach the required sample sizes for each primary fish landing site within the study area, this resulted in even less time being available to conduct key informant interviews.

Regarding data quality, the mapping exercises from the Narrows study sites did not provide enough feature or attribute data to construct a geodatabase. However, along with the challenge of limited data, the mapping exercise outputs were not able to accurately represent their related features. For example, in Figure 40, the respondent highlights fishing areas and threats with small markings that do not provide accurate representations of the full extent of fishing activities. Not only does mapping of activities like fishing require clear and accurate representation of extents, it requires that all respondents use comparable representations. The respondents utilized different representation styles and as a result, much of the spatial data cannot be combined to represent the same features.

For instance, a line covering a specific area cannot be combined with dots in another or a polygon covering the same area. In trying to determine the area used by all respondents it is best to gather information that highlights the full extent of the area used. Points can be effectively used to represent features like point sources of pollution but may be ineffective for defining entire areas affected by pollution.

Figure 40 Spatial field data collection map showing small markings used to identify fishing areas and threats

No geostatistical or geospatial analysis functions could be conducted using the data collected due to the challenges presented by the provision of limited datasets. In scenarios where data limitations exist, polygons may be expanded or contracted based on the descriptive data collected through key informant interviews, however, the mapping exercise outputs do not provide enough descriptive information to conduct such extrapolation.

Although the spatial component of the SocMon assessment was not successful, the results of the four key informant interviews are still provided here for completeness of the assessment.

Those interviewed have been involved in fishing for an average of 33 years. 75% of key informants did not provide fishing location ranges as would have been necessary to accurately spatially map the extent of fishing area within the Narrows. Monkeys, Sand Bank and Butler's were fishing grounds popular with one fisher. Conflicts between SCUBA and fishing, particularly related to pot fishing, seem to be important. Exact areas of conflict were not provided but one key informant noted the potential for conflict exists wherever pots are placed. Another mentioned he had a number of his moorings cut a few times at various spots within the study area. Overfishing of juvenile conch and lobster and sediment runoff from construction on land were identified by two persons as major issues in the area.

A variety of resources were identified as being of importance within the Narrows including ecosystems such as coral reefs and seagrass beds, pelagic species such as wahoo, mahi mahi and barracuda, as well as lobster, conch and bait fish. Other species of importance included eagle and sting rays, turtles (hawksbill and green) for the tour industry. These resources were important to the key informants as they formed the basis of their commercial and sport fishing, and dive tour livelihoods.

The enforcement of zonation and establishment and implementation of the park were suggested by 75% of key informants as areas of management focus that should be a priority for management. One key informant suggested a temporary fishing ban on small lobster and conch.

These results reflect similar perceptions and views by fishers who were surveyed.

5 DISCUSSION

This section was developed by the University of the West Indies Centre for Resource Management and Environmental Studies (UWI-CERMES) in the absence of information on the activities in which the Department of Marine Resources (DMR) is engaged with respect to the St. Kitts Marine Management Area (SKN MMA) and The Narrows which it encompasses. Due to work commitments, SocMon team members from the DMR were unable to contribute to this section. As such this section is general in content.

It is important to note that the Narrows is an area within the larger St. Kitts and Nevis Marine Management Area (SKN MMA) not an MMA by itself. The SKN MMA has a total of five priority use zones. Within The Narrows area there are three of these priority use zones; conservation, fisheries and recreation. The multi-use nature of The Narrows makes the area a critical one for sustained management and monitoring (both socio-economic and ecological). Integrated monitoring of The Narrows will help to inform and guide management of the area.

This socio-economic assessment is the second of its kind in which the SocMon methodology was applied to The Narrows. Whereas the 2008 SocMon assessment targeted fishers, small business operators, and households, the 2017 assessment focused only on fishermen. The original intent however was to include a wide range of primary and secondary stakeholders of The Narrows – fishers, hoteliers, tour/dive operators, water taxi/ferry operators, hospitality sector and coastal development. However due to the growing work commitments of the St. Kitts and Nevis SocMon team and therefore a lack of capacity to undertake a full (encompassing varied stakeholder groups) assessment in a relatively short period of time, fishers were deemed to be the most important for data collection.

In general, the primary data collection activity achieved the site monitoring goal of collecting socio-economic and marine resource data to promote sustainable use of resources, management and education in The Narrows. The data and information collected will be useful in providing additional information on perceptions, levels of awareness and attitudes of

stakeholders for decision-making with respect to managing the multi-use area of The Narrows and the SKN MMA in general.

The data collection activity was not successful in attaining the sample sizes required for a statistically representative sample of fishers within The Narrows, but the information is important in providing an understanding of the awareness and perceptions of this stakeholder group. It is recommended that this assessment be repeated in about 3-5 years with a statistically representative sample for statistically accurate results.

5.1 Demographics

As was highlighted by Arthurton and McDonald (2010), The Narrows is of extreme importance to the livelihoods of the people, especially fishers, from St. Kitts and Nevis for various reasons. More than half of the individuals surveyed reported earning 50% or more of their income from activities within the area. Fishing was found to be the leading activity from which individuals derive the majority of their income. In addition, fishing was also a secondary source of income for approximately 40% of respondents. Although most fishers and their families make a living from The Narrows only 2-3 days per week, the level of dependency on the area is significant since persons utilize the area continuously (every day of the week). Half of the fishers combined have a long association, between 30-49 years, with the fisheries sector, and it may be assumed, The Narrows too. Due to this apparent high level of dependency on and connection with, The Narrows, any fishery management measures implemented within the area or the SKN MMA in general, has the potential of affecting the livelihoods of fishers. Therefore livelihood dependency should be taken into account in decision-making and the management authority should continue to include fishers in the sustainable management of the area.

Similar also to the 2010 SocMon study, the highest percentage of fishermen was between the ages of 50-59 with very relatively few individuals below the age of 40, indicating the aging population of the fishers. Measures and attention should therefore be put in place to attract and appeal younger persons to fishing for the continuity of this industry while encouraging sustainable fishing practices.

There is a fair level of education among the fishers surveyed with just under half of them having a primary education and greater than one-third attaining a secondary level of education. The educational level of fishers should continuously be taken into account in all efforts by the management authority to engage them in management of the area.

Although educational level may be considered fair, overall, fishers have a high awareness of the importance and value of ecosystems, and coastal and marine resources (particularly reefs, and seagrass beds); the interdependence of fishing and ecosystems; and the importance of management measurements for sustainable use of resources. Most have a strong desire to protect ecosystems and resources for future generations. Fishers however could benefit from educational initiatives targeting mangroves since there was some uncertainty regarding the interconnectedness between this ecosystem and its value to fish stocks, and the fisheries sector in general.

5.2 MMA knowledge and perceptions of resource conditions

Fishers mainly associate marine management areas with losses or increases in livelihoods, and the protection of coastal and marine resources. This indicates a high understanding of the impacts of these management tools.

The majority of fishermen expressed a perceived change in resource conditions within the narrows over the past 5 years. In general, fishers perceive that the condition and abundance of coastal and marine resources – mangroves, seagrasses, coral reefs, beaches, conch, lobster

and reef fish - have declined from 2102 to 2017. Declines were marked for all resources, except coral reefs, for which a small positive increase in condition from 2012 to the present was perceived. It should be noted however that perceptions of reef condition were the most uncertain of all other resources examined. Most persons believed they were in neither good nor bad condition over the five-year period.

Of all the ecosystems investigated, fishers considered seagrasses to be in better condition (very good or good) than coral reefs and mangroves in 2017. Responses clearly show fishers not to be well acquainted with mangroves with the overwhelming majority of persons unable to provide an indication of their current condition.

Overall, fishers believe conch to be more abundant currently (in 2017) than either lobster or reef fish. Lobster abundance was perceived to be slightly better than reef fish abundance. It should however be noted that perceptions of 2017 abundance of these resources was more mixed than perceived conditions in 2012.

A decline in abundance of parrotfish, conch and lobster was perceived over the five-year period of interest while the long-spine black sea urchin was believed to have increased in abundance. The perceived increase in abundance of the black sea urchin compares well with results from the Coral Reef Report Card for St. Kitts and Nevis, which reported an increase in number of urchins seen in 2015 compared to 2011 when the first national coral reef survey was conducted. These results were suggestive of urchin recovery on some reefs. Since black sea urchins *(Diadema)* are grazers, they clean algae off reefs, providing space for coral recruits resulting in increased coral cover on reefs. No change in size of parrotfish and urchins was perceived by fishers over the period 2012 to 2017. It should be noted that the 2016 Coral Reef Report Card for St. Kitts and Nevis reported small sized parrotfish (6-10 cm), with few large individuals (results compiled from the 2011 national reef survey). Fishermen were not asked to provide an estimate of the current size of parrotfish therefore it is impossible to infer whether fishermen believe parrotfish to be small or large in size in the Narrows and how this relates to their perception of no change in size of the species over the last five years. In future socio-economic monitoring, it would be prudent to obtain size estimates for comparison with biological data.

