Co-Management of FAD Fisheries

A Socio-Economic Analysis of Offshore Fishers Residing on **CARIFICO** Member Islands

February 2017

CARIbbean **FI**sheries **CO**-Management

- *Antigua and Barbuda Fisheries Division*
- *St. Kitts and Nevis Department of Marine Resources*
- *Dominica Fisheries Division*
- *St. Vincent and the Grenadines Fisheries Division*
- *St. Lucia Department of Fisheries*
- *Grenada Fisheries Division*

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Back cover image "Back to the Sea, Reduce Poverty" by artist Kate Punnett, St. Joseph's Convent Marriaqua, St. Vincent and the Grenadines.

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A Socio-Economic Analysis of Offshore Fishers Residing on CARIFICO Member Islands

Project Team

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Offshore Fishing


Fish Aggregating Device (FAD)


Fisher trolling at FAD


Catching fish near a FAD


Public FAD


FAD ready for deployment


Net fishing near-shore


Roseau fisheries complex


Soufriere fishing complex


Mahaut landing site

Fishing Aggregating Device (FAD)


FAD surface buoys


FAD appendage black plastic stripe


Drop line gear


Ice box on boat


Ice box and catch


FAD catch –blue marlin


FAD catch – yellowfin tuna


FAD appendage tarpaulin

Survey Pilot Test and Data Collection on Dominica


Dr. Lorenzen, Dr. Sidman and Dr. Montes from UF


Dominica Fisheries Division Officers and staff


Interview by Dominica Fisheries Division Officer


Interview by Dr. Montes from UF


Interview by Dominica Fisheries Division Officer


Interviewing fishers at Toucarie, Dominica


Interview by Dominica Fisheries Division data collector


Interviews by Dr. Sidman (left) and Dr. Lorenzen (right) from UF


Reviewing the survey with the Chief Fisheries Officer, Dominica

CARIFICO Consultant Training

Regional workshop on socio-economic survey for CARIFICO consultants

Regional workshop on socio-economic survey for CARIFICO consultants

Interview by Grenada CARIFICO consultant

Interview by Antigua and Barbuda CARIFICO consultant

Interview by St. Vincent and the Grenadines CARIFICO consultant

Interview by Dominica CARIFICO consultant

CARIFICO Consultant Training

Interview by St. Kitts and Nevis CARIFICO consultant

Interview by St. Lucia Fisheries Officer

Discussing interviews with fishers at Fond St. Jean, Dominica

Interview by JICA expert Mr. Tamura

CARIFICO project managers played an important role in implementing the study in their countries.

Contents

LIST OF ABBREVIATIONS

CARIFICO	Caribbean Fisheries Co-Management
FAD	Fish Aggregating Device
FSG	Florida Sea Grant, University of Florida
UF/IFAS	The University of Florida's Institute of Food and Agricultural Sciences
JICA	Japan International Cooperation Agency
TPB	Theory of Planned Behavior

CHAPTER 1. INTRODUCTION

Caribbean islands rely on fisheries for food, income and cultural identity. While reef fisheries in the region have long been heavily exploited, pelagic fisheries for species such as tunas, marlin and dolphinfish are considered less exploited, with potential for expansion. Manmade structures that float just below the ocean surface, or fish aggregating devices (FADs), attract highly mobile and thinly distributed pelagic fishes and concentrate them to a known location. FADs increase harvest efficiency and are widely employed in artisanal and industrial-scale tropical pelagic fisheries (Klima and Wickham, 1971). The structures are typically kept afloat by surface buoys and are anchored by large concrete blocks or to sand bags that are dropped to the sea floor (Figure 1).

The use of FADs in pelagic fisheries is being promoted in the Caribbean as a way of maintaining or improving local seafood supply while reducing pressure on reef fishery resources. FADs can be considered fisheries enhancements: technical interventions aimed at increasing the economic productivity of common pool fisheries resources. Because of this, FADs require some level of use rights in order to provide incentives for investment into these technical interventions while limiting free-riding and overuse (Anderson 2002; Lorenzen 2014). It is clear that due to their unique management issues, FAD fisheries provide both excellent opportunities and major challenges for co-management (CRFM, 2013). The goal of co-management is to improve livelihoods and support the sustainable use of fishery resources through increased participation in governance.

In recent years, criteria used to evaluate the impacts of fisheries management programs have become increasingly multi-dimensional and integrated, capturing ecological, economic and social factors also known as the 'triple bottom line' (Anderson et al., 2015). Livelihoods indicators including natural, physical, human, social and financial assets have been used to assess benefits derived by fishers and communities from certain interventions, such as the establishment of protected areas (Allison and Ellis 2001; Smith et al., 2005). These indicators also help resource managers understand the influence of current and future management strategies on community wellbeing (Tzanatos et al., 2006; Teh et al., 2009; Fung Chen et al., 2012).

In the eastern Caribbean region, the Japan International Cooperation Agency (JICA) is supporting the development of fisheries co-management arrangements in partnership with the governments of six Caribbean islands (Figure 2). This project, called Caribbean Fisheries Co-Management (CARIFICO), aims to promote shared governance arrangements for the management of public or communal FADs through outreach interventions, such as consultations, trainings, and equipment. The use of FADs has a longer tradition on some islands participating in CARIFICO than others. Each participating island represents a unique situation, which requires different approaches toward attaining a co-managed fishery. The CARIFICO project represents an excellent collaborative opportunity for governments to share experiences and best practices for fisheries co-management in the wider Caribbean region.

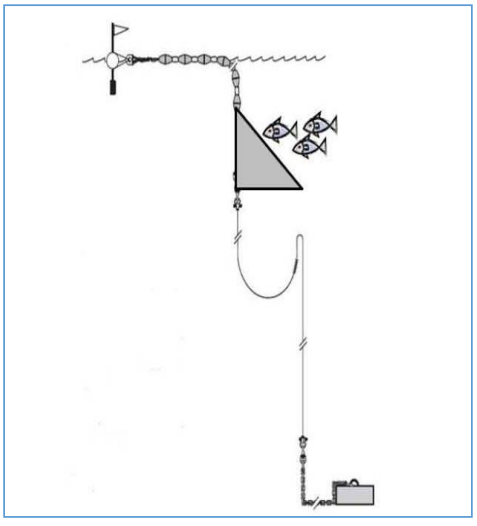

Figure 1. Fish Aggregating Device (FAD)

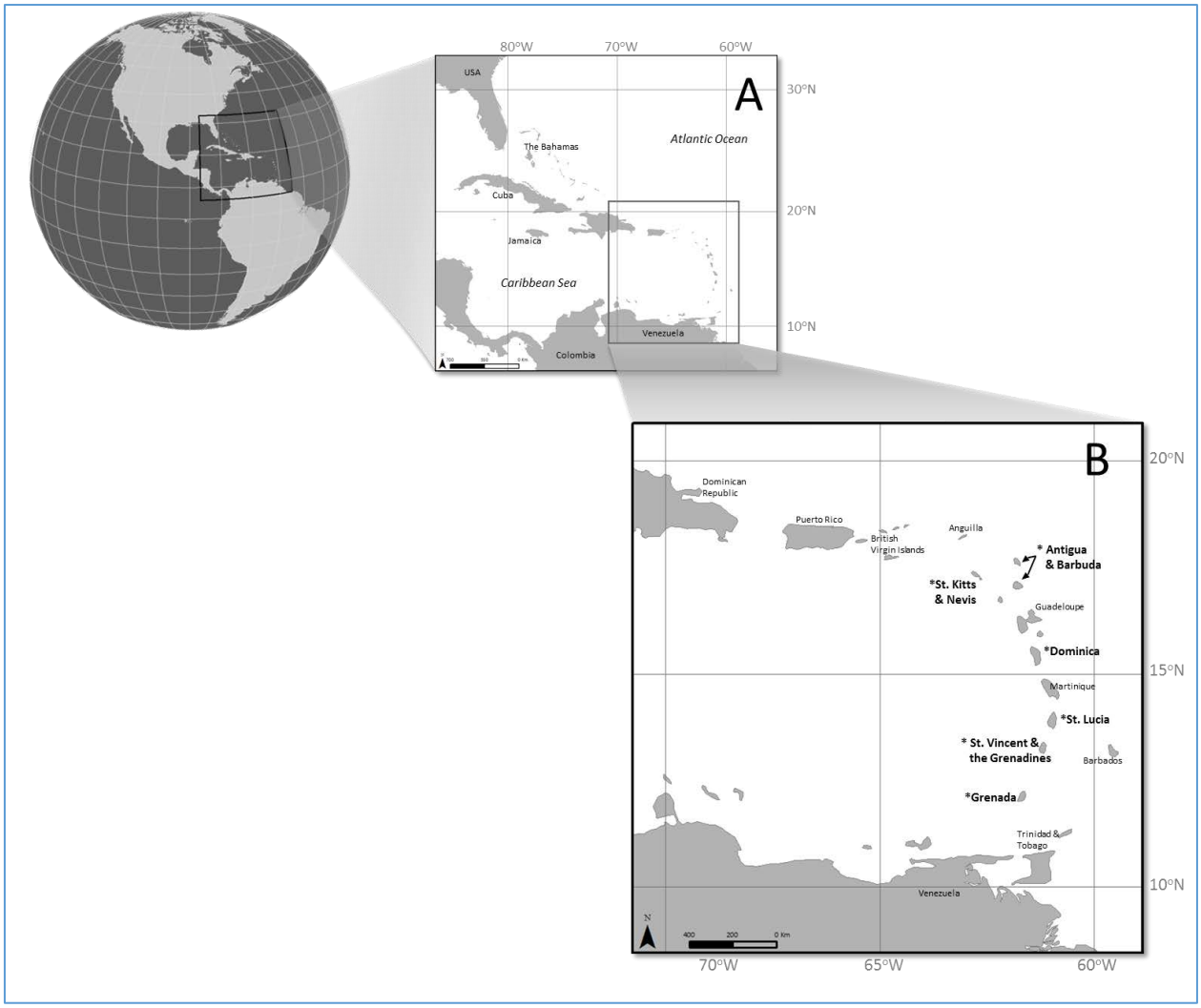

Figure 2. A) The Caribbean region; B) Islands participating in the CARIFICO project in the Lesser Antilles: St. Kitts and Nevis, Antigua and Barbuda, Dominica, St. Lucia, St. Vincent and the Grenadines, and Grenada.

Fisheries co-management is a flexible process where government and resource users share the responsibility and authority for marine resource management. Today, co-management is recognized as an effective approach for the sustainable management of small-scale fisheries and has been promoted throughout the Caribbean island states. CARIFICO, in collaboration with government agencies, fishers and local partners aims to develop co-management approaches unique to each country, focusing in particular on the management of the FAD fishery.

Better cooperation and livelihoods brought about by a co-management program can be used as indicators of a program's efficiency (Tzanatos et al., 2006). As such, this study applies the Sustainable Livelihoods Framework (Carney, 1998) to quantify changes in natural, physical, human, social and financial assets attributed to offshore artisanal fishers prior to and during implementation of the CARIFICO project. This entails a demographic characterization of fishers and a description of their awareness of fishing rules, their social networks, their assets, their financial investments and benefits derived from their participation in activities intended to motivate social cohesion and co-management.

The setting of private FADs is a traditional fishing practice on some CARIFICO participating islands (Figure 2). However, expansion of FAD use and ensuing conflicts surrounding informal use rights have prompted governments to discourage private FAD deployment and use while expanding the deployment of public FADs. Attitudes, social norms, and perceived control may play a role in the tendency of fishers to set public or private FADs. These factors may also affect the desire among certain fishers to participate in CARIFICO activities. A comparison of these factors outlined in the Theory of Planned Behavior (TPB) (Ajzen 1991; Ajzen and Driver

1992) was therefore conducted to determine their influence on the motivation of fishers to set public and private FADs.

Study Goals

The study aims to evaluate FAD use patterns, co-management arrangements and livelihoods of pelagic fishers with particular emphasis on changes that have occurred in recent years, during the CARIFICO project. It also aims to assess the factors influencing the decision of fishers to set and maintain public and private FADs.

Study Objectives

- Characterize FAD deployment and use by fishers and their perceptions of fishing success;
- Assess fishers' knowledge of formal and informal rules on the deployment and use of FADs and perceived compliance with such rules;
- Evaluate fishers' perceptions of co-management and the provision of services and facilities;
- Quantify changes in livelihood assets experienced by fishers prior to and commensurate with CARIFICO;
- Assess factors that motivate or impede fishers' decisions to deploy private or public FADs;
- Synthesize results and outline opportunities for further development of FAD fishery co-management.

CHAPTER 2. BACKGROUND

Fisheries Co-Management

Fisheries can be governed and managed in different ways including by governments (e.g., bureaucratic governance), by self-regulation of groups of fishers (e.g., self-governance or community management), or through allocation of individual or communal use rights (e.g., rights-based management, privatization). Fisheries management systems can also combine multiple approaches. Fisheries co-management can be defined as an evolving partnership arrangement where fishers, government, and other stakeholders share the authority and the responsibility for fisheries management (Figure. 3) (Pomeroy, 1998). Co-management is not a single-faceted or static partnership, but instead is characterized by a variety of arrangements that emphasize different degrees of power-sharing that can change over time. Examples of some types of co-management arrangements are (Sen and Nielsen 1996):

- Instructive – minimal information exchange from the government to users
- Consultative – government consults users but makes management decisions
- Cooperative – users are treated as equal partners in the management process
- Advisory – users play an advisory role in the management process
- Informative – government delegates management authority to users

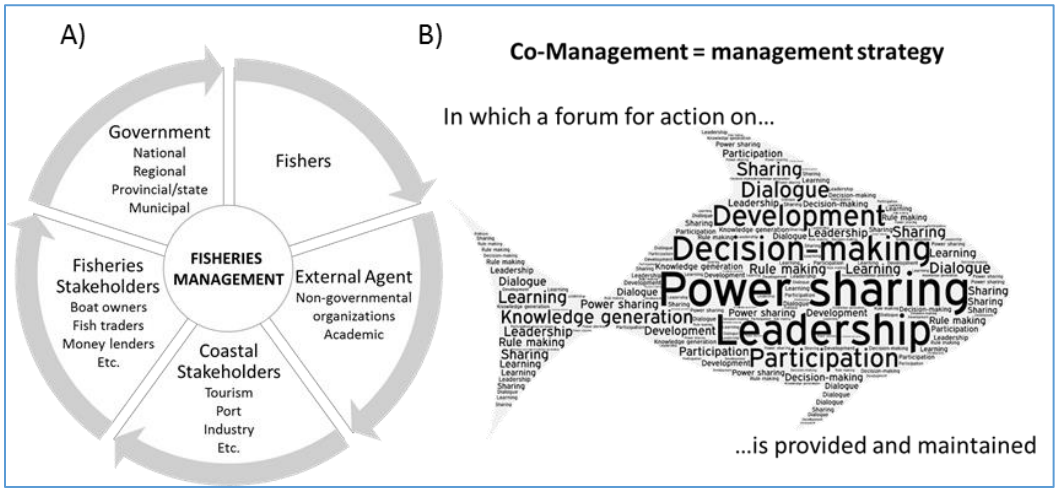

Figure 3. A) Fisheries co-management actors and B) Co-management as a strategy for managing resources (modified from Pomeroy, 1998).

Fisheries management in the CARIFICO islands is characterized by a diverse application of these arrangements led mainly by governmental agencies and external agents such as the CARIFICO project. At the same time, there is evidence of elements of community management/self-governance in some fisheries.

Performance of Fisheries Management

Researchers have identified a number of factors that can influence the success and sustainability of coastal resource management initiatives. Examples of indicators used to evaluate the performance of management include: perceptions of impacts; attitudes and wellbeing (e.g., overall wellbeing of the household and resources); improvements in income; perception of access to and control over resources; participation in and influence over community affairs; compliance with rules and regulations; perception of conflicts over resources; satisfaction with resource management; and improvements to trust, reciprocity and social cohesion (Pomeroy et al., 1997; Himes 2007; Gutierrez et al., 2011; Lozano and Heinen, 2016).

In line with the objectives of this study and drawing from the literature, the survey instrument captures fishers' general perceptions of their livelihood and management strategies rather than specific social and economic measures. This method is more suited to the study objectives because sharing specific socio-economic information can be considered too intrusive for participants but also because exact amounts of assets, such as income, can be difficult for participants to recall (Pomeroy et al., 1997). A substantial literature exists on the general topic of co-management and two approaches widely applied in this context provide the framework for the development and analysis of the socio-economic survey: The Sustainable Livelihoods Approach and the Theory of Planned Behavior.

Sustainable Livelihoods Approach

This approach has been widely applied to improve understanding of how livelihoods can change from a policy or management decision and evaluate the ability of communities to cope with and recover from stressors (Rennie and Singh, 1996). There are a number of factors that can constrain or enhance livelihood opportunities. By identifying those factors and their change over time managers can assess the effect or contribution of previous initiatives and help to plan future activities to improve livelihoods. Livelihood encompasses people's assets, capacities and activities essential to secure life necessities (Chambers and Conway 1991; Allison and Ellis 2001; Smith et al., 2005). It is typically applied as a planning tool to measure the impact of social and institutional interventions at different points in time and to maximize the effectiveness of management and policy decisions (Morse and McNamara, 2013).

Figure 4. The five facets of the sustainable livelihood framework (Scoones, 1998)

The economic activities that sustain people, usually called livelihood strategies, depend on their access to resources and opportunities. Livelihood is not only about income but has linkages to education, social connections and access to natural resources (Morse and McNamara, 2013). The Sustainable Livelihoods Approach measures five assets that underpin individual or community wellbeing: natural, financial, physical, human, and social (Figure 4). The Sustainable Livelihoods Approach was applied in this study to measure change - either positive or negative - in these assets among offshore fishers during two time frames: (a) past year - commensurate with the CARIFICO project, and (b) five years ago – prior to the CARIFICO project.

Theory of Planned Behavior

"Explaining human behavior in all its complexity is a difficult task." Ajzen 1991

The Theory of Planned Behavior (TPB) is a well-accepted social theory commonly used to measure the strength of three factors, shown to influence whether or not someone will perform a specific behavior or action: attitude, subjective norm and behavioral control. It has been used broadly to explain health behaviors (e.g., smoking, exercise, health issues), compliance with regulations (e.g., vehicle speed limits, hunting regulations, protected areas regulation), and behaviors related to natural resource utilization (e.g., hunting, fishing, recycling), among others.

The TPB framework has also been applied to evaluate education and outreach programs and identify management actions to deter or promote a desired behavior or action. For example, in Florida there are areas within waterways that are designated as manatee speed zones. Boaters in these areas are required to lower their speed to minimize injuries to manatees. Managers were interested in obtaining information regarding what factors affect compliance with manatee speed zones to develop outreach programs. TPB found that boaters were more motivated to comply with regulations if they perceived that law enforcement officials were present and if other boaters were following the rules (Jett et al, 2013).

The TPB establishes that a behavior is most likely to occur if a person believes that performing the behavior has a positive outcome (referred to as attitude); if the person thinks that others (e.g., friends, family) approve and/or are themselves performing the behavior (referred to as the subjective norm); and if a person thinks that they have the knowledge, skills, and resources to act out the behavior (referred to as perceived behavioral control) (Figure 5).

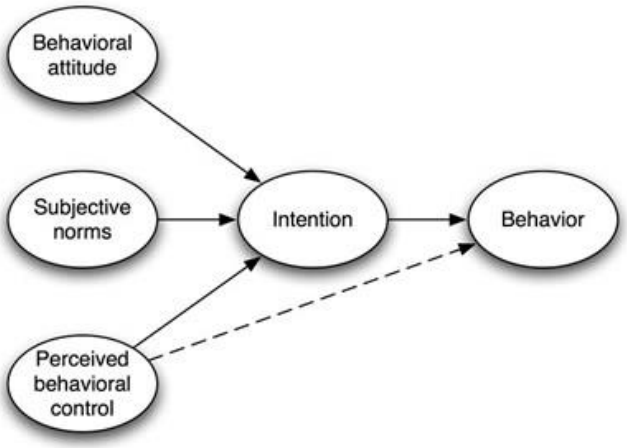

Figure 5. The theory of planned behavior (Fishbein and Ajzen, 2010)

For this study, information was solicited from offshore fishers about factors believed to motivate or deter them from setting and/or maintaining public FADs and private FADs.

Specific questions included:

- Do fishers have a positive or negative attitude toward deployment of public and/or private FADs?
- Do the opinions of other fishers influence the decision to deploy public and/or private FADs?
- Do fishermen perceive that they have the knowledge, skills, and resources to set and maintain public and/or private FADs?

This information can be useful to fisheries managers who wish to deter the deployment of private FADs, for instance, by developing outreach or policies that address the factors most influential in supporting that behavior.

CHAPTER 3. STUDY DESIGN AND IMPLEMENTATION

Survey Instrument

The survey instrument was designed to solicit socio-economic information from offshore fishers, evaluate trends in livelihood assets prior to and commensurate with CARIFICO activities, and allow for an assessment of factors that can motivate or impede the tendency of fishers to set public and/or private FADs (see Appendix A for the survey instrument).

Socio-economic information was captured by questions related to the following topics:

- Demographics encompassing age, ethnicity, household composition, years spent fishing, fishing methods used and membership in community and professional organizations.
- Fishing arrangements and awareness of fishing rules both formal and informal.
- Economic investments and personal assets including household items, vessel and engine ownership, income generating activities and financial arrangements.
- Participation in and benefits derived from facilities, services and trainings supported by government and CARIFICO.

Socio-economic questions were designed to allow for an appraisal of current and past livelihood status using a common set of factors outlined in the Sustainable Livelihoods Framework. The survey instrument also incorporated a set of questions that allowed for a comparison of factors, outlined in the Theory of Planned Behavior (TPB) that can influence a fishers' tendency to set and maintain public and/or private FADs. Finally, items related with the co-management literature were also included in the survey instrument (e.g., level of satisfaction with resource management).

Survey and Questionnaire Design

Prior to implementation of the survey, the University of Florida-based investigators hosted a meeting with a JICA expert, Mr. Minoru Tamura, and a CARIFICO data analyst from Dominica, Mr. Derrick Theophille, to collectively evaluate the project objectives, methods and selection of questions that would appear on the survey instrument. This meeting took place at the University of Florida from August 22-26, 2016. The meeting served as a venue to develop an agenda to (1) guide survey site selection; (2) pilot test and implement the survey on Dominica; and (3) train CARIFICO consultants who would be responsible for conducting the survey on the other five islands participating in the CARIFICO program, with assistance from JICA staff. It was determined that Dominica would serve as the location for the survey pilot test and training of the CARIFICO consultants (see Appendix B for the survey planning meeting agenda). Prior to implementation, a draft of the survey instrument was shared with the Fisheries Division affiliated with each CARIFICO participating island for approval.

Survey Protocol

Implementation of the survey required prior approval by the University of Florida's Institutional Review Board (IRB), which evaluated the survey questions and ensured that the interview methods protected the rights of survey participants to informed consent: Treating participants with respect, minimizing participant risk for participation and protecting the confidentiality of their input. Importantly, measures were taken to provide participants with necessary information so that they could determine if they wanted to participate in an interview or not (see Appendix C for the letter of informed consent that accompanied the questionnaire).

The following considerations were requisite for compliance with the informed consent requirement.

1. Participation must be free of coercion or excessive compensation.
2. Participation must be voluntary and confidential.
3. Participation risk must be clear and minimized.
4. Participants must be aware of study objectives prior to the interview.
5. Participants must be provided with information on how to contact investigators.
6. The confidentiality of personal data collected must be secured.

Survey Pilot Test and Implementation

The survey instrument was pilot-tested on Dominica during September 2–5, 2016 with assistance from eight fishers affiliated with the Roseau fisheries complex. Further refinement of the questions and the survey format occurred on-site based on the input from Roseau fishers. Explaining the survey protocol and conducting each interview took approximately 45 minutes. Initially, it was feared that the length of the survey would negatively affect the interviews but this did not seem to be an issue with the fishers who were generous with their time and the information that they provided.

The updated questionnaire was subsequently used in formal interviews with 74 fishers at five randomly-selected landing sites (Marigot, Portsmouth, Bioche, Toucarie and Layou) on Dominica during September 6-10, 2016. In addition to these primary locations, three additional randomly selected landing sites (Stowe, Scott's Head / Fond. St. Jean, and Mahaut) were identified to conduct CARIFICO consultant trainings, which occurred during September 12-16, 2016. Data collected from 16 surveys conducted during the trainings supplemented that collected the week prior by the University of Florida-based project investigators and Dominica Fisheries Division staff. In advance of the interviews, flyers were distributed to fishers at the selected landing sites to make them aware of the project and their opportunity to participate in the interviews (see Appendix D for the project announcement).

A snowball interview approach was first applied. Fishers at randomly selected landing sites who participated in interviews provided the names of other fishers who might also be interested in being interviewed. However, given the relative difficulty in tracking down fishers off-site it was decided that a more opportunistic convenience sampling approach would yield more completed surveys in the required time-frame. Convenience sampling allowed the project staff to optimize the participation of Dominica Fisheries Division staff, who accompanied the team to the landing sites and helped to conduct the interviews. Organizing interviews to take place in the late afternoon ensured that the maximum number of fishers would be available at landing sites and not otherwise occupied with the offloading and processing of their catch. Given the time-frame for the project it was determined that CARIFICO consultants and project staff would conduct as many interviews as possible during a two to three-week period. Thus, while the selection of locations to survey was random the selection of fishers to interview was not. The vast majority of the fishers surveyed were artisanal offshore fishers but a sample size could not be determined as the population size was not known. It was decided in consultation with JICA partners that the team would conduct as many interviews as possible during a two to three week time-frame on each participating island.

The Dominica Fisheries Division staff assisted with the printing of the final survey instrument, provided notice to fishers of the planned survey, organized transportation to landing sites, and helped conduct interviews. The staff's participation greatly increased the number of interviews possible given the short time-frame and allowed the team to conduct simultaneous interviews with the many fishers who gathered at landing sites to socialize after a days' work. Interviews were conducted privately on an individual basis to ensure the confidentiality of the information provided. This usually involved moving the interview location to a more private place within close proximity of the landing site where other fishers were not privy to the conversation.

CARIFICO Consultants Training

A workshop was conducted on Dominica during September 12-16, 2016 to train the six CARIFICO consultants on methods to implement the survey protocol and to conduct the interviews with fishers (see Appendix E for the training agenda). On September 12, the training program began with an overview of the project and the literature that was referenced to develop the survey questions. On September 13, a more detailed discussion of the survey questions was facilitated with input from the workshop participants. The survey protocol was then presented and practice interviews were conducted in a controlled setting at the Dominica Fisheries Division. This practice round was followed by a debrief session during which participants discussed any issues that they had while implementing their rehearsal interviews.

On September 14 and 15, participants helped select landing sites on the other CARIFICO islands where interviews were scheduled. Participants then accompanied the project investigators and Dominica Fisheries Division staff to several randomly selected landing sites including Scotts Head/Fond St. Jean and Mahaut to further hone their interview skills with fishers at those localities. On-site practice interviews took place in the late

afternoon when the fishers were available. This allowed time for a field trip to the Freshwater Lake and Trafalgar Falls in the Morne Trois Pitons National Park on September 15.

An overview of the Qualtrics web-based data system and data entry protocols was provided on the morning of September 15. During this exercise, each participant was given the opportunity to enter the data from the interviews that they had conducted the previous day. The workshop concluded with a wrap-up session and final question and answer period with the CARIFICO consultants. The CARIFICO consultants departed Dominica on September 16.

Site Selection

The random selection of landing sites representing the interview locations was conducted during the CARIFICO consultants' workshop on Dominica. Localities chosen for interviews were drawn randomly from the existing fishing settlements/landing sites identified by CARIFICO consultants. Primary landing sites were augmented with backup landing sites, to be surveyed as needed, in order to maximize the sample sizes. (Table 1).

Table 1. Survey sites selected for the countries of interest.

Participating Islands	Primary Landing Sites		Backup Landing Sites	
	Major	Medium / Small	Major	Medium / Small
St. Kitts and Nevis	Basseterre New Castle	Dieppe Bay Port Zante Dandy Point	Old Road Jessup	Catton Ground Long Haul Indian Castle
Antigua & Barbuda	Shell Beach Market Wharf	Beach Comber Gaynors Valley Church	Parham Harbour Urlings	High Street Wharf Morris Bay Pearl Harbour
Dominica	Marigot, Portsmouth	Bioche Toucarie Layou	Roseau	Scott's Head/Fond St. Jean, Mahaut Colihaut
St. Lucia	Casteries Soufriere	Banannes Canaries Praslin	Dennery Vieux Fort	Anse la raye Micoud Savannes Bay
St. Vincent & the Grenadines	Kingstown Fitz Hughes	Indian Bay Rose Bank Sandy Bay	Calliaqua Petit Bordel	Campden Park Questelles Fancy
Grenada	Grenville St. George	Waltham Victoria Sauteurs	Grand Mal	Gouyave Hillsborough Petit Martinique

Regional Survey Implementation

Regional implementation of the survey took place during October-November, 2016. CARIFCO consultants conducted Interviews with assistance from JICA experts. In this way, the consultants associated with the Fisheries Division on each of the six islands participating in the CARIFICO project made important contributions to the implementation of the survey.

Data Entry

Survey data was digitized by each CARIFICO consultant online using Qualtrics software. Data management was facilitated by Microsoft Excel 2016 software. The data analysis was conducted using IBM SPSS 24.

CHAPTER 4. RESULTS

This chapter presents the results of the socio-economic analysis and is divided into three parts:

- A demographic and behavioral profile of offshore fishers in the islands under study;
- An assessment of livelihood status, derived from trends in natural, physical, financial, social and human assets,
- An evaluation of factors that can inhibit or motivate FAD fishery development and co-management through an application of the TPB.

A total of 384 interview-based surveys were conducted on islands participating in the CARIFICO project, but only 362 of the surveys were valid and used in the analysis (Table 2). Twenty-two surveys were determined not to be valid because the majority of the questions were unanswered. To account for unanswered questions, the sample size for each question is provided in the tables that follow. Also, due to the limited number of interviews conducted on St. Kitts and Nevis a separate analysis was completed for this CARIFICO island outside of this report.

Table 2. Survey returns

Country	Surveys conducted	Valid surveys
St. Kitts and Nevis	19	9
Antigua & Barbuda	60	58
Dominica	90	89
St. Lucia	73	70
St. Vincent & the Grenadines	62	59
Grenada	80	78
Total	384	362

I. Demographic and Fishing Profile

Age

Fishers participating in the interviews ranged in age from their late teens to their early 70s (Mean=41; Min=17; Max=74). A total of 333 fishers answered this question. This broad range in age is characteristic of fishers on all the CARIFICO islands who participated in the survey and is indicative of a profession that is not only capable of sustaining fishers in the longer-term, but is attracting younger adults as well. The range and distribution of ages appears in Table 3 and Figure 6.

Table 3. Respondent's age.

Group	Mean	St. Dev	Total	Min	Max
Antigua & Barbuda	42	10.1	51	18	69
Dominica	42	13.5	89	17	74
St. Lucia	43	11.3	65	21	68
St. Vincent & the Grenadines	43	11.9	51	18	67
Grenada	38	11.1	77	22	68
Total	41	12.0	333	17	74

Among islands there were no statistical differences between the mean age of participants ($F(4,328) = 1.9$, $p = 0.112$).

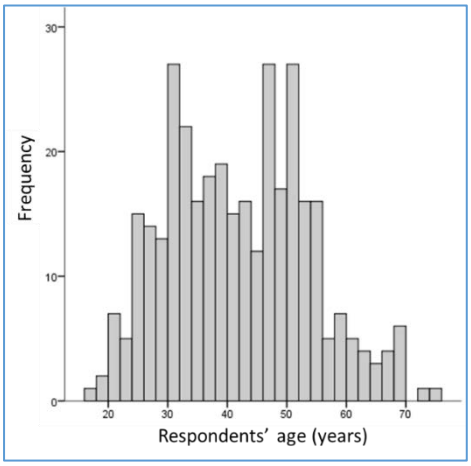

Figure 6. Age distribution of survey respondents (N=341).

Ethnicity

The majority of fishers participating in the interviews were black and of African descent (80%). A small, but significant number (11%) are native to the region (Kalinago or Arawak). Approximately 8% of the fishers interviewed were either Hispanic, Caucasian or East Indian (Table 4).

Table 4. Respondent's ethnicity.

COUNT	Caucasian	Hispanic	Black	Kalinago	Arawak	East Indian	Other
Antigua*	12.1%	3.4%	82.8%	0.0%	0.0%	1.7%	0.0%
Dominica	1.1%	0.0%	83.2%	13.7%	0.0%	0.0%	2.1%
St. Lucia	0.0%	0.0%	91.5%	0.0%	1.4%	7.0%	0.0%
St. Vincent*	11.1%	0.0%	68.1%	12.5%	4.2%	2.8%	1.4%
Grenada	3.8%	0.0%	75.0%	18.8%	0.0%	1.3%	1.3%
Total	5.1%	0.5%	80.1%	9.8%	1.1%	2.4%	1.1%

* Abbreviated for: Antigua and Barbuda; St. Vincent and the Grenadines.