Views on size were more mixed for conch and lobster. In both cases even though most fishers felt these species had not changed in size, significantly large proportions thought there had been a decrease in size. This warrants investigation.

Declining conditions perceived by fishermen compares fairly well with Reef Health Indices as outlined in the St. Kitts and Nevis Coral Reef Report Card 2016 for Nevis West (Subregion 38) and Nevis East (Subregion 39) both of which encompass The Narrows (Kramer et al. 2016). The overall Reef Health Indices for both these Subregions were scored as “poor”.

The RHIs provide the following information on a number of indicator species surveyed and indicates “poor” coral cover of 5 – 9.9% and poor reef condition due to abundant levels of fleshy macroalgae (>25%) for both Subregions. Commercial fish biomass was rated as “poor” in Subregion region 38 and “critical” in Subregion 39 with biomass values between 420-839 g/100m^2 and < 420 g/100m^2, respectively. Healthy reefs (those in good or very good condition) have reference values of 1260 - ≥ 1,680 g/m^2 for commercial fish biomass.

Although fishers perceived a decline in parrotfish, the RHI scores for herbivorous fish biomass were “fair” (1920-2879 g/100m^2) in Subregion 38 and “very good” (≥ 3480 g/100m^2 in Subregion 39.

This perceived decline in resource condition seems to be a continuing trend from the 2008 SocMon assessment in which fishers also felt there had been a worsening in the condition of fisheries resources over a five-year period. The recent establishment of the St. Kitts and Nevis

Marine Management Area with its priority use zones should result in improving conditions within The Narrows and the Federation overall once management measures are implemented and enforced and key stakeholders are involved in management.

The general observation of a decline in fish catch over the past five years by the majority fishers supports fisher perception and ecological data that indicate declining resource conditions over this time-frame.

As might be expected, the condition of the marine environment is important to fishers for their livelihoods, relaxation and for its existence value. As such the management authority should continue to build relationships with all fishers in the area, engaging them in management and decision-making.

5.3 Problems affecting The Narrows and suggestions for improving resource conditions

Similar to the results of the 2008 Narrows SocMon assessment, unsustainable fishing was thought to be a major problem affecting the area. The Department of Marine Resources has the Fisheries, Aquaculture and Marine Resources Act and complementing regulations to allow for the necessary enforcement actions that may alleviate this issue.

In the current assessment, climate change and user conflict were also thought to be problems within the area. The latter also seems to be a persistent problem in the highly and diversely used Narrows area. In the 2008 SocMon, fishing gear theft, cutting of buoy lines and interference by yachts were all provided as issues resulting from conflict among uses in the area. The establishment of an MMA, implementation of fish size limits within The Narrows, increase in net size and banning of spearfishing are all thought by fishers to be means of mitigating the perceived issue of unsustainable fishing in the area. With the recently launched SKN MMA, unsustainable fishing practices should be reduced considerably if management is effective. The zonation of the SKN MMA should assist in improving marine and fisheries resource condition and the perceived decrease in abundance of certain species in The Narrows. A large conservation zone comprising the majority of The Narrows should alleviate fishing pressure on fishery resources and result in increased abundance of resources such as paorrotfish, reef fish, lobster and conch through replenishment to areas adjacent to this zone once users comply with rules and regulations for the area. The fisheries zone to the east of The Narrows should also aid in reducing the instances of user conflict experienced by fishers.

5.4 Support for resource management

Generally, there is high support among fishermen for the implementation of management measures for the protection of parrotfish, long-spined black sea urchins and coral reefs in The Narrows. This could be interpreted as a sense of stewardship fishermen have towards the resources they are dependent on. It also could indicate their awareness of the importance of and value of such resources to their livelihoods and to overall ecosystem functioning, and therefore their willingness to support management efforts that would aid in resource protection and recovery. It is likely that with such a sense of stewardship among fishers at this time, any temporary management measures implemented by the management authorities would be met with cooperation from this stakeholder group.

All fishermen interviewed would support measures to protect coral reefs in the area. This is a particularly striking result and could be attributed to the uncertainty fishers feel about the current condition of reefs in The Narrows. Support for management of the black sea urchin may be due to the fact that there is no fishery for the resource in St. Kitts and Nevis, hence fishers would not be impacted by any measures implemented to manage and aid recovery of this species. Due to the importance of parrotfish to the reef complex and fishers support of

size restrictions and closed areas for research to increase population abundance and recovery of this species, the management authority should investigate and move to implement these management measures in The Narrows.

5.5 Management effectiveness

Management activities are varied and can involve awareness-raising and educational campaigns to promote the benefits of coastal and marine resources and ecosystems, and their sustainable use and protection to livelihoods and life in general. Management activities often also involve monitoring conditions and use of coastal and marine resources against which to measure trends of impacts from users and changing weather and climatic conditions. Management efforts also involve the enforcement of rules and regulations for the conservation, protection and sustainable use of resources. Engaging stakeholders in management and decision-making is also a crucial activity for successful and effective management.

There seems to be a high level of awareness, and therefore it is assumed, good understanding of, the rules and regulations pertaining to marine and coastal activities in The Narrows, particularly fishing, tourism and marine transportation. There is a trend of high awareness of rules and regulations among this stakeholder group. Results of the 2008 SocMon assessment, also indicated high awareness of existing rules and regulations governing usage of coastal and marine resources in The Narrows. This augers well for future management of the SKN MMA and The Narrows and indicates that the management authorities have been successful in awareness-raising activities. The more aware users are of, and have a good understanding of, the rules and regulations pertaining to the uses of coastal and marine resources, the more likely they are to comply with these legal measures, and the easier and more effective management will be and the more successful the MMA/MPA will be. Since the level of understanding of rules and regulations was not measured in this study, in future monitoring, it is recommended that this indicator should be captured for more complete data.

In spite of the apparent high level of awareness of rules and regulations pertaining to marine activities in The Narrows, there is a perception among fishers of poor compliance with those rules and regulations regarding fishing. This could indicate that although fishers are aware of certain fishing regulations, they may not agree with or like them. This will be a challenge for the management authorities and should be addressed. Lack of compliance does not only negatively impact the marine and coastal resources, but the will affect the management authorities' ability in gaining stakeholder support for management. If it is widely perceived that people are not complying with rules and regulations, then it will be difficult to gain trust, support, participation or compliance. This information should be monitored to determine the effect management has had on trends in attitudes and perceptions of stakeholder groups. If compliance begins to increase, then this may be reflected in people's perceptions of compliance. If compliance does not increase over time, then the management authority will have to raise awareness about the benefits of complying with rules and regulations and should increase enforcement initiatives (Bunce and Pomeroy 2003).

Most fishers perceive there to be full or good compliance with coastal development and marine transportation regulations.

Although fishers say that their participation, and that of their families, is high in events organized specifically relating to co-management of The Narrows, there was division among them on whether they thought enough was being done to encourage stakeholders to participate in co-management of the area. This could indicate that although fishers attend events related to management of The Narrows, they may not be involved or actively participate in management activities and decision-making. The active participation of stakeholders in coastal management decision-making can improve the success of coastal

management activities. If stakeholders are more involved in coastal management decision-making and feel ownership over the process, they are more likely to support coastal management activities. Stakeholders are important to support and sustain coastal management (Bunce and Pomeroy 2003).

There has been a long-standing desire among fishers to be engaged in co-management of The Narrows. Since the 2008 SocMon study, fishers have felt that they could work together with government to solve the problems in The Narrows and were supportive of The Narrows being managed by the government and a group such as an NGO, Fisheries Cooperative etc.

5.6 Socio-economic activities within and use of The Narrows

There is a long-standing tradition of fishing in The Narrows. Most fishers have been engaged in the fishing sector for between 30 to 49 years. This is comparable to the results of the 2008 SocMon assessment in which most fishers had been fishing in The Narrows for greater than 10 years. A fair level of dependency on The Narrows also exists among fishers and their household members with most spending between two to three days per week earning a living from the resources within the area. Fishing activity has remained relatively similar since the 2008 SocMon study in which fishers indicated they spent at least two days per week fishing in the Narrows.

Additionally, fishing was found to contribute to the livelihoods of all of the respondents and was thus the main and most important livelihood activity among the group. It should be noted however that persons make a living from other marine-based and land-based activities in the area.

The socio-economic importance of The Narrows to fishers and therefore their high dependency on the resources of the area need to be taken into account during the implementation of any management measures in The Narrows and the SKN MMA since there is the potential for this stakeholder group to be impacted.

The number of people using The Narrows for a range of activities – watersports, spearfishing, turtle watching, diving, snorkeling, sailing/yachting – is thought to have increased since 2012. Management must be aware of this and must seek to determine the carrying capacity for the area. The zonation of the SKN MMA should help to alleviate conflict among so many different users.