Household Composition

Many fishers either live alone, with their girlfriend or with their spouse. But, on average, a participating fisher's household is comprised of 3 people (min=1, max=10). Among CARIFICO islands, there was no statistical difference regarding the number of people living in a fisher's household ($F(4,348) = 1.6$, $p = 0.175$). The size of fishing households is broadly similar to that of households in the general population.

Education

The majority of fishers interviewed had completed either primary (53%) or secondary school (37%). Few had completed college (7%) (Figure 31 and Table 1F in Appendix F).

Fishing Experience and Practices

On average, survey participants had about 20 years (SD=12.0) of fishing experience (Table 5). Fishermen from Antigua and Barbuda and Grenada have been fishing for less time than the average with 18 and 16 years spent fishing, respectively. Participants in Grenada reflected the lower average of fishing experience, which is statistically different from St. Lucia and St. Vincent and the Grenadines participants ($F(4,349) = 4.4$, $p = .002$).

Table 5. Fishing experience.

Group	Mean	St. Dev
Antigua and Barbuda	18.03	11.1
Dominica	21.32	12.9
St. Lucia	23.13	11.4
St. Vincent & the Grenadines	22.75	13.7
Grenada	16.47	9.6
Total	20.31	12.0

Most fishers interviewed are registered commercial fishers (88%). Approximately 10% of those surveyed mainly fish for subsistence. The remaining 3% are primarily recreational or charter/sport fishers (Table 2F in Appendix F). Generally, over the past five years, there has been a slight increase in the number of individuals becoming crew members and boat captains (Table 3F in Appendix F). The overwhelming majority (84%) of fishers interviewed owned their boats five years ago and presently own their own boats (Table 4F in Appendix F).

Most fishers interviewed use a variety of fishing methods, with trolling, longline/hand line, bottom long line and drop line being the most common practices. A significant number of offshore fishers also use pots/traps and nets. Comparatively few fishers interviewed use rods and reels or spears.

On average, vessels used for pelagic fishing are 23 feet long (SD=6.1, Min=19, Max=29, N=282) and the majority are made of fiberglass. Only 15% of vessels have a cabin (Table 5F in Appendix F). On a country level, vessels in Antigua and Barbuda and St. Lucia are significantly greater in length than the other islands (F(4,277) = 30.6, p = 0.000).

Comparatively, fishers in CARIFICO islands have been fishing offshore for an average of 15 years. Offshore fishing has been historically active for longer periods in St. Lucia (20 years on average), St. Vincent and the Grenadines (18 years on average) and Dominica (16 years on average) and is a more recent development for fishers in Grenada (11 years on average) and Antigua and Barbuda (7 years on average). A large standard deviation (11.9 years) and ANOVA (F(4, 345) = 14.9, p = .000) indicates that fishers interviewed in Antigua and Barbuda and Grenada have engaged in offshore pelagic fishing for significantly shorter periods of time than fishers in other islands under study (Figure 7).

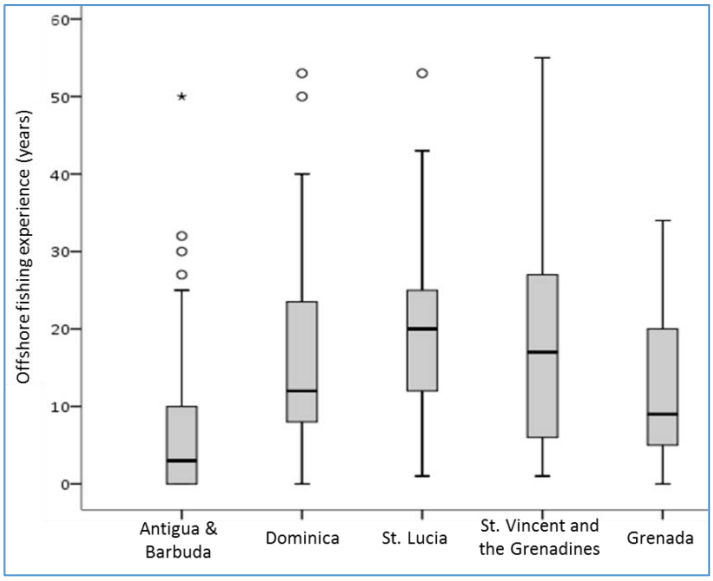

Figure 7. Offshore fishing experience. Circles = outliers >1.5 but <3 interquartile ranges; asterisk= >3 interquartile ranges from nearest edge of boxplot.

FAD Use

Fishers in the islands under study have used FADs for an average of 6 years. This number is significantly higher in Dominica (average of 10 years) and St. Lucia (average of 9 years) – ANOVA (F(4, 344) = 33.0, p = .000) – which is indicative of a longer history of fishers setting FADs for private use on those islands (Figure 8).

The use of FADs by fishers on Antigua and Barbuda, St. Vincent and the Grenadines and Grenada is a more recent development, likely coinciding with the initiation of the CARIFICO project. This result is illustrated in Figure 9, which shows a significant growth in FAD fishing from five-years ago to present, particularly on St. Vincent and the Grenadines and Grenada. Similarly, an upward trend in the use of FADs from five-years ago to present (from "sometimes" to "frequently") is observed for St. Lucia. Antigua and Barbuda and Dominica showed no appreciable change in FAD use during the five-year period. On average, Antigua and Barbuda fishers used FADs "sometimes" and Dominica fishers used FADs "frequently" during the five-year period.

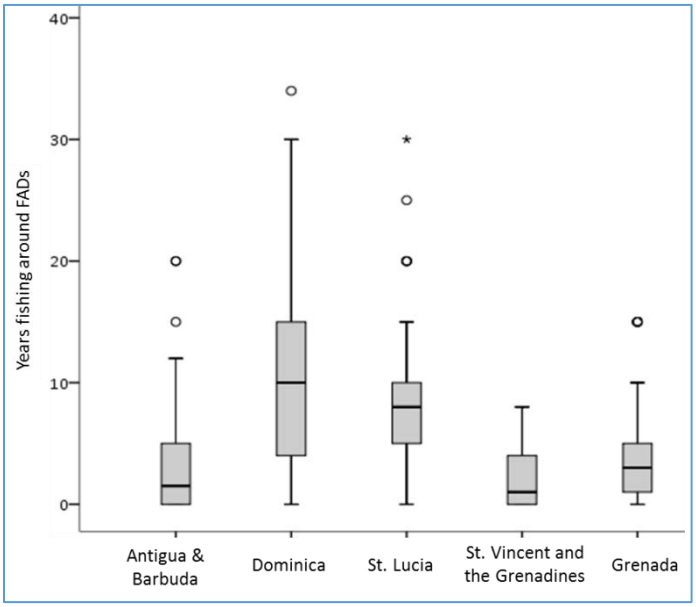

Figure 8. Number of years fishing around FADs. Circles = outliers >1.5 but <3 interquartile ranges; asterisk= >3 interquartile ranges from nearest edge of boxplot.

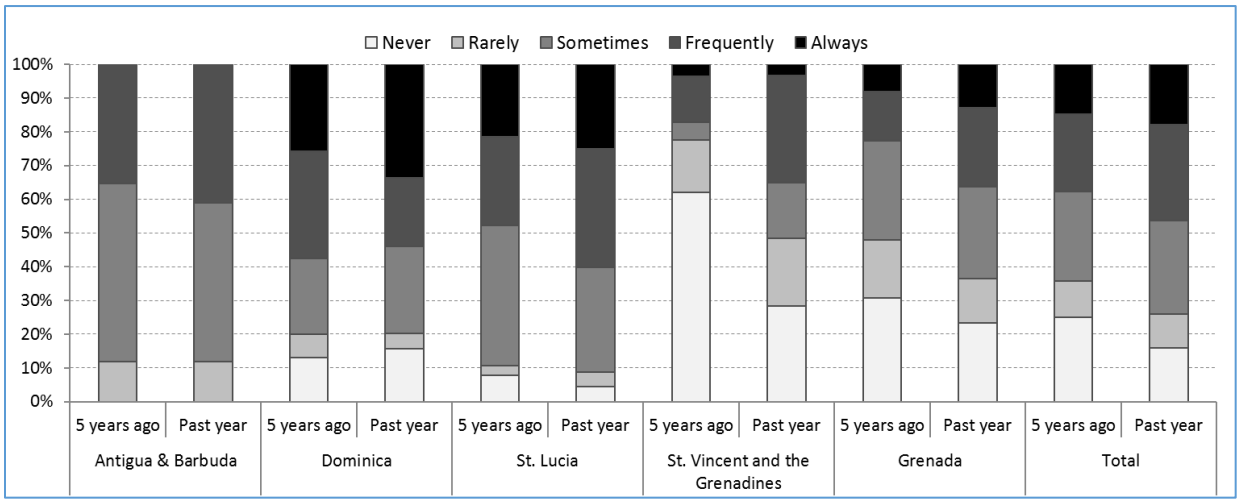

Figure 9. Frequency of FAD use.

There has been a general transition to more public FADs and fewer private FADs being set on Dominica, St. Vincent and the Grenadines and Grenada. However, Dominica fishers are still setting significant numbers of private FADs compared to the other CARIFICO islands. The setting of private FADs also increased during the past five-years on Antigua and Barbuda and St. Lucia (Table 6). These results indicate a general increase in the number of participants setting and/or maintaining FADs in the past year from five years ago. However, this difference varied among islands with Antigua and Barbuda, St. Vincent and the Grenadines and Grenada showing greater increases in public FAD deployments when compared to Dominica and St. Lucia (Figure 10).

Table 6. Types of FAD deployment during the past year and five years ago.

	Past year					5 years ago				
Group	+Neither	Only public	Only private	Both	Total	+Neither	Only Public	Only Private	Both	Total
Antigua*	66%	17%	11%	6%	35	82%	12%	0%	6%	34
Dominica	34%	18%	20%	28%	87	33%	12%	31%	24%	84
St. Lucia	59%	28%	7%	6%	68	57%	34%	4%	4%	68
St. Vincent *	66%	32%	2%	0%	59	83%	12%	3%	2%	59
Grenada	64%	31%	3%	3%	75	70%	27%	1%	1%	74
Total	56%	26%	9%	10%	324	61%	20%	10%	8%	319

* Abbreviated for: Antigua and Barbuda; St. Vincent and the Grenadines. +Neither refers to fishers who do not set FADs of any kind.

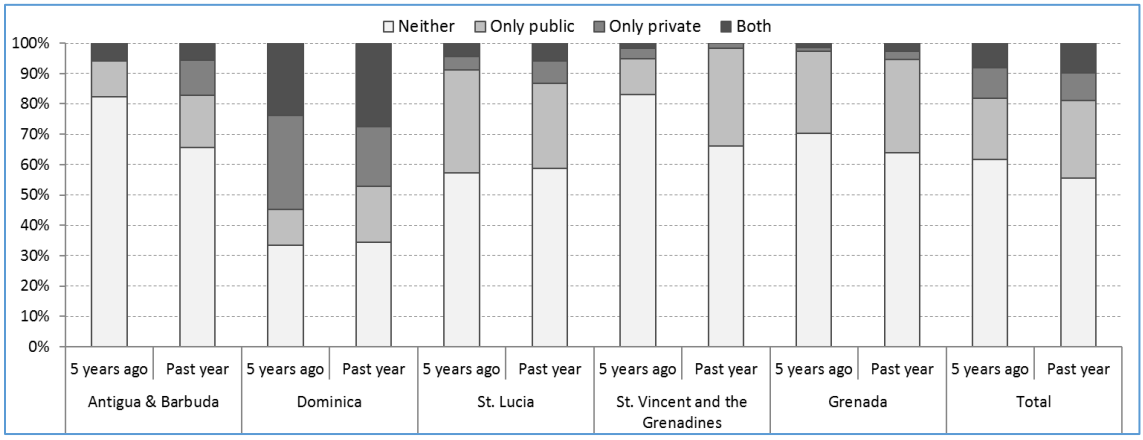

Figure 10. Types of FAD deployment (public and/or private) among fishers.

Knowledge of and Adherence to Fishing Rules

Many fishers were aware of rules regarding FAD use (public or private): 39% of participants were aware of rules related to the use of public FADs and 26% of participants were aware of rules related to private FAD use. More specifically, fishers expressed greater awareness of formal rules about how to set public FADs, who can use public FADs, fees for the use of public FADs and how to move around public FADs than about informal rules pertaining to the deployment and use of private FADs. The lower reported awareness of rules about private FADs likely reflects the fact that in many of the islands, private FADs are not as common. In Dominica, where both private and public FADs are common, awareness of rules was similar for both types of FADs. Of those who were knowledgeable about rules, most are aware of government policy that considers all FADs (whether public or private) to be publicly accessible. Dominica fishers, however, expressed greater knowledge of informal rules applied to the use of private FADs (Figure 11).

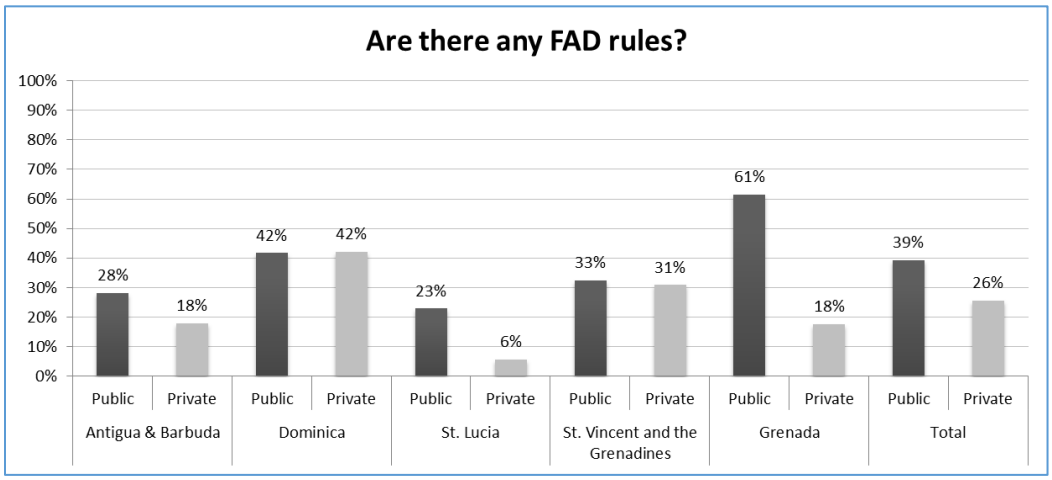

Figure 11. Knowledge of rules related the deployment, maintenance and use of public and private FADs.

A closer examination of fishers' awareness of specific rules varies based on the particular rule in question. For example, the rules that most participants were aware of related to the setting and/or maintaining of public FADs (Figure 12-A and C) and paying fees for using public FADs (Figure 12-A and B). Fewer than one-third of participants were aware of any rules about the number of fishers that can use FADs at the same time, who can use FADs, and how to move around FADs (public or private) - (Figure 12-A and D through F).

An overwhelming majority of fishers surveyed (between 91% to 93%) indicated that others "never," "rarely" or "sometimes" observed the rules regarding use of public or private FADs (Figure 13). Fewer than 9% of public FAD users and 7% of private FAD users indicated that formal and informal rules were being observed by other fishers "frequently" or "always." This low assessment for others following FAD rules is particularly common to fishers from Antigua and Barbuda, St. Lucia, St. Vincent and the Grenadines and Grenada. But these countries have a shorter history of setting FADs than islands, such as Dominica. Therefore, it is expected that fewer fishers would be aware of rules concerning FADs that have only recently been established.

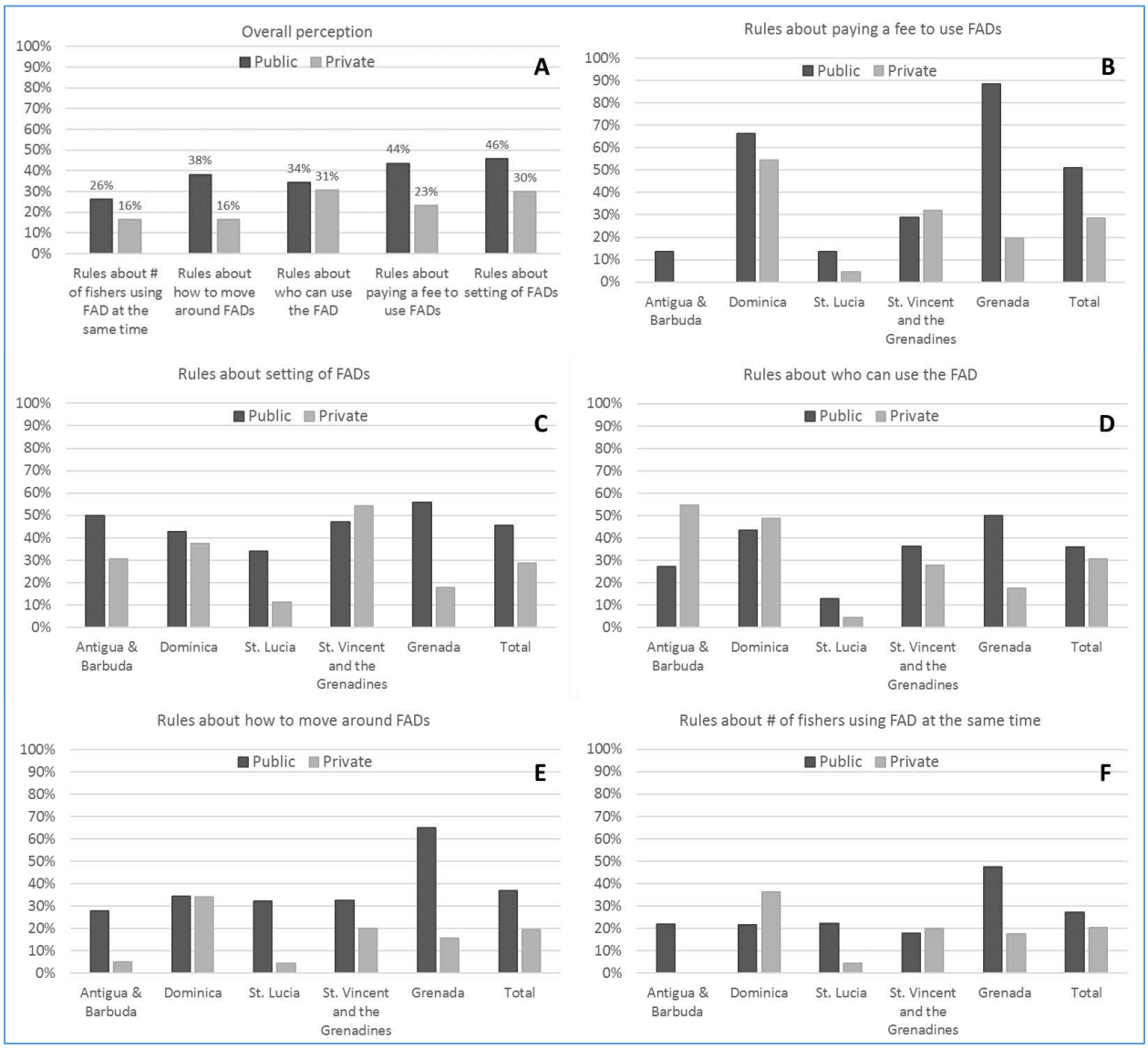

Figure 12. Awareness of rules related to the use of FADs. A) Overall perception, B-F) awareness of specific rules. Dark bars = rules for public FADs and lighter bars = rules for private FADs.

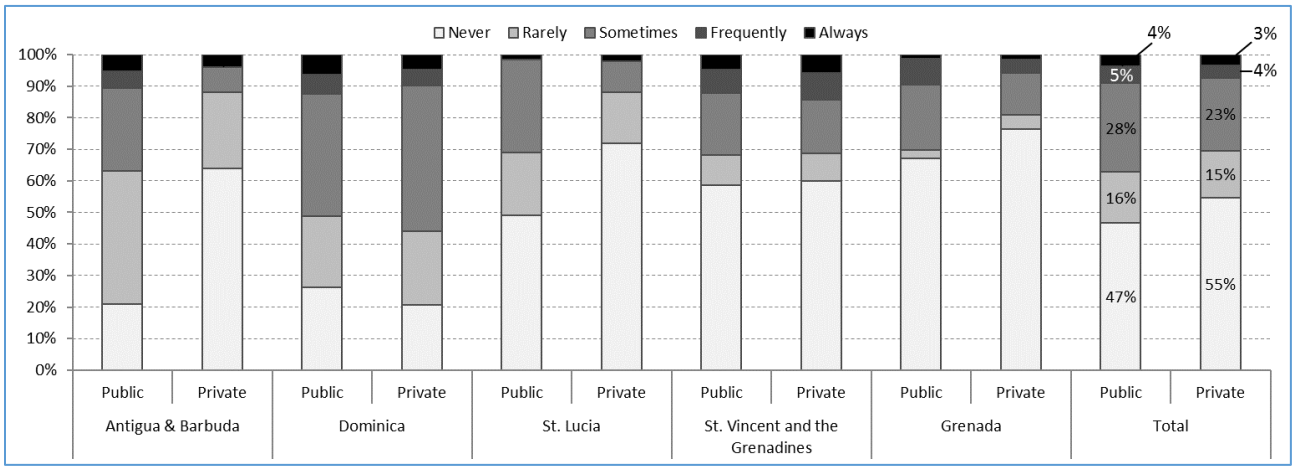

Figure 13. Perception of participants regarding fishers following FAD rules.

II. Satisfaction with Fisheries Co-management

Services, Facilities and Opportunities for Input into Management Decisions

Survey respondents were, in general, not satisfied with facilities, services and opportunities that they have to provide input into management decisions. When asked their satisfaction level they tended to select options on the dissatisfied side of the scale (Figure 14). Respondents were less satisfied with the services provided by fishing cooperatives and services provided by landing sites (Figure 14).

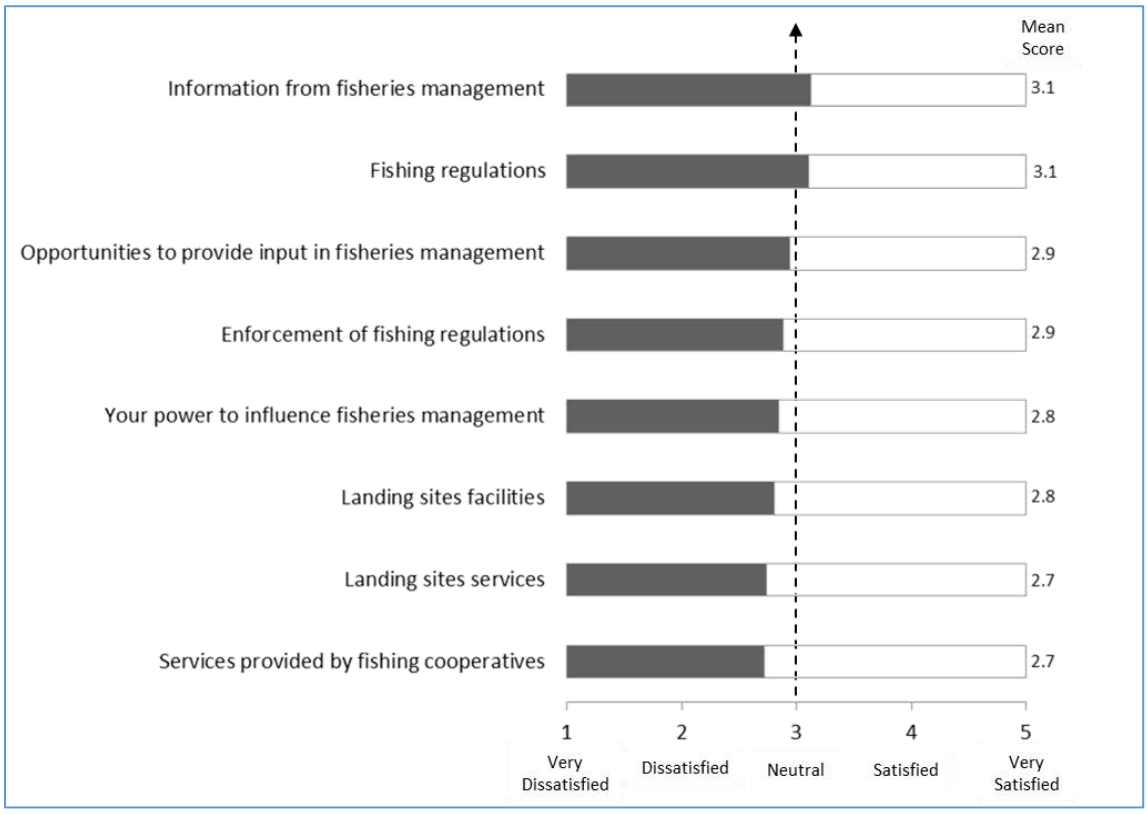

Figure 14. Survey respondents level of satisfaction with services and opportunities to provide input into fisheries management. Scoring was on a satisfaction scale of 1 to 5, with 5 being very satisfied.

Fishing Regulations

Fishers were a bit more positive about their satisfaction with existing fishing regulations (41%) than with facilities and services. However, few fishers were "very satisfied" (2%). An almost equal number of fishers were "neutral" or "dissatisfied" regarding their feelings about fishing regulations (30% and 24%, respectively) (Figure 15).

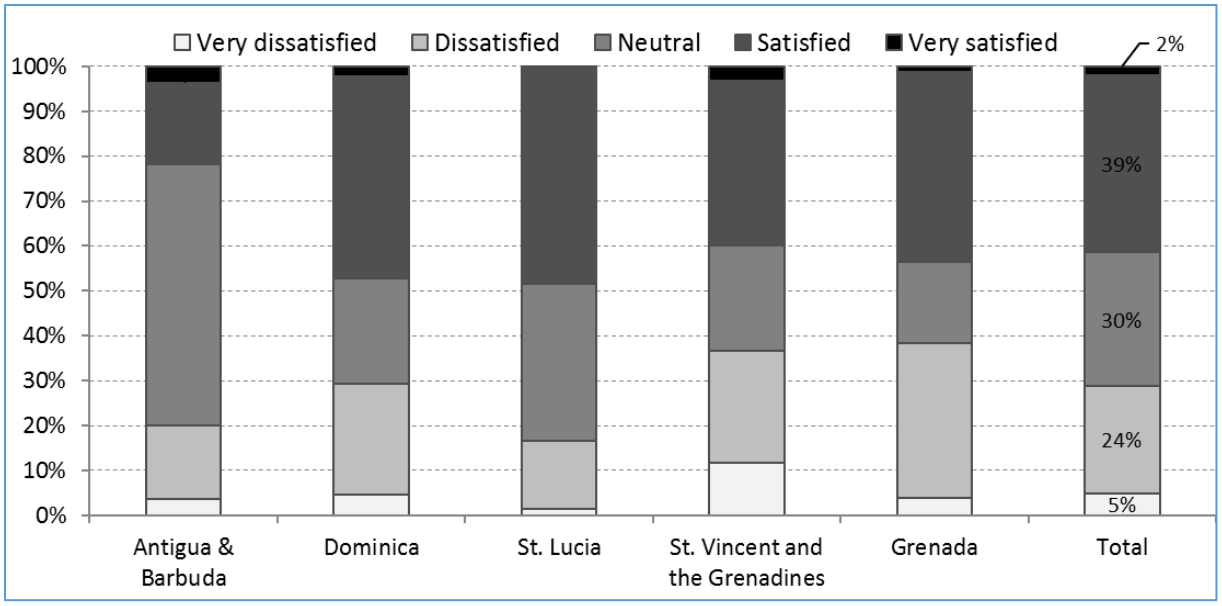

Figure 15. Satisfaction with fishing regulations.

Information Received About Fisheries Management

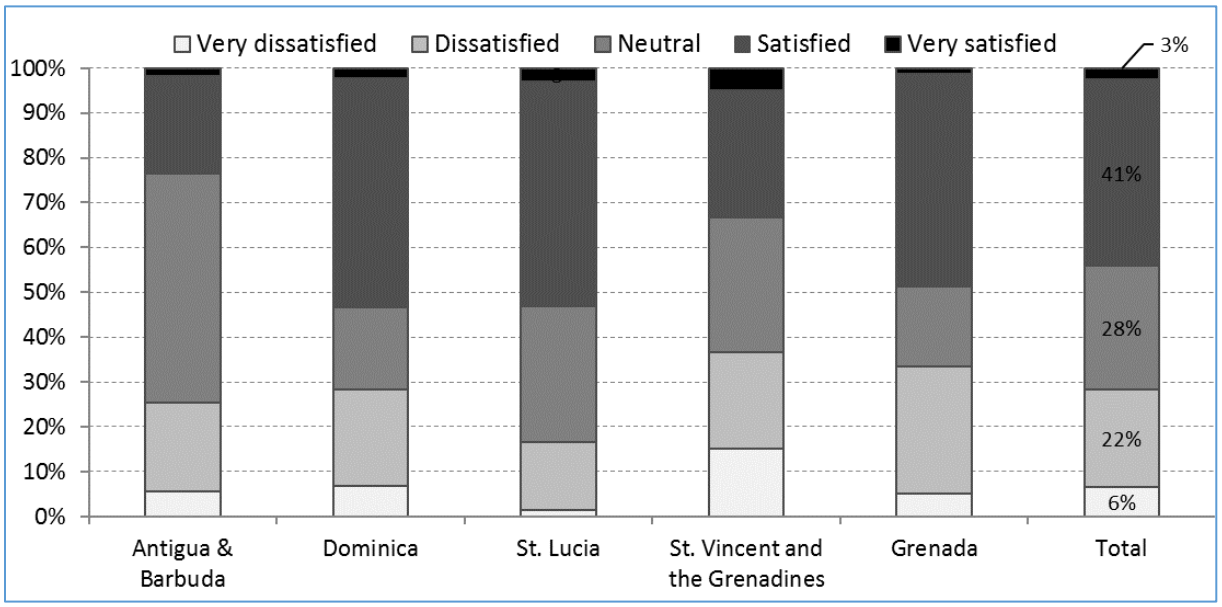

Figure 16. Satisfaction with information received about fisheries management.

The majority of fishers were either "satisfied" (41%) or "neutral" (28%) regarding the information that they receive about fisheries management. About (22%) were "dissatisfied." Very few fishers were "very satisfied" or "very dissatisfied" (Figure 16).

Opportunities to Provide Input in Fisheries Management

Fishers were evenly split regarding "satisfaction," "dissatisfaction" and "neutrality" (32%, 29%, and 29% respectively) regarding opportunities afforded them to provide input into fisheries management decisions. A comparatively small number of fishers expressed either extreme dissatisfaction or extreme satisfaction with their ability to provide input (Figure 17).

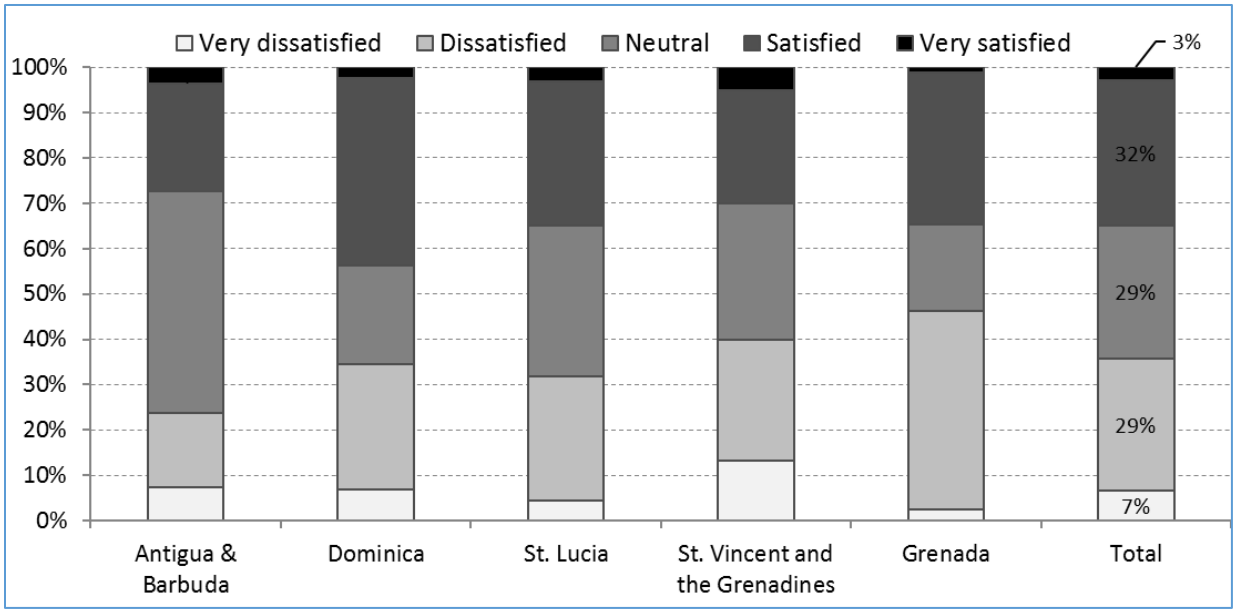

Figure 17. Satisfaction with opportunities to provide input to fisheries management.