Fishers have also observed decreases in the number of persons using The Narrows for beach seining and turtle fishing activities over the last five years. This is a positive change given the potentially negative impacts of beach seining (undersized fish, non-target species, no or limited marketable catch) and detrimental effect of turtle harvesting.

6 RECOMMENDATIONS FOR MANAGEMENT

The following recommendations for management are based on the results of this socio-economic assessment and are those received from the DMR based on initial review of the SocMon results.

- There is a need for management plans to be drafted for the zones within SKN MMA.
- Declaration or enactment of closed seasons for vulnerable species.
- Compliance with the rules encouraged by the users as initial enforcement measures, then stronger long term enforcement as the appropriate legislation is now in place.
- More frequent coastal patrols are needed for monitoring, control and surveillance of the marine management areas.

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8 APPENDICES

Appendix 1: SocMon workshop participants

SocMon Capacity Building Workshop for The Narrows
16-18, 28-29 November 2016

Surname	First name	Position	Organisation
Browne	Nikkita	Oceanography and EIS Officer	Department of Marine Resources
Greaux	Tricia	MMA & HM Officer	Department of Marine Resources
Hodge	Janice	ECMMAN IPC	ECMMAN
Moore	Danielle	Outreach Coordinator	Nevis Historical Society
Stubbs	Marcia	Education & Compliance Officer	Department of Marine Resources
Ward	Thema	Physical Planning Officer	Physical Planning, Natural Resources & Environment (Nevis)
Wilkinson	Clive	Fisheries Officer	Department of Fisheries (Nevis)

Appendix 2: Workshop training programme (SocMon methodology)

ECMMAN Socio-economic Monitoring for Coastal Management (SocMon)
Capacity Building Workshop for
The Narrows
Nevis Cooperative Credit Union Conference Room, Charlestown, Nevis
16-18 November 2016

SOCIO-ECONOMIC MONITORING FOR COASTAL MANAGEMENT (SOCMON) PROGRAMME

Day and time	**Activity**
Wednesday [16 November]	
9:30 -10:00	Welcome and introduction to SocMon training component SocMon participant introductions Workshop goals and objectives Workshop schedule Workshop expectations
10:00 – 10:30	Introduction to the Global SocMon initiative and SocMon Caribbean Overview: The Six Steps to SocMon
10:30 – 10:45	***BREAK***
10:45 – 11:00	Case study – Canaries, St. Lucia
11:00 – 11:15	*Situation overview:* The Narrows
11:15 – 12:00	**Group work: Site monitoring plan development** *SocMon preparatory activities for socio-economic assessment and monitoring* - Goals and objectives for monitoring; - Boundaries for monitoring; - Identification of stakeholders; - Location of stakeholders and key informants; - SocMon team *(SocMon Preparatory Activities Worksheet, pages 1-4)*
12:00 – 1:00	***LUNCH***
1:00 – 1:30	**Group work: Site monitoring plan development contd.** *SocMon preparatory activities for socio-economic assessment and monitoring* - Goals and objectives for monitoring; - Boundaries for monitoring; - Identification of stakeholders; - Location of stakeholders and key informants; - SocMon team *(SocMon Preparatory Activities Worksheet, pages 1-4)*
1:30 – 3:30	Field trip to The Narrows for field scoping and de-brief on site

1

Day and time	Activity
Thursday [17 November]	
9:30 – 9:45	Review of Day 1 The Narrows field scoping discussion
9:45 – 10:30	Introduction to field data collection methods: - Secondary sources of data - Semi-structured interviews (key informants) - Structured surveys (household) - Group interviews - Focus groups - Visualisation techniques
10:30 – 10:45	***BREAK***
10:45 – 12:00	**Group work: Site monitoring plan development continued** *SocMon preparatory activities and planning for socio-economic assessment and monitoring* - Review and compile available sources of secondary data, including secondary spatial data; - Identify secondary data sources - Select SocMon variables for monitoring; - Determine gaps in information *(SocMon Preparatory Activities Worksheet, pages 4-14)*
12:00 – 1:00	***LUNCH***
1:00 – 3:30	**Group work: Site monitoring plan development continued** *SocMon preparatory activities and planning for socio-economic assessment and monitoring* - Review and compile available sources of secondary data, including secondary spatial data; - Identify secondary data sources - Select SocMon variables for monitoring; - Determine gaps in information *(SocMon Preparatory Activities Worksheet, pages 4-14)*
Friday [18 November]	
9:30 – 9:45	Review of Day 2
9:45 – 10:00	Data analysis - How to analyse data - A quick look at developing key informant narratives Examples of displaying assessment results
10:00 – 10:30	**Group work: Site monitoring plan development continued** *Planning for field data collection* - Determine data collection methods to be used, type of sampling and sample sizes; - Formulate semi-structured interview guides for key informants; - Develop household interview survey, coding sheet and data table; - Select and develop visualisation techniques for data collection. *(SocMon Preparatory Activities Worksheet, pages 15-17)*
10:30 – 10:45	***BREAK***
10:45 – 11:15	Post data analysis: Validation and communicating results

Day and time	Activity
	Social Media Revolution 2015 video
11:15 – 12:00	**Group work: Site monitoring plan development continued** *Planning for field data collection* - Determine data collection methods to be used, type of sampling and sample sizes; - Formulate semi-structured interview guides for key informants; - Develop household interview survey, coding sheet and data table; - Select and develop visualisation techniques for data collection. *(SocMon Preparatory Activities Worksheet, pages 15-17)*
12:00 – 1:00	***LUNCH***
1:00 – 3:00	**Group work: Site monitoring plan development continued** - Communication plan essentials – Who, how and what?; - Develop workplan for site assessment; - Determine critical resources required for the assessment; - Develop the budget for implementation of the assessment *(SocMon Preparatory Activities Worksheet, pages17-20)*
3:00 – 3:30	- Key lessons learned by participants about SocMon - Implementing SocMon at The Narrows – activities for follow-up, challenges, issues, concerns - Workshop evaluation - Wrap-up

Appendix 3: Narrows SocMon site monitoring plan

Socio-economic Monitoring for Coastal Management (SocMon) Workshop

A workshop hosted by the
Climate Resilient Eastern Caribbean Marine Managed Areas Network (ECMMAN)
in collaboration with the
Centre for Resource Management and Environmental Studies (CERMES), UWI Cave Hill

The Narrows
Nevis Cooperative Credit Union, Charlestown, Nevis
16-18 November 2016

SocMon preparatory activities worksheets used to plan monitoring

These worksheets are *guides* to organising the preparatory activities for a socio-economic assessment or monitoring programme. They can be modified in any way you find useful. Other worksheets are in the GCRMN manual. Spreadsheets are often more convenient than word processing applications for working with tables of all types.

1 Introduction

You may use this worksheet to help structure your formulation of an ecosystem-based socio-economic monitoring plan for The Narrows. The worksheet forms the basis of your SocMon site monitoring plan. Feel free to provide explanations, where applicable, for your choices in each of the section notes.

Read the SocMon literature — GCRMN manual, Caribbean guidelines and climate addendum. Also read relevant literature on The Narrows and adjacent areas from which you can gather useful information on what should be monitored, how, when and where.

The socio-economic data and information from monitoring need to be useful for management planning, decision-making and adaptive management. A monitoring plan must take into account the local reality - available funds, human resource capacity and the demands of decisions. It has to prioritise particular variables to monitor, with good reasoning behind choices. When completing the worksheet, be sure to refer to the SocMon Caribbean guidelines and GCRMN manual for guidance.

2 Goals and objectives guiding socio-economic monitoring

Monitoring must have a goal and specific objectives for being undertaken. These are often based on management plans (e.g. fisheries, MPA, tourism) or other expressions of policy.

Monitoring goal	Monitoring objectives (up to three SMART ones)
Collect socio-economic and marine resource data to promote sustainable use of resources, management and education in The Narrows.	1. Promote awareness for biodiversity conservation and sustainable use of resources.
	2. Determine trends in management effectiveness.
	3. Determine trends in socio-economic benefits from resource use of coastal and marine ecosystems

Notes:

GCRMN Manual: Pages 19-20, 36-40

3 Defining the study area

Using the information on issues and stakeholders, define the geographic area appropriate for the study site (contains all or most critical activities/issues and stakeholders). Document the specific selection criteria that you used. Clearly identifying the study area is important in

identifying use patterns and potential threats to resources. The study area should include where the stakeholders live and work.

Study area selection criteria	Study area description (or attach area map)
Defined conservation and fishing zones	Conservation zone as defined from Nags Head (St. Kitts) to Cades Bay (Nevis) northeast to Booby Island. Fishing zone northeast of Booby Island to the two mile radius boundary. Landward extent: Cades Bay to Long Haul (Nevis) and Nags Head to Turtle Beach (St. Kitts)

Initial Study Area Map

Notes:

GCRMN Manual: Pages 26-28

2

4 Stakeholder identification

Stakeholder identification and selecting the boundaries for the study site are iterative processes. Start by identifying the activities in the area and then determine who the likely stakeholders are. Name their organisation, if any.