Power to Influence Fisheries Management

A large proportion of fishers were not satisfied with their power to influence fisheries management decisions (41%). About 28% of fishers were satisfied. A large proportion of fishers were "neutral" (28%) meaning that they were neither satisfied nor dissatisfied regarding their power to influence fisheries management decisions (Figure 18).

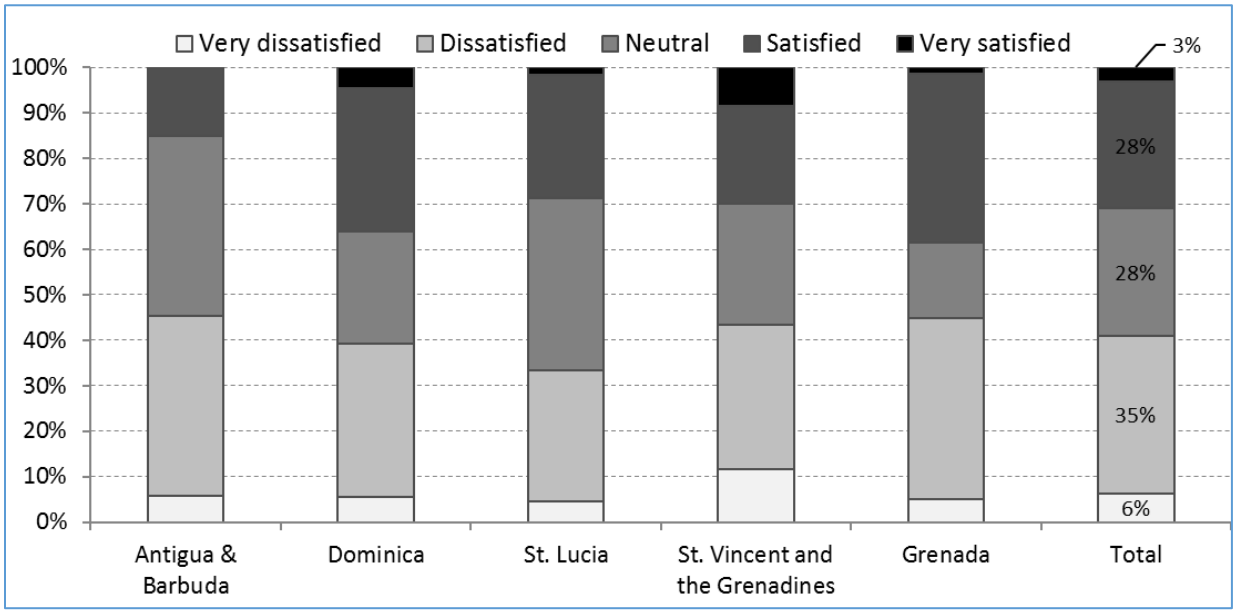

Figure 18. Satisfaction with power to influence fisheries management.

Enforcement of Fishing Regulations

Satisfaction with enforcement of fishing regulations was split between fishers: About (37%) were more satisfied and about (38%) were more dissatisfied with the current enforcement strategies. An almost equally significant proportion of fishers were neutral (25%) in this regard (Figure 19).

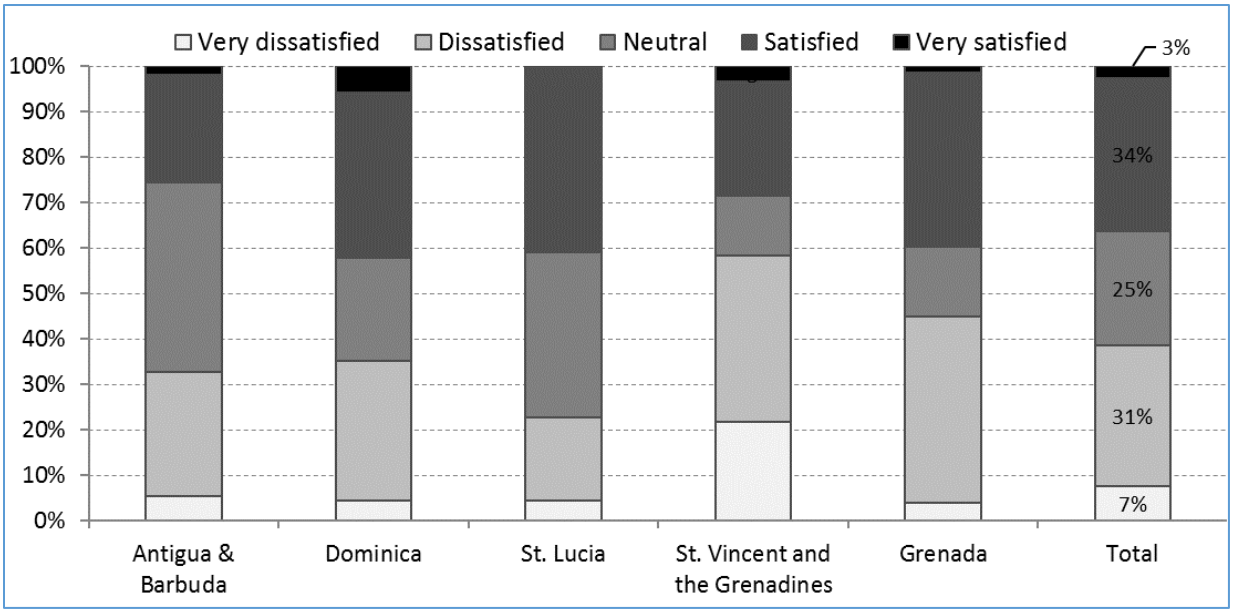

Figure 19. Satisfaction with enforcement of fishing regulations.

Landing Site Services

Fishers were split with 35% being dissatisfied and 32% being satisfied with landing site services, such as fuel, ice and cold storage. Few fishers were "very satisfied" (3%). However, a larger percentage of fishers indicated that they were "very dissatisfied" with services (18%). Taken as a whole about 66% of fishers expressed some level of dissatisfaction or neutrality regarding landing site services (Figure 20).

Fishers' satisfaction with services at major landing sites (i.e., with fisheries complex) and medium/smaller landing sites (i.e., without fisheries complex) was also evaluated (see Table 1 for a listing of landing sites). The assumption was that fishers affiliated with major landing sites would be more satisfied with the services provided than fishers affiliated with medium/smaller landing sites. The results for this comparison conform to the general finding above that fishers were overall dissatisfied with landing site services irrespective of the type. (Chi-Square=3.33, $p \geq 0.05$).

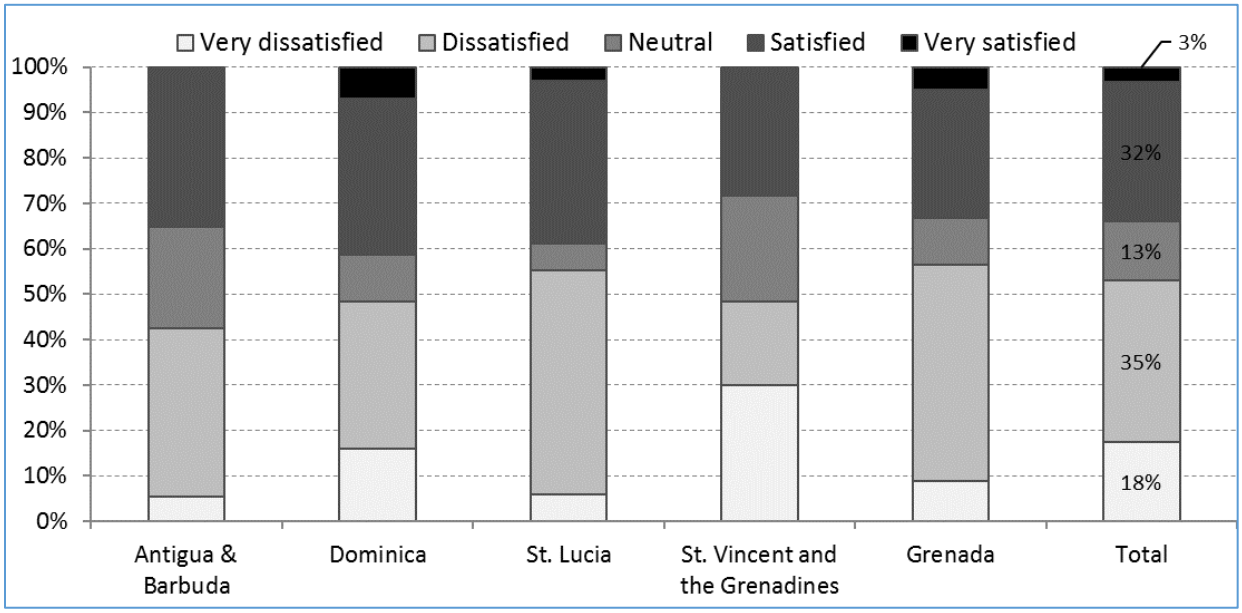

Figure 20. Satisfaction with fish landing sites services.

Landing Site Facilities

Fishers were also split with 34% being dissatisfied and 34% being satisfied with landing site facilities. As with the services, few fishers were "very satisfied" with the facilities (5%). In total, about 61% of fishers expressed some level of dissatisfaction or neutrality regarding landing site facilities (Figure 21).

Fishers satisfaction with facilities at major (i.e., with fisheries complex) and medium/smaller (i.e., without fisheries complex) landing sites was also evaluated (see table 1 for a listing of landing sites). The assumption was that fishers affiliated with major landing sites would be more satisfied with the facilities provided than fishers affiliated with medium/smaller landing sites. The results for this comparison showed that fishers affiliated with major landing sites were significantly less satisfied with the facilities than those fishers associated with medium/small landing sites (Chi-Square=11.2, p=0.02). This result may stem from the possibility that higher expectations are now held by fishers affiliated with larger fisheries complexes for facilities and services, that they have come to rely on, to be provided and maintained (e.g., ice machines; cold storage, subsidized fuel). Fishers affiliated with smaller landing sites, which typically do not offer the same level of function/convenience as larger fisheries complexes, may not have the same level of expectation. This finding presents an opportunity for further inquiry, particularly related to the function and maintenance of facilities and the consistency of services being provided.

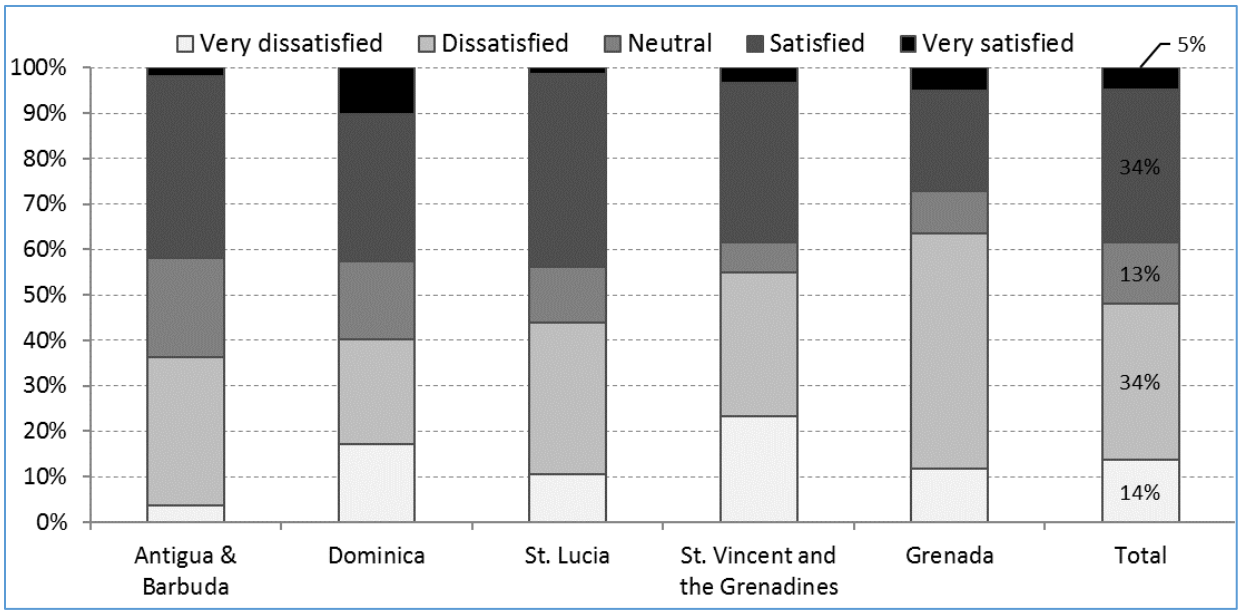

Figure 21. Satisfaction with fish landing facilities.

Services Provided by Fishing Cooperatives

Fewer fishers, still, expressed positive views about the services provided by fishing cooperatives (30%). About 70% of fishers were either "very dissatisfied," "dissatisfied" or "neutral" regarding cooperative services (Figure 22). Satisfaction of services, facilities and management for CARIFICO islands is presented in Figure 23.

Fishers satisfaction with services provided by fishing cooperatives at major landing sites (i.e., with a fisheries complex that typically includes a fish processing center, cold-storage facilities, fuel and protected basins) and medium/smaller landing sites (without fisheries complex infrastructure) was also evaluated (see table 1 for a listing of landing sites). The assumption was that fishers affiliated with major landing sites would be more satisfied with the services provided by fishing cooperatives than fishers affiliated with medium/smaller landing sites. The results for this comparison showed that fishers affiliated with major landing sites were significantly less satisfied with the services provided by fishing cooperatives than those fishers associated with medium/small landing sites (Chi-Square=12.0, p=0.02). Consistent with the findings regarding landing site facilities, this result could be related to fishers' expectations for a greater level of service out of cooperatives at larger fisheries complexes, as opposed to smaller landing sites where cooperatives and services may not be as prevalent.

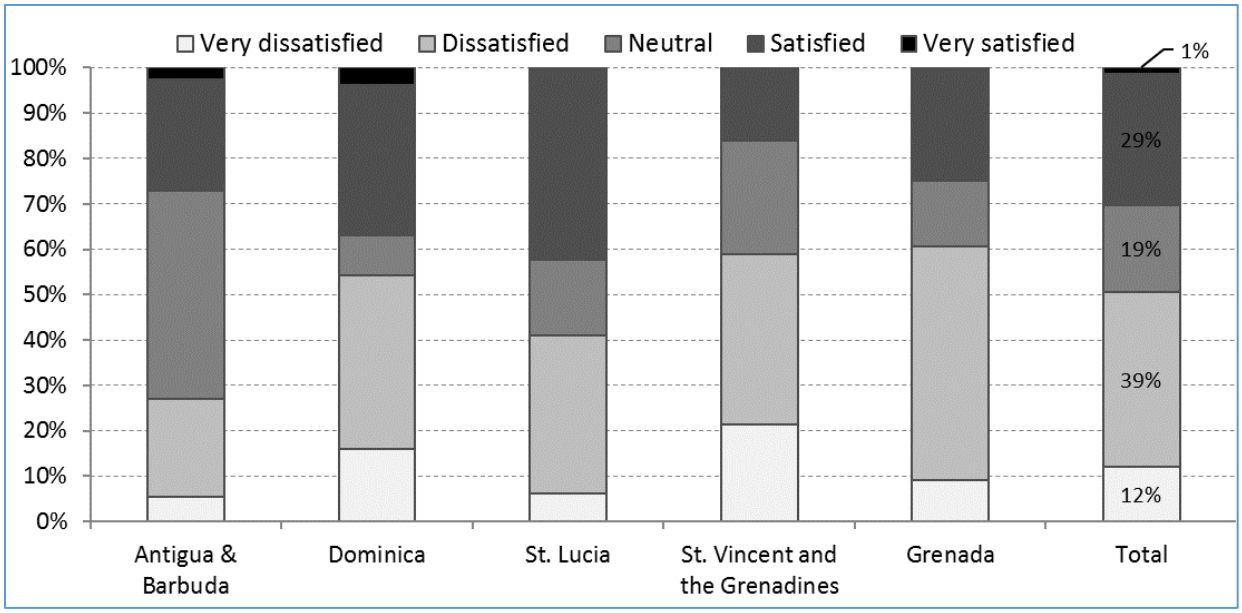

Figure 22. Satisfaction with fishing cooperatives.

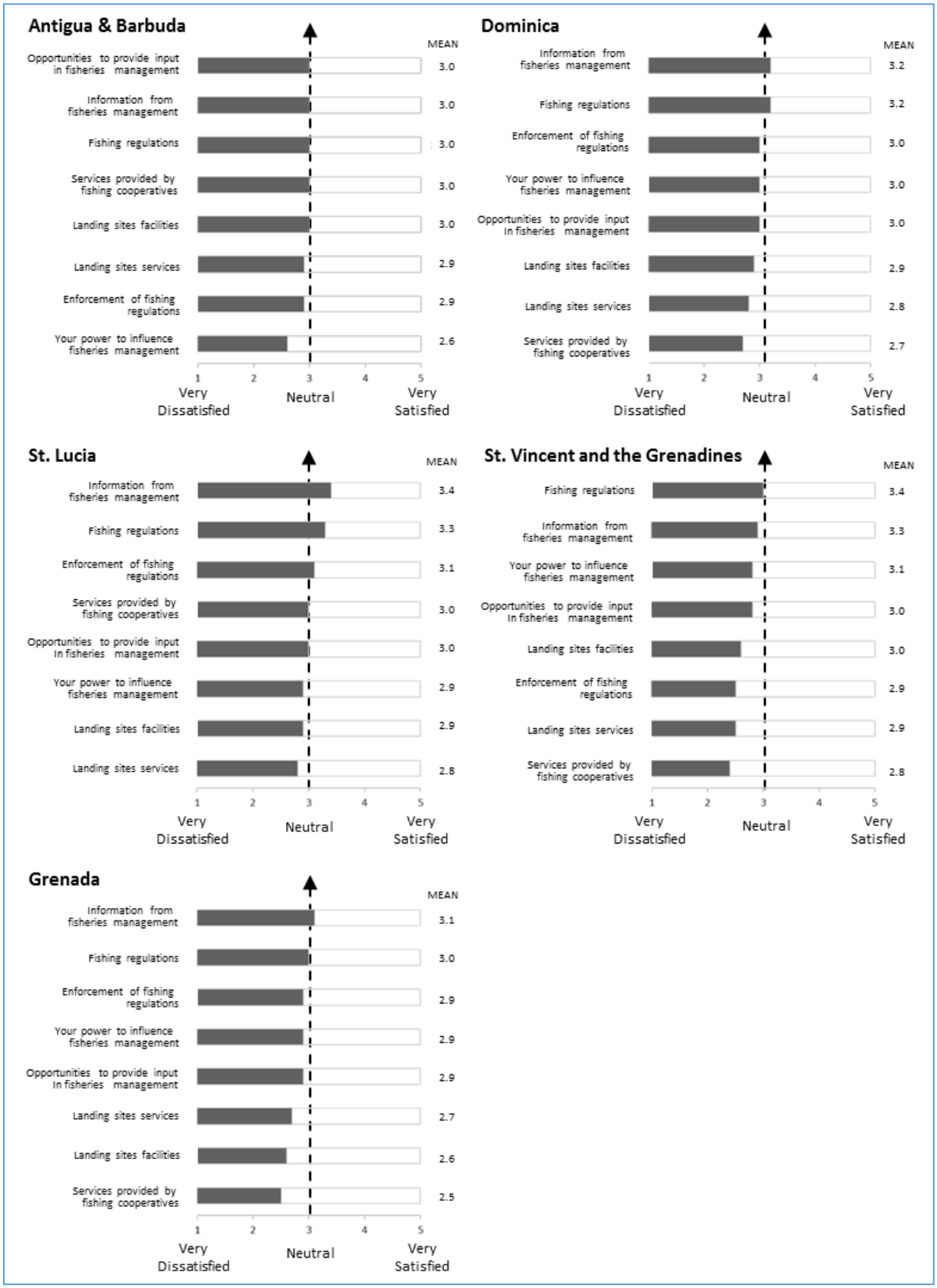

Figure 23. Satisfaction with services and opportunities to provide input into fisheries management. Scoring was on a satisfaction scale of 1 to 5, with 5 being very satisfied.

III. Trends in Livelihood Assets

Description of Livelihood Assets

An important component of the socio-economic analysis consisted of a description of trends in the livelihood status of fishers, both past and present. To support this objective, the Sustainable Livelihoods Framework was applied to evaluate current livelihood status and to show trends (improvements or declines) to livelihoods over a five-year period. A five-year time-frame was determined to be sufficient to compare trends in livelihoods prior to and during implementation of the CARIFICO project. In this context, the degree to which fishers collectively benefit (or not) from natural, physical, human, social, and financial assets that contribute to their economic and social wellbeing was quantified. Assets were described by fishers using a scale from 1 to 5: poor (1), fair (2), average (3), good (4), and very good (5).

Natural Asset

How would you describe your success in offshore fishing?

The majority of fishers believed that they have "average" to "good" success in fishing, both presently and five years ago, with a slightly higher percentage of fishers indicating "average" to "good" fishing five years ago (74%, 3.6 mean) over the present (69%, 3.3 mean) - (Figures 24 and 25). The percentage of fishers who categorized their fishing success as "very good" presently (12%) was also a bit lower than perceptions of their fishing success five years ago (17%) (Table 6F in Appendix F).

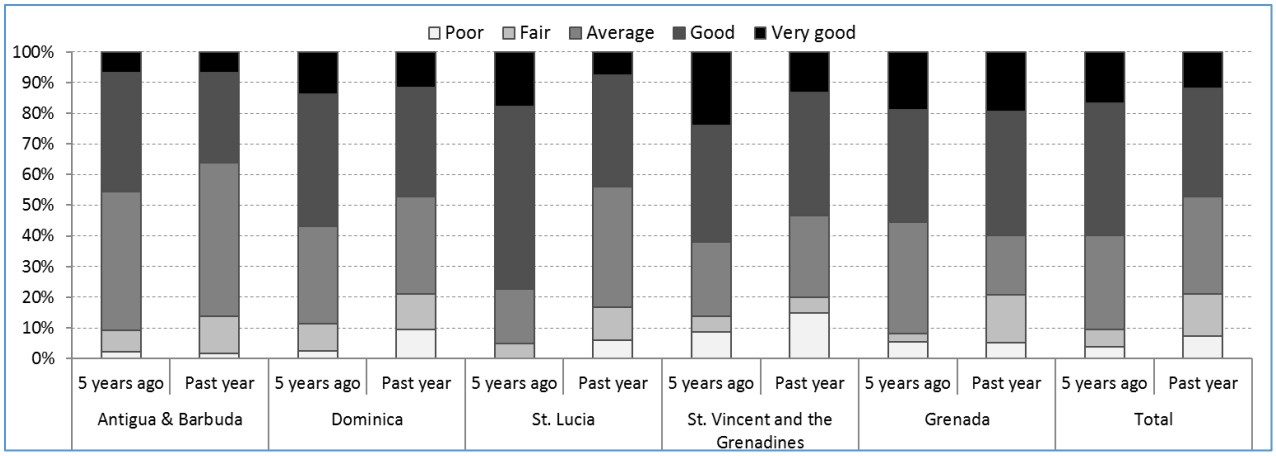

Figure 24. Percentage of responses based on a scale for success in fishing offshore

At a country level, respondents from St. Lucia showed the greatest difference between their fishing success five year ago (mean=3.9) over the present (mean=3.3) (Figure 25).

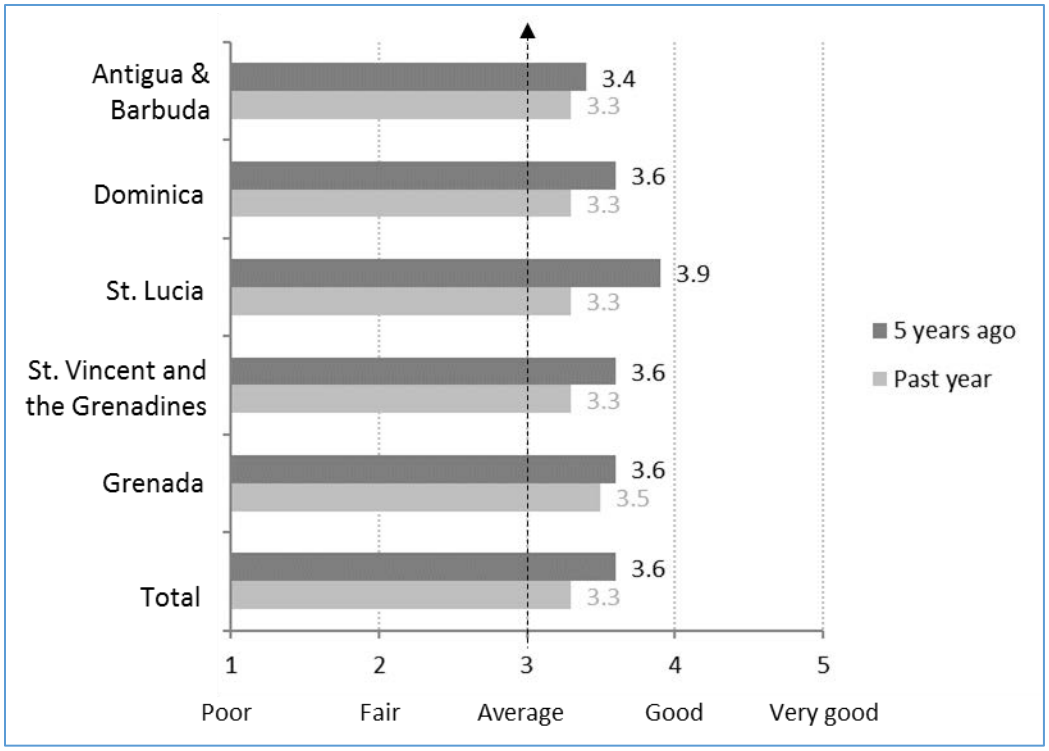

Figure 25. Level of success in fishing offshore over time (mean scores). Scoring was on a scale of 1 to 5, with 5 being very good.

How would you describe the abundance of fish?

The majority of fishers believed that fish abundance was "average" to "good", both presently and five years ago, with a slightly higher percentage of fishers indicating "average" to "good" abundance five years ago (73%, 3.7 mean) over the present (65%, 3.3 mean). The percentage of fishers who categorized fish abundance as "very good" presently (12%) was also a bit lower than perceptions of fish abundance five years ago (19%). This suggests that fishers generally perceive fish abundance as declining over the past five years. This perception is supported by the statistic that an average of 46% of fishers reported "good" abundance five years ago and only 32% of fishers reported "good" abundance presently (Figures 26 and 27) (Table 7F in Appendix F).

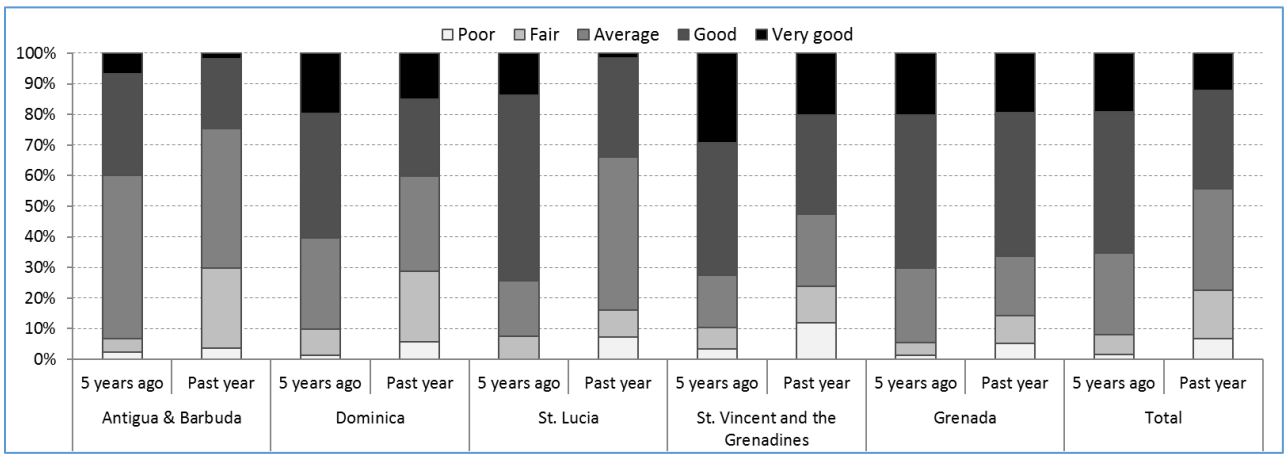

Figure 26. Perception of fish abundance.

Respondents from St. Lucia and Antigua perceive the greatest decline in fish abundance from five years ago over the present (Figure 27).

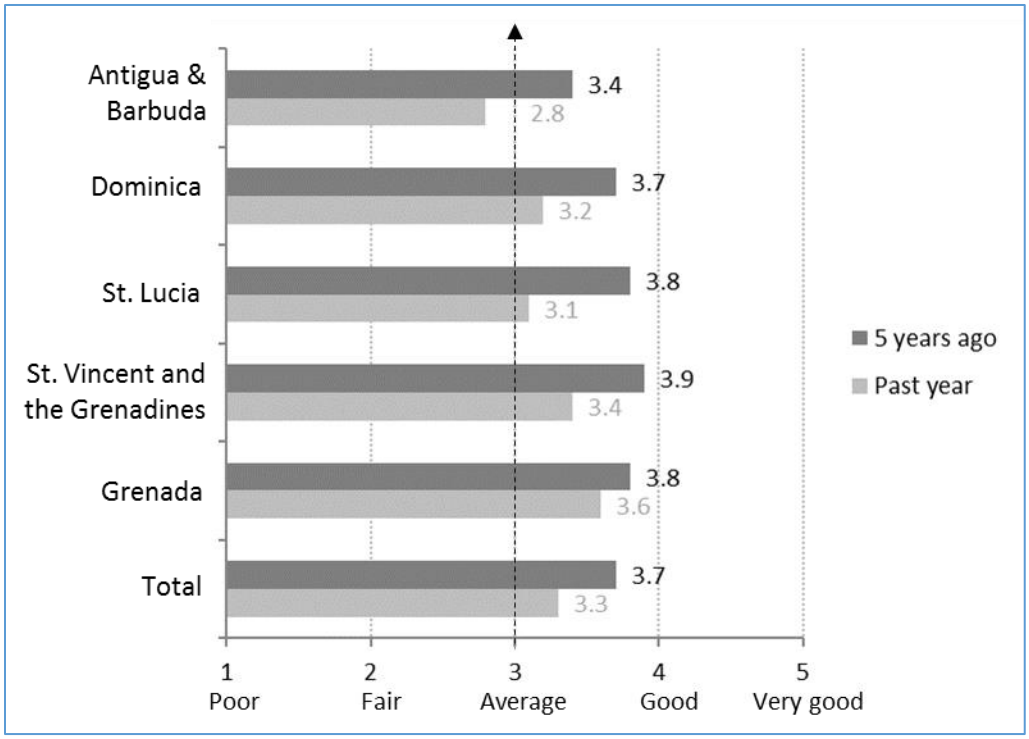

Figure 27. Perception of fish abundance over time (mean scores). Scoring was on a scale of 1 to 5, with 5 being very good.

Physical Asset

Possession of the assets

Possession of all key assets among fishers increased during the past five years, with the exception of private FAD ownership. Almost half of the fishers now own their own land (49%); more fishers also now own their own homes (64%) and boats (58%). There has also been a significant increase in ownership of assets including televisions, indoor toilets and refrigerators. Assets that remained out of reach, or not particularly desired, include the ownership of private FADs (12%), air-conditioning (10%) and motor vehicles (33%) (Figures 28 and 29).