Study area activity or issue	Primary stakeholder [and organisation]	Secondary stakeholder [and organisation]
Fishing	Fishers FisherAssociations/Cooperatives	• Department of Fisheries (Nevis) • Department of Marine Resources (St. Kitts)
Tourism	Hoteliers Tour operators/divers Water taxi operators	• Restaurants • Watersports/recreation • Ministry of Tourism (Nevis) • Ministry of Tourism (St. Kitts) • Hotel and Tourism Authority • Department of Fisheries • St. Kitts Sea Turtle Monitoring Network • Nevis Turtle Group
Coastal Development	• Park Hyatt • Seabridge (Nevis) • Tamarind Bay development (including marina) • Christophe Harbour • Turtle Beach • Chrishi Beach • Reggae Beach • Spice Mill • Gin Trap • Oualie Beach Hotel • V. W. Amory International Airport • Nisbet Hotel • Proposed fish landing site (Herbert's Beach) • Candy Resort	• Department of Physical Planning, Natural Resources and Environment (Nevis) • Department of Physical Planning (St. Kitts) • Department of Environment (St. Kitts)

Study area activity or issue	Primary stakeholder [and organisation]	Secondary stakeholder [and organisation]
	• Scotch Bonnet condominiums • Mount Nevis Hotel • Marina's	
Research		• St. Kitts Sea Turtle Monitoring Network • Nevis Turtle Group

Notes:

GCRMN Manual: Pages 21-25

4

5 Stakeholder locations and key informants

The communities where SocMon will take place will depend primarily on the stakeholders involved in coastal management. Suggest key persons who can talk about the larger population.

Stakeholders (1° and 2°)	Location of stakeholder	Key informants for stakeholders
Fishing		
Fishers	Newcastle	George Hicks, President Newcastle Bay Foundation
	Barnaby	Clive Perkins
	Jones Estate	Clivin Christmas
	Basseterre	Wyclef John
	Fountain	Everett Cozier Clive Wilkinson Tricia Greaux/Delcia Brookes
Tourism		
Hoteliers	Mosquito Bay/ Jones Estate	John and Alastair Yearwood
	Nisbet Estate	Tim Thuell
	Shaws Estate	Dr. Adly Meguid, Edmund Melbourne
	Liburd Estate	?
	Christophe Harbour	Charles Darby III, Steve Heyboer, Charles Darby IV, Katherine Verano, Cita Chadderton
Tour operators/divers	Banana Bay (Park Hyatt)	Ms. Skerritt
	Mosquito Bay	Ellis Chadderton (Scuba Safaris)
	Newtown Bayroad	Kenneth Samuel (Kenneth Dive Centre)
	Prince's Street	Jessica Dupre (Blue Water

Stakeholders (1° and 2°)	Location of stakeholder	Key informants for stakeholders
		Safari)
	Bird Rock Beach Hotel	? (Dive St. Kitts)
	Fisherman's Wharf	? (Pro Divers) Leeward Island Charters
Water taxi/ferry operators	Mosquito Bay/Jones Estate	Wincent Perkins (Islander Watersports)
	Cockleshell Beach	Gary Pereira (Reggae Beach)
	Cades Bay/Majors Bay	? Jones and ? Isaac (Seabridge)
Restaurants/food vendors	Cockleshell Beach	Gary Pereira Roger Brisbane (Spice Mill)
	Cades Bay	? (Chrishi's) Rodney Flemming (R & M Restaurant)
	Jones Bay	? (Gin Trap)
	Mosquito Bay/Jones Bay	Alastair and John Yearwood (Oualie Beach Hotel Restaurant)
	Newcastle Bay	? (Marina's)
		Alvan Browne (Rumours) Joe Nevis
Watersports/recreation/sportfishing	Cockleshell Beach	Clivin Christmas (sportfishing) Ian Gonzales (sportfishing)
	Mosquito bay (Oualie)	Ellis Chadderton (Scuba Safaris) Winston Crooke (Cross Channel Swim) Allistair Nevis Yacht Club
	Christophe Harbour (?)	Nicholas Dupre (St. Kitts Yacht Club)
	Sea Haven	Lemuel Pemberton (Nevis Turtle Group)

Stakeholders (1° and 2°)	Location of stakeholder	Key informants for stakeholders
	S.E. Peninsula Beaches	Dr. Kimberley Stewart (St. Kitts Sea Turtle Monitoring Network)
Ministry of Tourism (Nevis)	Pinney's Estate	Carl Williams/Dorson Ottley
Ministry of Tourism (St. Kitts)	Port Zante	Dianille Taylor-Williams
St. Kitts Tourism Authority (St. Kitts)	Pelican Mall	Racquel Browne
Nevis Tourism Authority	Charlestown	Greg Phillip
SKN Hotel and Tourism Association	SKN	Johan Kelly
Department of Fisheries (Nevis)	Prospect	Eric Evelyn
Coastal Development		
Department of Physical Planning, Natural Resources and Environment (Nevis)	Charlestown	Joel Williams/Thema Ward
Department of Physical Planning (St. Kitts)	Bladen's Commercial Development	Randolph Edmead
Department of Environment (St. Kitts)	Basseterre	June Hughes
Park Hyatt	Banana Bay	?
Seabridge	SKN	Rawlinson Isaac
Tamarind Bay development (including marina)	Cades Bay/Tamarind Bay	Gregory Hardtman
Christophe Harbour	SE Peninsula	Charles Darby III, Steve Heyboer, Charles Darby IV, Katherine Verano, Cita Chadderton
Turtle Beach	Turtle Beach	?
Chrishi Beach	Cades Bay	Christian ?

Stakeholders (1° and 2°)	Location of stakeholder	Key informants for stakeholders
Reggae Beach	Cockleshell Bay	Gary Pereira
Spice Mill	Cockleshell Bay	Roger Brisbane
Gin Trap	Jones Estate	(Sarah Petre-Mayers)
Oualie Beach Hotel	Mosquito Bay	Alastair and John Yearwood
V. W. Amory International Airport	Newcastle	Darron Sutton
Nisbet Hotel	Nisbet Estate	Tim Thuell
Fish landing sites	Newcastle	Shawn Isles George Hicks - (Newcastle Bay Foundation)
	Jones Bay	Kareem Wilkin
	Long Haul	Clive Wilkinson
Candy Resort		?
Scotch Bonnet Condominiums	Scotch Bonnet Point	?
[Mount Nevis Hotel]	Shaws Estate	Dr. Adly Meguid, Edmund Melbourne
Marina's	Newcastle Bay	Dr. Adly Meguid, Edmund Melbourne
Quarry operator		

Notes:

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8

6 SocMon Spatial reconnaissance checklist

Good reconnaissance is critical in the initial phases of the SocMon Spatial process. In this phase, researchers gain an understanding of on-the-ground spatial interactions which guide future monitoring activities. A checklist should be created to guide reconnaissance observations. Information of importance is "What are we looking for?", "Where is it?" and "Who can tell us?" These questions are related to the monitoring objectives, and later to the specific variables selected for monitoring.

Feature (What are we looking for?)	Location (Where is it?, What is it close to?)	Key informants (Who can tell us about it?, Who uses this space?)
Activities		
Resources		
Coral Reefs, Seagrass Beds, Mangroves, Beaches, Wetlands (Ecological Resources)		Pepperton, DMR
Cherry Stick		
Biodiversity	Bird Sanctuary	Fishers, (Turtle People)
Key infrastructure		
Drains, Transportation Infrastructure		NASPA, KASPA Private Entities
Jetties, Fisheries Infrastructure		George Hicks, Clive Perkins, Clivin Christmas
Hotels & Tourism Development, Airport,		Physical Planning

7 SocMon leader and team

Although an initial study or monitoring program can be done by a single person (e.g. MSc student), the process is intended to be undertaken by an interdisciplinary team, the size and the required talents of which partly depend on the goal and objectives of the study or monitoring program. What types of expertise do you need and where from?

Skill requirement or role on team	Names and affiliations of team leader and members
SocMon Coordinator	Tricia Greaux Clive Wilkinson
Data collection and analysis coordinator and analyst	Nikkita Browne Clive Wilkinson Ashadi Duncan

Skill requirement or role on team	Names and affiliations of team leader and members
Community/stakeholder liaison	Marcia Stubbs Danielle Moore Kareem Wilkin Vaughn Sturge
Communications coordinator	Marcia Stubbs Danielle Moore Kareem Wilkin Vaughn Sturge
SocMon Spatial coordination	Thema Ward Nikkita Browne Tricia Greaux

Notes:

GCRMN Manual: Pages 43-47

8 Secondary data sources

One of the first steps in SocMon is to consult secondary data sources that can be used for guiding the investigation and interpreting the results. Use this table to identify the sources of secondary data based on the objectives set for your SocMon. When completing the table also think about secondary spatial data. In future monitoring you can check if additional sources of information on the objectives become available. One row is added for general types of information. Where possible make notes about the suitability, quality, method(s) of collecting the data, when it was collected, who collected, analysed and interpreted it. When reporting, documents should also be listed in your 'References'.

Tips for scoping secondary spatial data:

- Look for information that is specifically related to the area of interest.
- Information should not be restricted to GIS data and/maps; descriptive information is important as well. For example, newspaper articles about user conflicts within a specific area.
- For GIS data:
    1. Look for information on data collection methodologies that can be easily replicated in your study, and
    2. Ensure quality by looking out for the 5 Ws: What, Where, When, hoW and by Whom.

SocMon objective	Sources of secondary data	Notes
1. Promote awareness for biodiversity conservation and sustainable use of resources		
2. Determine trends in management effectiveness.		
3. Determine trends in socio-economic benefits from use of coastal and marine ecosystems	Arthrurton and McDonald. 2010. Establishing a socio-economic monitoring program for the Narrows to inform marine conservation and decision-making in St. Kitts and Nevis (SocMon report)	
General types of information		

Notes:

GCRMN Manual: Pages 53-57

9 Key indicators to be monitored

Based on the goal and objectives of the monitoring, you need to determine which (if not all) of the SocMon Caribbean variables[1] need to be measured, sources of secondary information to consult before interviewing (key informant, household, visualisation techniques), and practical considerations for each variable. The practical considerations include levels of difficulty in acquiring information, issues, error or uncertainty, challenges in implementing fieldwork, links to data sources that are desirable, etc. Refer to the Caribbean guidelines when selecting the variables to determine the information measured by the variable and its suitability for monitoring based on its relevance to monitoring goals and objectives. Recently broad socio-economic parameters with links to drivers of ecological change have been developed by GCRMN-Caribbean. See below.

**Since most socio-economic information can be gathered from secondary data rather than interviews (key informant) and surveys (household) rigid distinction between variables (as shown in the SocMon Caribbean guidelines) is unnecessary. Select your variables and choose the most appropriate data collection method.*

Also remember that if a variable/indicator specific to your purposes of monitoring is not available among the suite of SocMon Caribbean and GCRMN-Caribbean parameters, you can design new variables.

The variable selection process for SocMon Spatial must consider the spatial relationships between features. Certain spatial representation goals may require the packaging of related variables E.g. We may have to group Use Patterns and Types of Impacts if we are monitoring. In selecting variables for monitoring, identify whether they represent a feature, an attribute or both. This will help in determining which variables must be linked as features and attributes for monitoring of spatial characteristics in this assessment.

GIS abbreviations:

a. F = Feature (These are physical points and/or areas highlighted on the map)
b. A = Attributes (These are sets of information which describe the features that they are related to)

[1] For the purpose of these worksheets, variable and indicator are being used synonymously

a) **SocMon Caribbean variables**

Variable to monitor (see the Caribbean Guidelines)	Obj. # 1, 2, 3	Secondary and key sources of information and comments on factors to be taken into account	Priority (high, med, or low)	Spatial info F/A
Demographics				
K1. Study area	1-3	GIS mapping	High	F
K2. Population	1, 3	Census	High	A
K3. Number of households	1, 3	Census	High	A
K4. Migration rate				
K5/S1. Age	1, 3	Primary data (survey)	High	A
K6/S2. Gender	1, 3	Primary data (survey)	High	A
K7/S4. Education	1, 3	Primary data (survey)	High	A
S5. Religion				
K8. Literacy				
K9/S3. Ethnicity				
K10/S5. Religion				
K11/S6. Language				
K12/S7. Occupation	2, 3	Primary data collection (survey)	High	A
S8. Household size				

Variable to monitor (see the Caribbean Guidelines)	Obj. # 1, 2, 3	Secondary and key sources of information and comments on factors to be taken into account	Priority (high, med, or low)	Spatial info F/A
Community infrastructure and business development				
S9. Household income	3	Survey	High	A
K13. Community infrastructure and business development	3	Planning, community informants, walk through	High	F
Coastal and marine activities				
K14/S10. Activities Household Activities	3	Interviews	High	F/A
K 15/S11. Goods and services (from activities)/ Household goods and services	3	Group table	High	F
K16/S12 Types of use (of good/service) /Types of household uses	3	Group table	High	A
K17. Value of goods and services				
K18/S13. Goods and services market orientation/Household market orientation				
K19. Use patterns	3	Group table	High	A
K20. Levels and types of impact	2, 3	Group table	High	F/A
K21. Level of use by outsiders				

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Variable to monitor (see the Caribbean Guidelines)	Obj. # 1, 2, 3	Secondary and key sources of information and comments on factors to be taken into account	Priority (high, med, or low)	Spatial info F/A
K22/S14 Household use(s)				
K23. Stakeholders				
K24. Tourist profile				
Governance				
K25. Management body	2		High	NA
K26. Management plan	2	Draft management plan	High	NA
K27. Enabling legislation	2	Relevant legislation and regulations	High	NA
K28. Management resources				
K29. Formal tenure and rules				
K30. Informal tenure, rules, customs and traditions				
K31. Stakeholder participation	2		High	NA
K32. Community and stakeholder organisations				
Attitudes and perceptions				
S15. Non-market and non-use values	1		High	NA

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Variable to monitor (see the Caribbean Guidelines)	Obj. # 1, 2, 3	Secondary and key sources of information and comments on factors to be taken into account	Priority (high, med, or low)	Spatial info F/A
S16. Perceptions of resource conditions	1		High	A
S17. Perceived threats	1,2		High	A
S18. Awareness of rules and regulations	1, 2	Primary data collection (survey)	High	NA
S19. Compliance	1,2	Primary data collection (survey)	High	NA
S20. Enforcement	1,2	Primary data collection (survey)	High	NA
S21. Participation in decision-making	2	Primary data collection (survey)	High	NA
S22. Membership in stakeholder organizations	1,2	Primary data collection (survey)	High	NA
S23. Perceived coastal management problems	1, 2	Primary data collection (survey)	High	NA
S24. Perceived coastal management solutions	1, 2	Primary data collection (survey)	High	NA
S25. Perceived community problems	1, 2	Primary data collection (survey)	High	A
S26. Successes in coastal management	1, 2	Primary data collection (survey)	High	F
S27. Challenges in coastal management	1, 2	Primary data collection (survey)	High	NA

Variable to monitor (see the Caribbean Guidelines)	Obj. # 1, 2, 3	Secondary and key sources of information and comments on factors to be taken into account	Priority (high, med, or low)	Spatial info F/A
Material style of life				
S28. Material style of life	2 , 3			

See SocMon Caribbean Guidelines: Bunce and Pomeroy (2003); Pages 18-23, 30 – 68

Notes:

b) GCRMN-Caribbean parameters

Parameter to monitor (see the GCRMN-Caribbean Guidelines)	Obj. # 1, 2, 3	Secondary and key sources of information and comments on factors to be taken into account	Priority (high, med, or low)	Spatial info F/A
Tourism arrivals				
Tourism recreation	1-3	Key informant interviews	High	NA
Tourism infrastructure	1-3	Secondary data from Planning	High	NA
Fishing infrastructure	1-3	Secondary data, key informant interviews		NA
Fishing pressure	1-3	Secondary data, key informant interviews	High	NA
Agriculture (large-scale)				

Parameter to monitor (see the GCRMN-Caribbean Guidelines)	Obj. # 1, 2, 3	Secondary and key sources of information and comments on factors to be taken into account	Priority (high, med, or low)	Spatial info F/A
Other point sources pollution	1-3	Secondary data, key informant interviews, note the quarry (obtain quarry information from Planning	high	NA

See GCRMN-Caribbean Socio-economic Guidelines

10 Variables associated with climate change

Abbreviations are used for data collecting methods:

a. BM = Biological monitoring
b. FG = Focus group interview/survey
c. HH = Household survey
d. KI = Key informant interview/survey
e. M = Mapping
f. O = Observation
g. S = Secondary data (referenced from the SEM-Pasifika Guidelines)

Area and Indicator number	Indicator and data collecting methods	Obj. # 1, 2, 3	How information might be used	Priority (high, med, or low)	Spatial info F/A
Exposure					
CC1	Demographically vulnerable groups **KI, S, HH**				
Sensitivity					
CC2	Dependence on resources and services vulnerable to climate change impacts **S, M, BM, KI, HH**	1-3	Met office, Coral Reef Report card	High	A
Existing SocMon and SEM-Pasifika	Perception of resource conditions **HH**				
Adaptive Capacity					

Area and Indicator number	Indicator and data collecting methods	Obj. # 1, 2, 3	How information might be used	Priority (high, med, or low)	Spatial info F/A
CC3	Current livelihood and income diversity of household **HH, KI, seasonal calendar**				
CC4	Perceived alternative and supplemental livelihoods **HH, KI**				
CC5	Awareness of household vulnerability to climate hazards **HH (S, KI)**				
CC6	Access to, and use of, climate related knowledge **KI, HH**				
CC7	Formal and informal networks supporting climate hazard reduction and adaptation **KI**				
CC8	Ability of community to reorganise **KI, HH**				
CC9	Leadership and governance **KI, HH**				
CC10	Equitable access to resources **HH**				