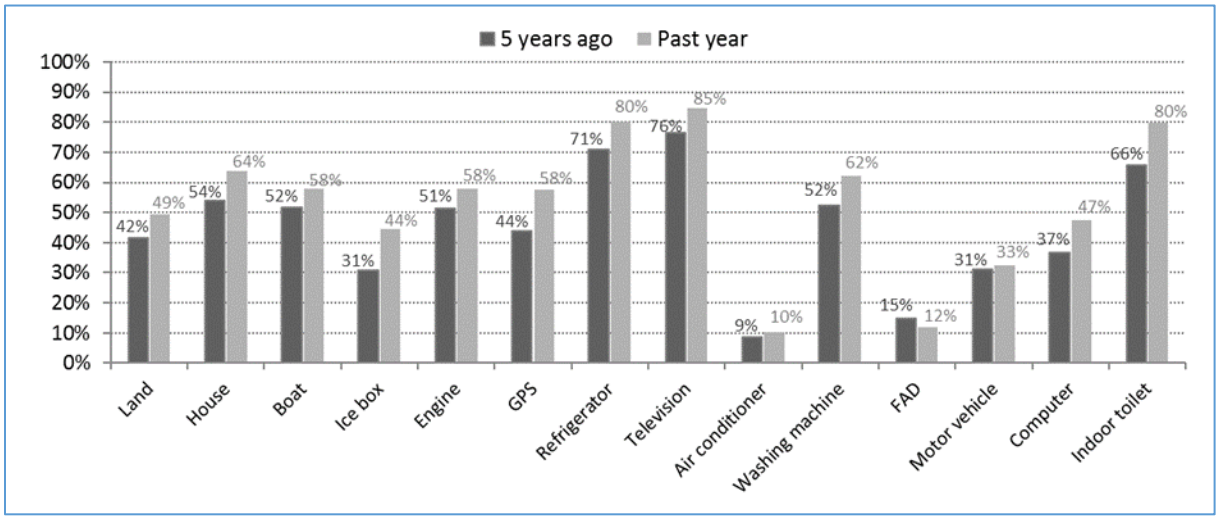

Figure 28. Possession of key assets over time.

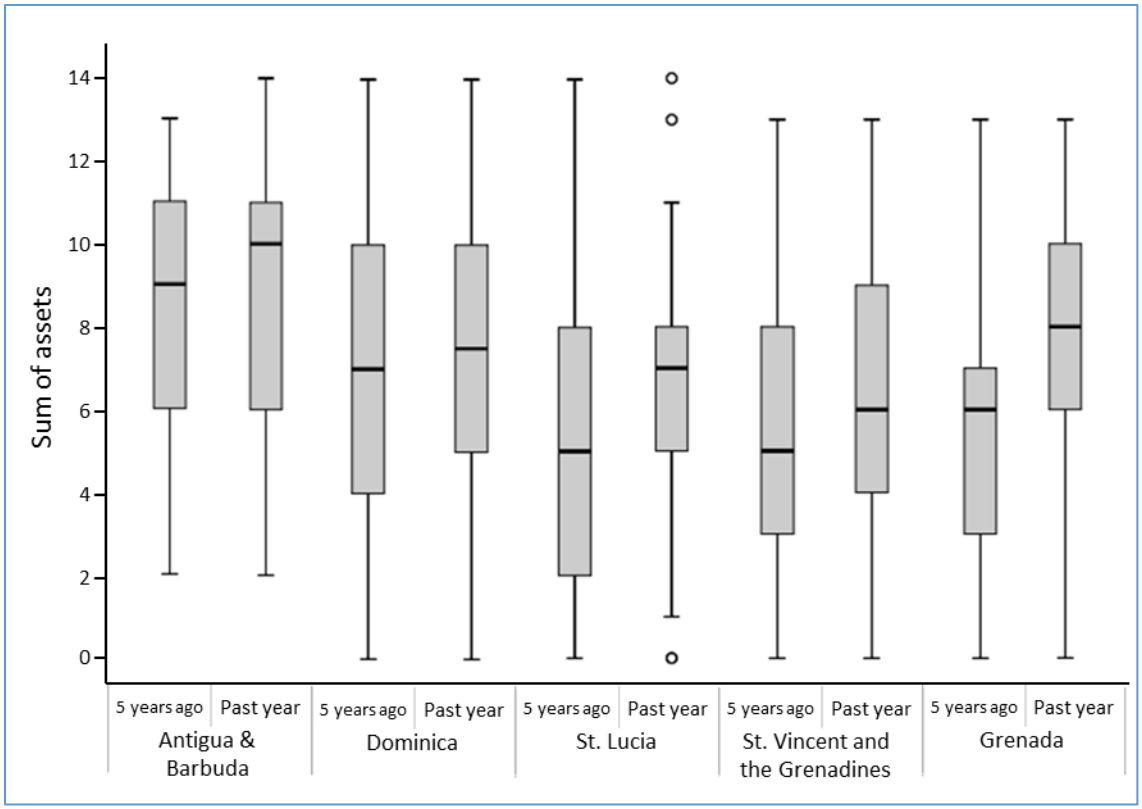

Figure 29. Sum of key assets possessed by respondents over time. Circles = outliers >1.5 but <3 interquartile ranges

How many boats do you own, finance, borrow?

Fishers typically own or rent one boat. However, some fishers reported that they rent or borrow up to 10 different boats for fishing.

Human Asset

Training participation

About a third of respondents did not participate in any of the training opportunities identified in Figure 30. For those who did, about 96% indicated that they benefitted. The most popular training was safety at sea (48%), followed by organized meetings/consultations (39%), and FAD setting/maintenance (37%). The least attended trainings include outboard motor repair (18%), record keeping (19%), and icebox construction (24%). Furthermore, participation in government sponsored data collection programs was also low (23%). Given the importance of navigation to offshore fishing, it was surprising that up to two-thirds of fishers had not attended programs or benefitted from training in this area (Figure 30). Navigation is likely a learning topic within safety at sea programs, but given the importance of this skill, these trainings could be expanded particularly for fishers new to the profession.

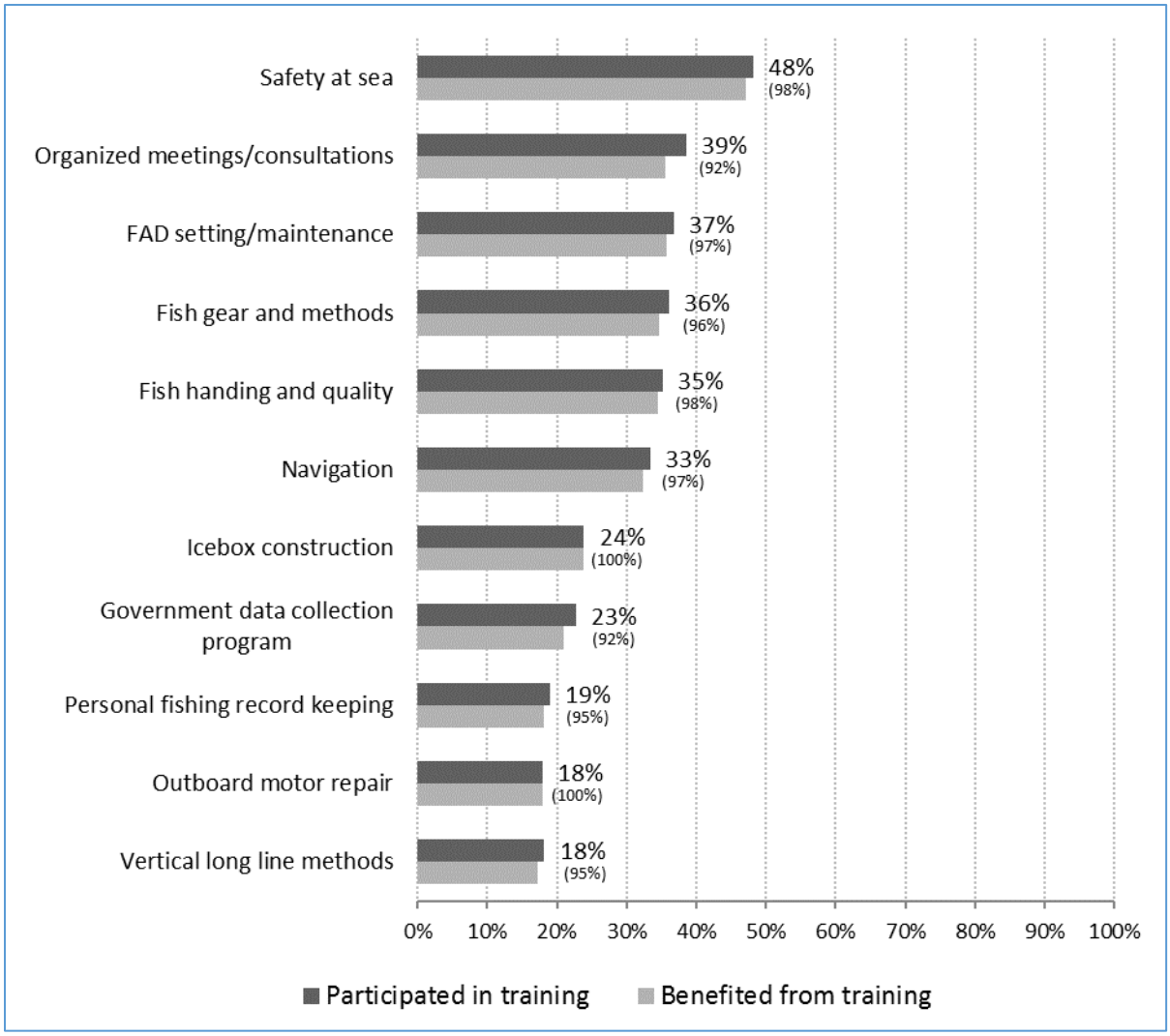

Figure 30. Participation in trainings and perception of benefits from trainings.

Respondents that participated in organized meetings/consultations and in a government-sponsored data collection program were the most dissatisfied with the activity (8% of respondents feel that they did not benefit in both cases). Additional results include:

- More than one third of fishers (39%) participated in organized meetings and consultations.
- With the exception of Grenada (47%) and Dominica (33%), few fishers participated in icebox construction.
- With the exception of Dominica (50%), few fishers participated in government sponsored data collection programs.
- A higher percentage of fishers participated in seamanship and safety courses but with the exception of Dominica (66%) this percentage is still relatively low (53% or less) for other CARIFICO islands.

Dominica and Grenada fishers received the most exposure to trainings, participating in an average of four to five trainings during the past year. Participation in trainings was significantly lower (0 to 1 training during the past year) among fishers in the other CARIFICO islands. This suggests that opportunities to attend trainings are not equally available to fishers.

Respondents' highest level of education completed

The vast majority of fishers interviewed had completed either primary (53%) or secondary school (37%) (Figure 31). Few had completed college or vocational training (8%). A significantly greater percentage of fishers on

Antigua and Barbuda have completed secondary school (50%) as compared to the other CARIFICO islands. A significantly greater percentage of St. Lucia fishers have completed primary school (71%) when compared to the other islands studied but their achievements in higher educational pursuits remain the lowest of the countries surveyed (Table 1F in Appendix F).

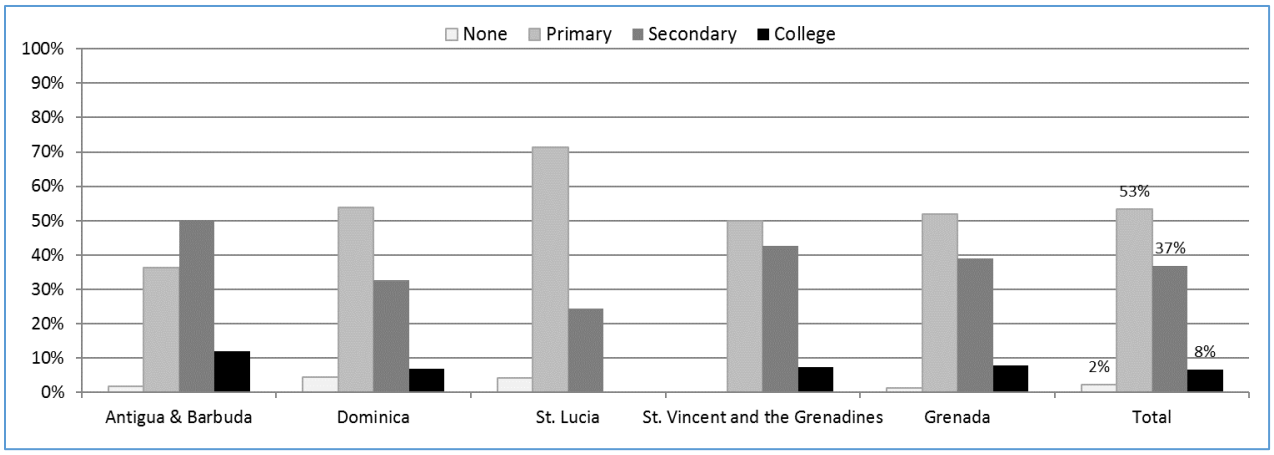

Figure 31. Highest level of education completed by country.

Financial Asset

How would you describe your income from fishing?

The majority of fishers (68% to 70%) believe their income to be "average" or "good," both presently and five years ago (Figure 32). A smaller percentage of fishers categorized their income as "very good" presently (10%) and five years ago (17%), which shows a decline in perceived income over the past five years. Equally important is that a significantly greater percentage of fishers categorized their present income as "poor" to "fair" (22%) when compared with five years ago (13%) (Table 8F in Appendix F). The perception of reduced income is generally consistent with perceptions of declining fishing success (Figure 24) lower fish abundance (Figure 26), and the perception that larger numbers of fishers are entering the profession, leading to greater competition for FAD fishery resources. Further, perceptions of a stagnant income could also be a function of fish prices not keeping pace with costs for other livelihood commodities. Further study into governance mechanisms that can help sustain fishing profitability and by expanding markets for pelagic fish products may help livelihoods in the longer-term.

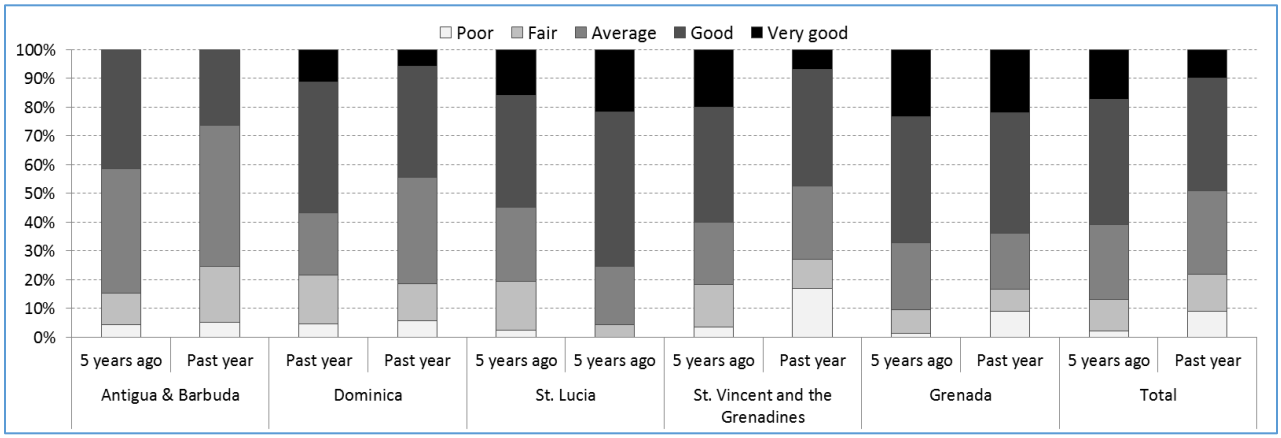

Figure 32. Perception of income earned from fishing activities over time.

How would you describe your general income (all sources)?

General income from "all sources" (Figure 33 and Table 9F in Appendix F) generally conforms to fisher' perceptions of income from fishing. This makes sense given that more than half of the fishers interviewed reported that fishing is their only source of income.

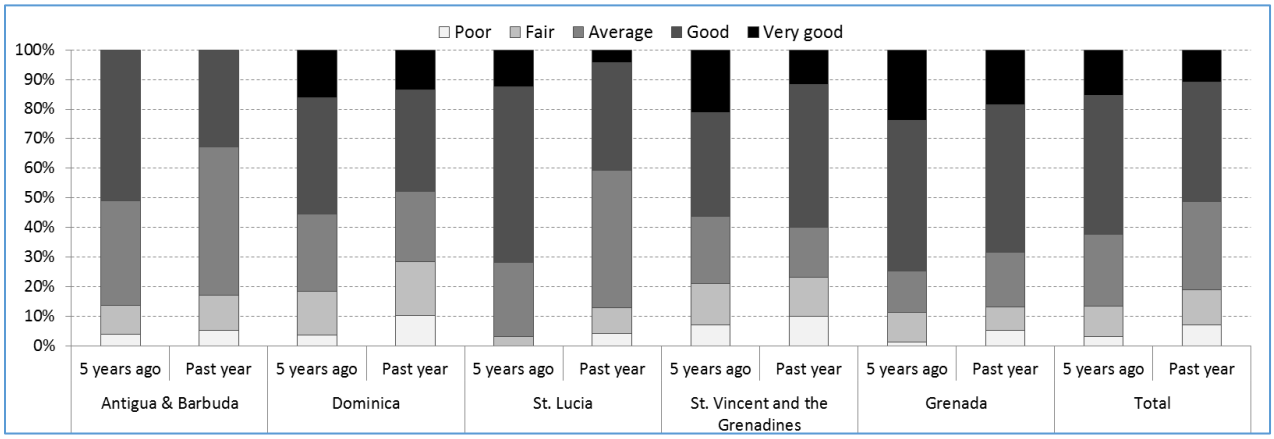

Figure 33. Perception of income earned from all sources over time.