Notes:

See Climate Change addendum Guidelines, Wongbusarakum and Loper (2011)

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Area and Indicator number	Indicator and data collecting methods	Obj. # 1, 2, 3	How information might be used	Priority (high, med, or low)	Spatial info F/A
CC3	Current livelihood and income diversity of household **HH, KI, seasonal calendar**				
CC4	Perceived alternative and supplemental livelihoods **HH, KI**				
CC5	Awareness of household vulnerability to climate hazards **HH (S, KI)**				
CC6	Access to, and use of, climate related knowledge **KI, HH**				
CC7	Formal and informal networks supporting climate hazard reduction and adaptation **KI**				
CC8	Ability of community to reorganise **KI, HH**				
CC9	Leadership and governance **KI, HH**				
CC10	Equitable access to resources **HH**				

Notes:

See Climate Change addendum Guidelines, Wongbusarakum and Loper (2011)

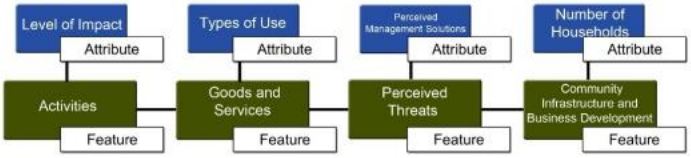
19

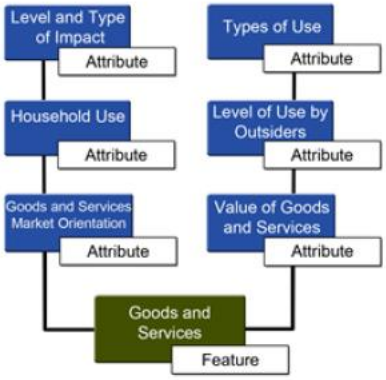
11 Organising SocMon Spatial variable packages

What features must be visualised?

Depending on your management objectives, feature variables can sometimes be closely linked. For example, if you are monitoring fishing pressure on coral reef resources, you may want to show both where coral reef habitat is located and where fishing pressure is greatest. As a result you may be required to represent both Goods and Services and Use Patterns as features.

How do you want features and attributes to interact within your database? In the space provided on the following page, show which attributes are used to describe which features. Remember that attribute variables will be used to provide descriptive information about the features you are highlighting. Draw diagrams (flow charts, matrices etc.) as outlined below, which show how your feature and attribute variables are linked.





E.g Output – If we are analysing pollution effects, we must look at it in relation to the affected feature.

Draw your variable packages here

Features	Attributes
Study Area	Population, Age, Gender, Education, Number of Households
Education	Occupation, Household income
Community Infrastructure	Activities, Community Problems
Activities	Types of use
Goods and Services	Use Patterns, Level and Types of Impacts, Perception of Resource Conditions, Perceived Threats, Dependence on resources and services vulnerable to climate change impacts (CC2)
Levels and Types of Impacts	(Maybe level of impact or associated activities can be used as attribute here?)
Success in Coastal Management	(Type of Activities maybe?)

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12 Interview sample design

Depending on many factors ranging from the objectives of monitoring to area demographics, you need to determine 'how' and 'how many' for selection of key informants and households.

a. Key informants	b. Households
Critical information areas Fishing Tourism Coastal development (Research)	**Estimated number of households in study area and means of obtaining estimate** To be determined
No. of informants: Approximately 20-25. The study has a large potential for numerous key informants but given the budget and time available, the original number should be reduced.	**Approx. sample size:** To be determined
Selection process: Based on participant knowledge	**Sample selection method:** Random

GCRMN Manual: Pages 72-73, 229-234

13 Draft interview (key informant and household) questions

There are many ways of asking the same question (content) and many types of question layout (structure). Rules apply. Select variables in your study and draft questions per variable to get information from respondents. Demonstrate that you can craft questions well using a variety of layouts, and ensure that each question is designed to provide data related to one or more of the objectives.

Questions (for key informant or household survey). Try a mix of both open and closed-ended questions		
Var. No.	**Var. name**	**Question**
K13	Community infrastructure and business development	Can you give an overview of the community infrastructure and business development within the study area? (KI) List tourism and fisheries based infrastructure? (KI)
K26	Management plan	Did stakeholders perceive their full participation in the creation of the marine park? (KI) Is co-management a feasible option for the Narrows area? (KI)
	Fishing pressure	How would you describe the fishing pressure today compared to 10 and 20 years ago? (KI) What is the average catch per landing site? (KI)
S16	Perception of resource conditions	In your opinion, what is the condition or state of the marine resources in the Narrows? Using a scale of – 1 (very bad), 2 (bad), 3 (neither good nor bad), 4 (good) and 5 (very good). Coral reefs 1 2 3 4 5 Seagrass beds 1 2 3 4 5 Conch abundance 1 2 3 4 5 Lobster abundance 1 2 3 4 5 Reef fish abundance 1 2 3 4 5 For those resources in bad or very bad condition, what can you suggest to improve their condition?
K 20	Levels and types of impact	How much does the following impact the Narrows? Fishing 1 2 3 4 5 Tourism 1 2 3 4 5 Where: 1 – Way too much 2 – Too much 3 – Just right 4 – Too little 5 – Way too little

		Questions (for key informant or household survey). Try a mix of both open and closed-ended questions
Var. No.	**Var. name**	**Question**
		Which of the following problems are affecting the Narrows? (Tick ALL that apply) _ Overfishing/unsustainable fishing _ Pollution _ User conflict _ Climate change _ Coastal development _ Unauthorised mooring _ Other, please specify _____
K7/S4	Education	What is your highest level of education? _ Primary _ Secondary _ Technical/vocational _ Tertiary/University _ Other, please specify _____

GCRMN Manual: Pages 96-100, 109-112

14 Visualisation techniques

The GCRMN manual describes several visualisation techniques that are useful for collecting, displaying and communicating socio-economic data informatively to document or assist decision-making. Many methods may be used simultaneously or sequentially. The means of presenting socio-economic monitoring results is critical in showing relationships among the data. Which methods will you use?

Technique and page in manual	**Variable and objective nos.**	**Notes on application of the technique to the variable and objectives (e.g. for all or some stakeholders? Issues?)**
Maps – 113		Through SocMon Spatial. May be used to highlight user conflicts through identification of user patterns
Transects - 119		
Timelines - 121		To highlight MMA-related projects and establishment of the MMA
Seasonal calendars - 125		
Historical transects - 129		
Decision trees - 131		

Technique and page in manual	Variable and objective nos.	Notes on application of the technique to the variable and objectives (e.g. for all or some stakeholders? Issues?)
Venn diagrams - 133		Highlight user conflicts
Flow charts – 136		
Ranking - 138		

GCRMN Manual: Pages 113-145

15 Communication plan

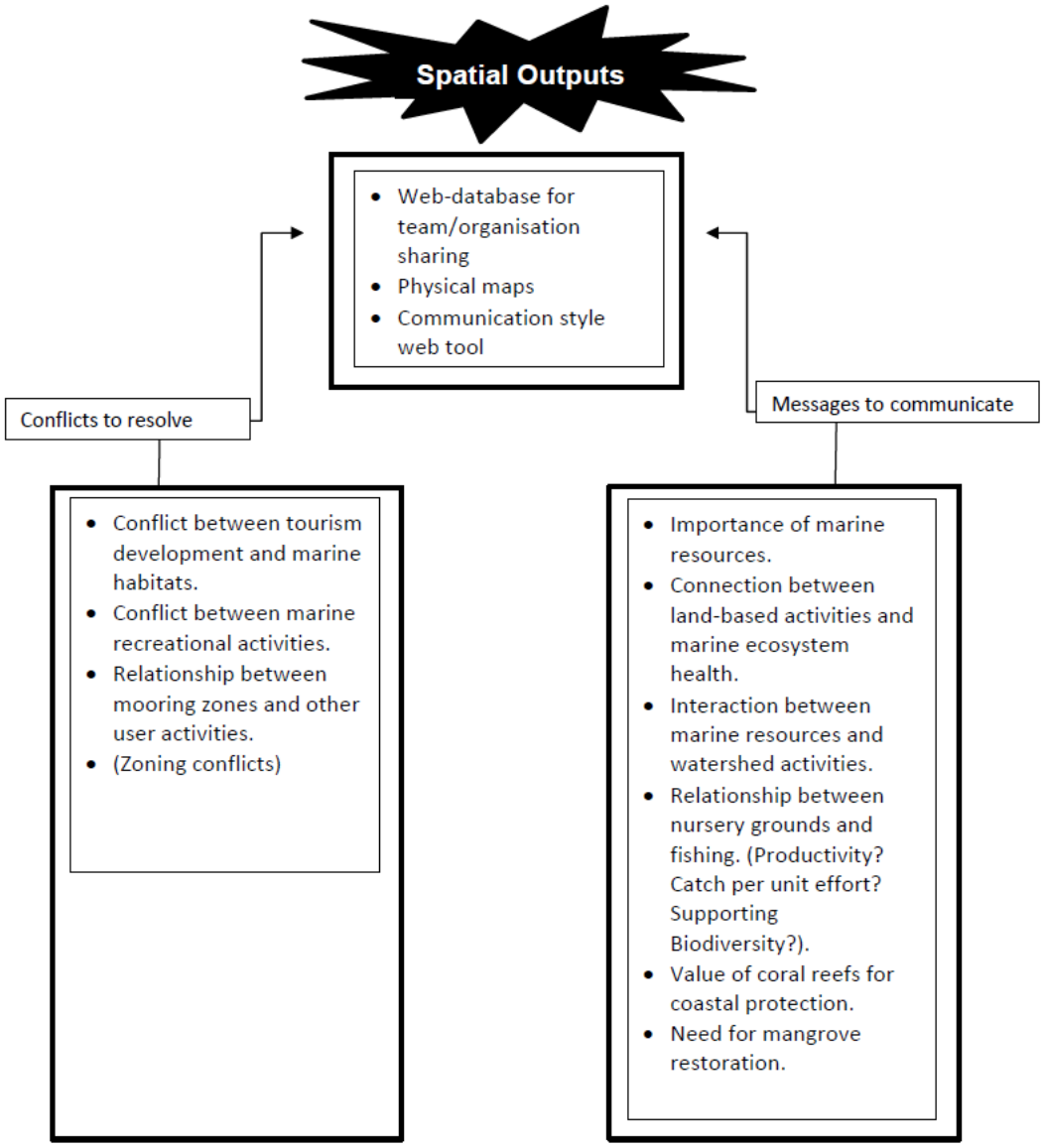
Communication of results and key learning is often done in terminal workshops, but other means are used to supplement this and ensure that various audiences receive the outputs.

Target audience	Main message	Communication product + pathway
Fisherfolk	Compliance for conservation and sustainability	Consultations, one-on-one discussions, fliers, t-shirts
Hoteliers	Don't buy undersized fishery resources, respect fishers and harvesting seasons	Pamphlets/brochures, e-copies of pamphlets
Water taxi and watersports operators	Respect the fishers and their gear	(Fines!!!!), one-one discussions, demonstrations of cut/damaged gear
Schoolchildren	Importance of biodiversity	Video, art (slogan) and essay competition, presentation with dance, school fieldtrip

Notes:

16 Determining spatial outputs

Using a "bottom-up" approach complete the diagram below. Start by identifying the major spatial issues and work your way up.



17 Work plan schedule

A SocMon study should take no more than one month (at most 6 weeks), so you need to schedule your work accordingly, remembering the SocMon stages including validation. For the purposes of this training workshop, set out tasks under each heading for the implementation of the SocMon assessment at The Narrows. Provide an estimate of the number of days/weeks required for each task.

Activity / task **Week →**	**1 21 Nov**	**2 28 Nov**	**3 5 Dec**	**4 12 Dec**	**5 9 Jan**	**6 16 Jan**	**7 23 Jan**	**8 30 Jan**
Preparatory activities								
Finalise site monitoring plan								
Confirm SocMon team								
Announce project to stakeholders								
Secondary data collection								
Compile relevant secondary data and information								
Review secondary data and identify any gaps in knowledge for primary data collection								
Primary data collection and observation								
Design key informant interview guide								
Design stakeholder surveys								
Conduct key informant interviews and surveys (including SocMon Spatial)								
Data analysis and interpretation								
Enter and code data								
Analyse data								
Draft site monitoring report								
Finalise and submit site monitoring report								
Validation, communication, adaptation								
Hold validation meeting(s)								
Develop communication products (includes SocMon Spatial products)								

Notes: Due to numerous work commitments data collection is likely to take place early in 2017 and not in 2016.

18 Critical research resources required (budget and non-budget)

Many resources will be used in the research, but there are usually just a few that are so critical the assessment may not be able to proceed without them. You must know early what these are.

Resource description	Use of resource	Comments on availability
Travel stipend/vehicle	Inter and intra island transport	To be budgeted
GIS	SocMon Spatial	Limited
Stationery	KI interviews and surveys	In-kind with perhaps some budgeting of the small grant
Refreshments	Validation meetings SocMon team meetings	To be included in the budget

19 Budget

The SocMon methodology is intended to be affordable so that monitoring can be sustained. Pay close attention to what are realistic costs, including in-kind contributions that may be available.

Description of expense	No. of units	Unit cost*	Total cost*
		Sum total of SocMon costs	

* = currency used [ ]

Budget explanatory notes (use if needed to explain calculations/estimations)

Appendix 4: Fisher survey

ID#____/Q#___

Socio-economic monitoring at the Narrows
ECMMAN SocMon Fisherfolk Survey

The Centre for Resource Management and Environmental Studies (CERMES) at the University of the West Indies in Barbados in collaboration with The Nature Conservancy's (TNC) Climate Resilient Eastern Caribbean Marine Managed Areas Network (ECMMAN) Project and The Department of Marine Resources are collecting socio-economic and marine resource information from fishers for the promotion of the sustainable use of resources, management and education in the Narrows. Any information you provide will be anonymous. You will not be personally identified in any reports. Your participation would be much appreciated.

Date:

Landing Site:

Promote awareness for biodiversity conservation and sustainable use of resources

1. When you hear the term Marine Managed Area what comes to mind? Check **ALL** that apply. *[NEW: MMA Knowledge]*

[ ] Protection of coastal and marine resources
[ ] Less access to the Narrows — by [ ] locals [ ] tourists [ ] both
[ ] More and bigger fish to be caught by fishermen for food
[ ] More and bigger fish to be viewed and bred, but not caught
[ ] Coral reefs with more life on them than at present
[ ] Less work and activities (livelihoods) in the area encouraged
[ ] More work and activities (livelihoods) in the area encouraged
[ ] Alternative livelihoods to working in the area encouraged
[ ] Other, please specify _____

2. Indicate the degree to which you agree or disagree with the following statements.
1-Strongly Agree 2-Agree 3-Neither Agree or Disagree 4-Disagree 5-Strongly Disagree

	Statement	Level of agreement
a)	Reefs are important for protecting land from storm waves	[ ]
b)	Fishing would be better if there was no coral	[ ]
c)	Unless mangroves are protected, we will not have any fish to catch.	[ ]
d)	Coral reefs are only important for fishing and tourism	[ ]
e)	I want future generations to enjoy the mangroves and coral reefs	[ ]
f)	Fishing should be restricted in certain areas even if no one fishes in those areas just to allow the fish and coral to grow	[ ]
g)	We should restrict development in some coastal areas so that future generations will be able to have natural environments	[ ]
h)	Seagrass beds have no value to people	[ ]

3.

a) How would you describe the current conditions of resources within The Narrows? *[S16]*

Resource	Very good	Good	Neither good / bad	Bad	Very bad	Don't know
Mangroves						
Seagrasses						
Coral reefs						
Conch abundance						
Lobster abundance						
Reef fish abundance						
Beaches						

b) Have you noticed any changes in the condition of these resources in the last 5 years?
[ ] Yes [ ] No *[S16]*

If YES, go to part (c). If NO, go to question 14.

c) How would you describe the condition of these resources in The Narrows 5 years ago? *[S16]*

Resource	Very good	Good	Neither good / bad	Bad	Very bad	Don't know
Mangroves						
Seagrasses						
Coral reefs						
Conch abundance						
Lobster abundance						
Reef fish abundance						
Beaches						

d) What do you think can be done to improve the state of these conditions? *[S24]*

_____

_____

4. Describe the change in size and abundance of fish and other resources in The Narrows over the last 5 years. *[S16]*

Resources	Increase	Decrease	No change	Don't know
Parrotfish size				
Parrotfish abundance				
Long-spine black sea urchin size				
Long-spine black sea urchin abundance				
Conch size				
Conch abundance				
Lobster size				
Lobster abundance				

5. How important is the condition of the marine environment (coral reefs, mangroves, water quality, beaches etc.) to you (in general for work, relaxation and just for its existence value)? *[S16]*

[ ] Very important
[ ] Important
[ ] Neither important or unimportant
[ ] Not important
[ ] Don't know

6. Which of the following problems are affecting the Narrows? (Check **ALL** that apply)
How might they be solved? Please provide

Problems	Solutions
[ ] Unsustainable fishing	
[ ] User conflict	
[ ] Coastal development	
[ ] Pollution	
[ ] Climate change	
[ ] Unauthorized mooring	
[ ] Other, please specify_____	

7.

a) Parrotfish, especially large-sized fish, are important to keep reefs healthy. They eat and remove macroalgae (seaweed) that would otherwise cover coral reefs causing them to become unhealthy and hindering their growth. They are important at increasing sand distribution. Would you support temporary measures to help increase their population and recovery? *[S24]*
[ ] Yes [ ] No

b) If YES, which of the following would you suggest? Check **ALL** that apply. *[S24]*

[ ] Fishing seasons
[ ] Gear restrictions
[ ] Size restrictions
[ ] Catch limits
[ ] Closed areas for research
[ ] Campaigns to help increase awareness, education or outreach
[ ] Leave it to nature
[ ] Other, please specify_____

c) If NO, why not?

_____

_____

8. a) Long-spined black sea urchins are important coral reef residents as they help keep marcoalgae (seaweed) from overgrowing corals and keeps reef bottom clear for young corals to settle on.
Would you support management efforts to help black sea urchins recover? *[S24]*
[ ] Yes [ ] No

b) If YES, which of the following would you suggest? Check **ALL** that apply. *[S24]*

[ ]Transplant from reefs with good abundance to those with poor abundance
[ ] Rear in laboratory to replenish reefs
[ ] Leave it to nature
[ ] MPA zones set aside for restoration
[ ] Other, please specify_____

c) If NO, why not?

_____

_____

9. a) Some reefs provide more and better habitat for reef creatures, do you support measures to help protect them? *[S24]*
[ ] Yes [ ] No

b) If YES, which of the following measures would you suggest? *[S24]*
[ ] Fishing seasons
[ ] Gear restrictions
[ ] Size restrictions
[ ] Closed areas
[ ] Coral gardening (restoration)
[ ] Leave it to nature
[ ] Other, please specify_____

c) If NO, why not?

_____

_____

Determine trends in management effectiveness

Management activities vary and can involve awareness-raising activities to promote the benefits of the Narrows to users (e.g. healthy coral reefs, seagrass beds, bigger fish, more fish, more income); monitoring conditions and use of marine resources to determine trends in impacts from users, changing weather and climate conditions; as well as making sure that rules and regulations relevant to activities and uses within the Narrows are complied with so that the area is protected for sustainable use of resources etc.

10. Are you aware of any rules or regulations related to the following activities with respect to The Narrows? *Answer* YES ***or*** *NO for each*.

[ ] Yes [ ] No Fishing
[ ] Yes [ ] No Tourism
[ ] Yes [ ] No Marine transportation
[ ] Yes [ ] No Coastal development
[ ] Yes [ ] No Agriculture
[ ] Yes [ ] No Quarrying
[ ] Yes [ ] No Other, please specify_____

11. To what extent do people obey (comply) with rules pertaining to these activities in The Narrows?
*Rate the level of compliance on a scale of 1 to 5. Circle **ONE** answer.*
1 – Full compliance
2 – Good compliance
3 – Neither good nor poor compliance
4 – Poor compliance
5 – No compliance
DK-Don't know

Activity	Level of compliance					
Fishing	1	2	3	4	5	DK
Tourism	1	2	3	4	5	DK
Marine transportation	1	2	3	4	5	DK
Coastal development	1	2	3	4	5	DK
Agriculture	1	2	3	4	5	DK
Quarrying	1	2	3	4	5	DK
Other_____	1	2	3	4	5	DK

12. Do you think enough is being done to encourage stakeholders to participate in co-management of the Narrows? *[K31/S21]*
[ ] Yes [ ] No

13. Have you or any member of your household participated in any meeting, workshop or other events organized specifically to discuss the co-management of the Narrows?*[K31/S21]*

[ ] Yes [ ] No

14. What community activities affect the Narrows?

_____

_____

_____

15. What solution(s) do you recommend for the problem(s) identified?

_____

_____

_____

16. Is there anything in particular that you would like the authorities responsible for managing the Narrows to focus on in the area? *[NEW: Management Priorities]*

_____

_____

_____

Determine trends in socio-economic benefits from resource use of coastal and marine ecosystems

17. What is your role in the fishing sector? (e.g. fisherman, boat owner, boat captain, vendor, fish processor, boat mechanic etc.) _____

18. How long have you been involved in the fishing sector? _____years

19. Do other members of your household/family work within the fishery sector? What roles do they have? *[Adapt K14/S10]*

Family member	**Role in fishing sector (e.g. fishermen, vendor, boat owner, boat captain, boat repairs, fish processor)**

20. What sort of activities, if any, do you and members of your household participate in for relaxation within The Narrows and surrounding areas? Check **ALL** that apply. *[K14/S10]*

[ ] Recreational fishing
[ ] Swimming
[ ] Diving
[ ] Snorkeling
[ ] Boating (motorized or non-motorized)
[ ] Water sports
[ ] Exercise
[ ] Other, please specify_____

21. How, if at all, do you or members or your household make a living from resources (coastal and marine) in the study area? Check **ALL** that apply. *[K14/S10; K12/S7]*

[ ] Fishing
[ ] Dive operation
[ ] Water sports operation
[ ] Tour guiding
[ ] Craft vending

[ ] Water taxi services
[ ] Day charter operation
[ ] Other, please specify_____

22. How many days in an average week do you or members of your household spend in the Narrows making a living from the resources there? [NEW: Livelihood Dependency]

[ ] days

23. What is your biggest concern about the fishing industry and what do you think could be done to make things better? *[S23, S24] Omit in field.*

Biggest concern	Way to make things better

24. For the following activities below, list the goods and services derived, and the types of use.

Examples below for the interviewer to guide the survey respondent.

Activity	***Type of fishery (Goods and services)***	***Method used (Types of use)***	***Fishing grounds (Use Patterns)***
Fishing	*Conch*	*Dive*	*Open water*
	Lobster		
	Coastal Pelagic	*Net*	*Reef*
	Coastal Demersal		
	Turtle	*Trap*	*Bay*
	Other, please specify		

To be completed for main species caught by weight, quantity or value. Record information for ONE or top THREE species.

Activity	**Type of fish** *(Goods & Services)*	**Fishing gear** *(Types of and use of goods and services)*	**Fishing location(s)** *(Use Patterns)*
Fishing			

Activity	**Type of fish** *(Goods & Services)*	**Fishing gear** *(Types of and use of goods and services)*	**Fishing location(s)** *(Use Patterns)*

25. In what way, if at all, has the number of people using the Narrows for the following activities changed in the last 5 years? *Circle - More, Less, Same, Don't know (DK). [K19]*

Activity	**Change in # of people using the Narrows for:**			
Pot fishing	More	Less	Same	Don't Know
Beach seining	More	Less	Same	Don't Know
Spearfishing	More	Less	Same	Don't Know
line fishing	More	Less	Same	Don't Know
Diving	More	Less	Same	Don't Know
Snorkeling	More	Less	Same	Don't Know
Sailing/Yachting	More	Less	Same	Don't Know
Watersports - kayaking, jet skiing, banana boat, paddle boarding	More	Less	Same	Don't Know
Turtle watching	More	Less	Same	Don't Know
Turtle fishing				

26. What has your catch been like over the past 5 years?

[ ] Increasing [ ] Remained the same [ ] Decreasing

27. What reason(s) would you give for this? *[S16]*

Demographics

28. Gender
[ ] Male [ ] Female

29. What is your current age? _____(# of years old) *[K5/S1]*

30. What is your current level of education?
[ ] Primary school
[ ] Secondary school
[ ] A-level/College/Associate Degree
[ ] University (e.g. Bachelors, Masters, PhD)
[ ] Professional, Technical and Vocational School

31. What is your main source of income? *(Most of your income comes from this activity) [S9 or K12/S7]*

---

32. What, if anything, is your secondary source of income? *[S9 or K12/S7]*

---

33. What proportion of your income, if any at all, is derived from your activities in The Narrows? *(Use terms such as quarter, half, more than half to assist persons in gauging proportion)*

[ ] <25%
[ ] 25-50%
[ ] 51-75%
[ ] 76-100%

Thank you

Appendix 5: Key informant interview guide

ECMMAN Narrows Key Informant Interview Guide: Fishers

The Centre for Resource Management and Environmental Studies (CERMES) at the University of the West Indies in Barbados in collaboration with The Nature Conservancy's (TNC) Climate Resilient Eastern Caribbean Marine Managed Areas Network (ECMMAN) Project and The Department of Marine Resources are collecting socio-economic and marine resource information from fishers for the promotion of the sustainable use of resources, management and education in the Narrows. Any information you provide will be anonymous. You will not be personally identified in any reports. Your participation would be much appreciated.

Date:

Key Informant:

Location:

Years fishing:

1. Where do you fish in (and around) the Narrows?

2. Where do conflicting activities occur (if any)?

3. Can you identify any major issues, concerns or threats in the area *[i.e. to the environment, your livelihood, family, community etc.: examples include pollution, crime etc.]*?
   Map where these occur.

1

4. Which resources in the Narrows are important to you?

5. In what way(s) are they important to you?

6. What in particular, if anything, is there that you would like the authorities responsible for managing the Narrows to focus on?

Thank you for your time. It is much appreciated.