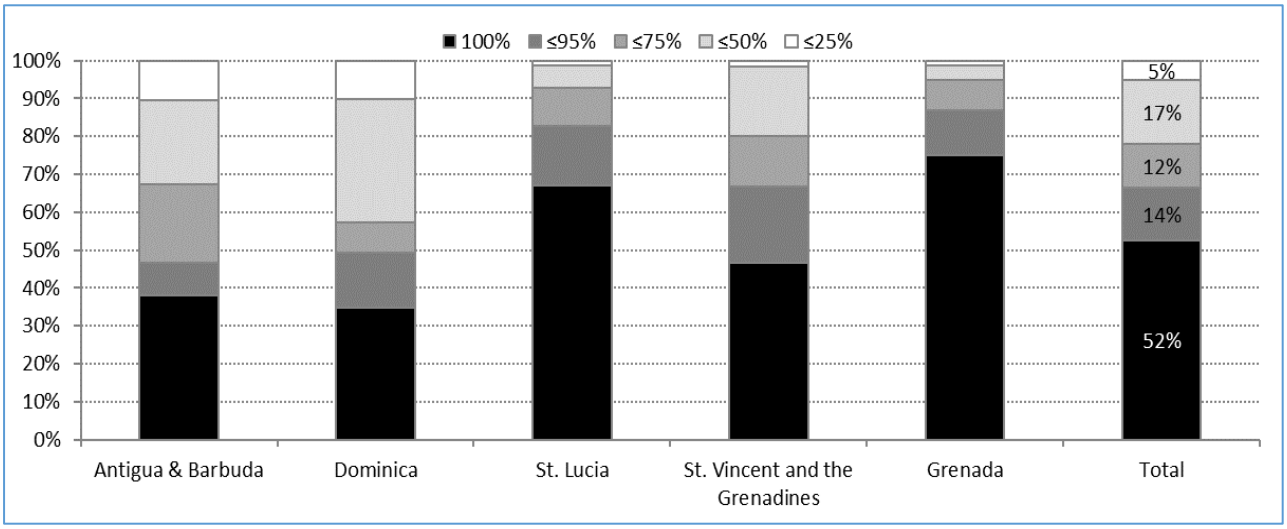

Figure 34. Full-time and part-time fishers.

Livelihood Strategies

In general, 52% of fishers were part-time (Figure 34) meaning that fishers are earning additional income from other sources such as construction (20%) and agriculture (14%). Just a few respondents have income from retirement funds and/or remittances (2%). Part-time fishers also earned income from a variety of occupations (14%) that included boat building, boat maintenance, mechanic, and tourism (Figure 35).

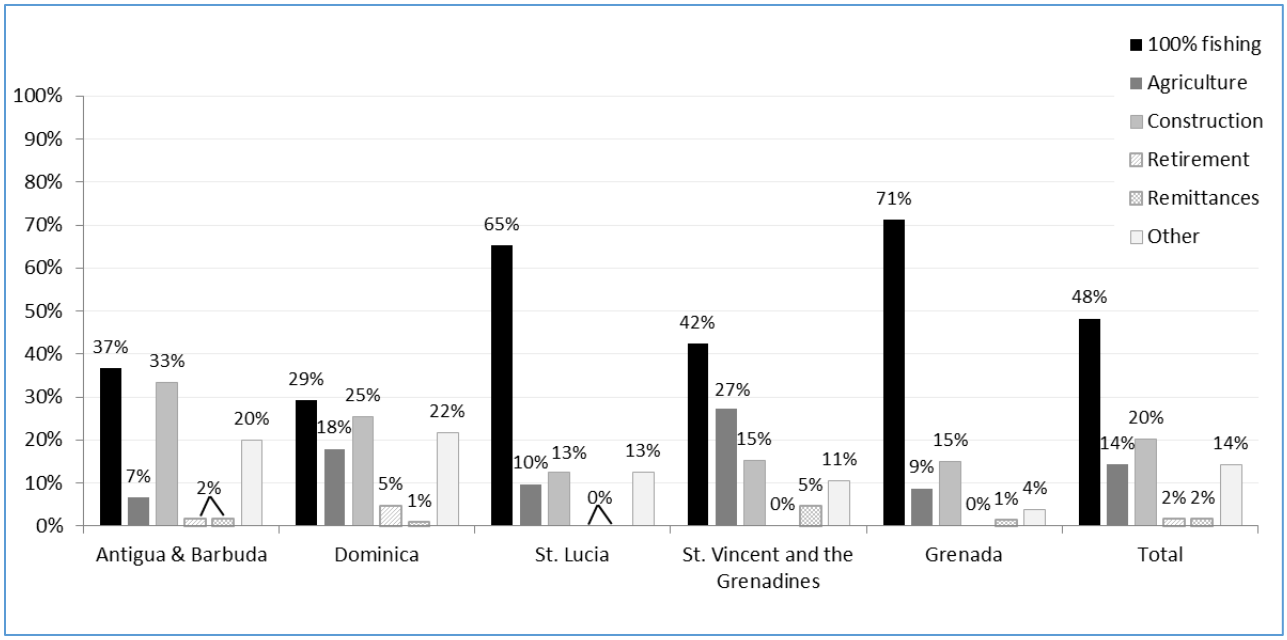

Figure 35. Income generating activities.

Do you save money?

The results indicate a slight decline (76% presently down from 81% five years ago) in the percentage of fishers who indicated that they save money. Notwithstanding, the vast majority of fishers revealed that they save money now and did so in the past (Figure 36).

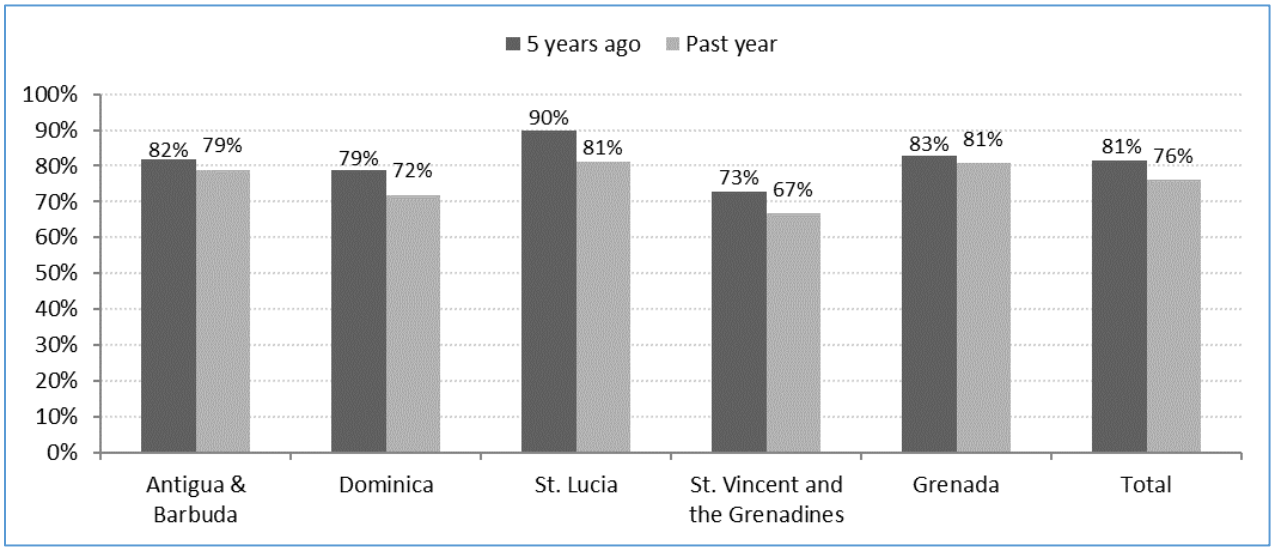

Figure 36. Percentage of fishers that save money over time.

Have you taken out a loan?

Very few fishers reported that they took out loans in the past year (6%). This percentage was down significantly from five years ago, where approximately 26% of fishers indicated that they had taken loans. St. Lucia fishers exhibited the most significant change, down from almost 33% having taken loans five years ago to about 1% reporting that they had taken a loan during the past year (Figure 37).

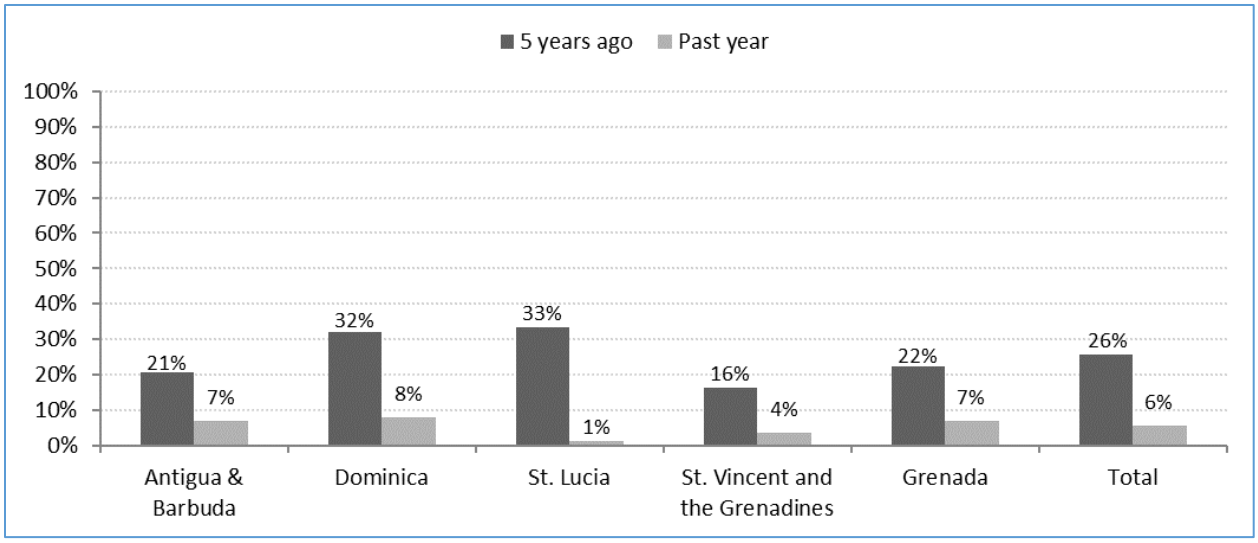

Figure 37. Percentage of fishers who have taken loans over time.

Social Asset

Who do you rely on to provide financial support in times of need?

Fishers typically rely on either themselves (nobody – 17%), an immediate family member or relative (36%), or a bank or lending institution (32%) for financial support. Friends and other fishers also are sought for support (15%). These circumstances have not changed appreciably during the past five years (Figure 38 and Table 10F in Appendix F).

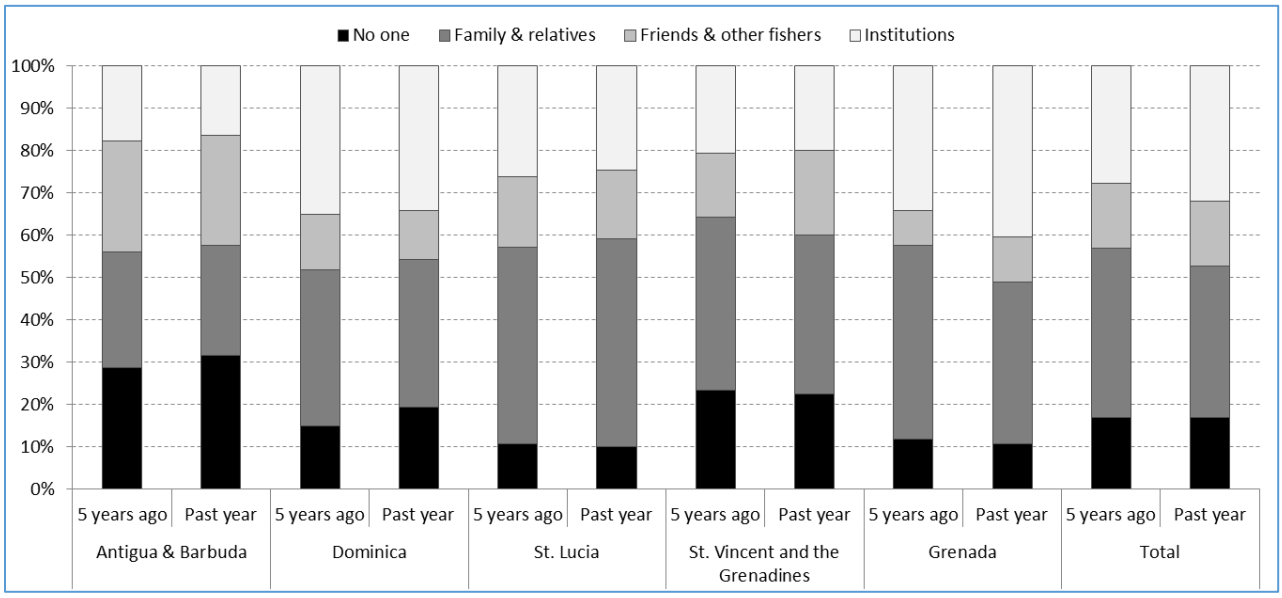

Figure 38. Sources of financial support over time.

Who do you involve in business related activities?

Fishers typically involve nobody (18%), an immediate family member or relative (41%), or friends and other fishers (23%) in their business-related activities; banks and institutions less so (18%). These circumstances have not changed appreciably during the past five years. However, fishers indicated slightly greater involvement of others as business partners (fewer indicated that they involve "no-one" else presently over five years ago). Fishers also indicate a slightly greater involvement of banks and lending institutions in their business affairs over time (Figure 39 and Table 11F in Appendix F).

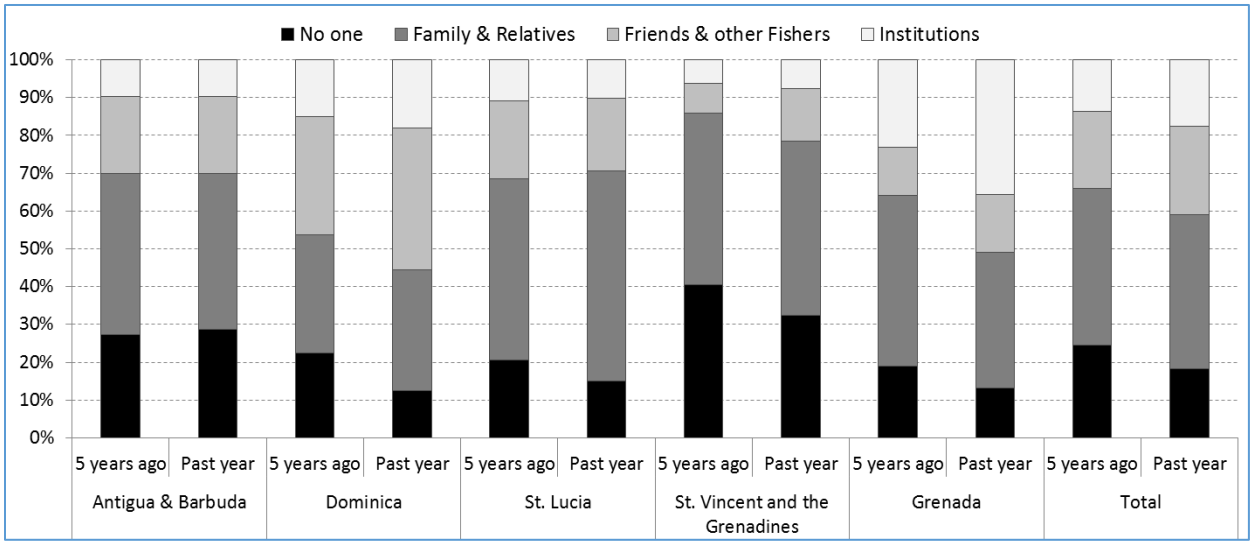

Figure 39. Who do you involve in business related activities?

Involvement in community organizations

Fishers are typically involved in church (34%) or sports-related organizations (25%). Fewer fishers are involved in political (9%) or school-related (12%) organizations in their communities. Only about 15% of fishers are actively involved in a non-fishing-related cooperative. These circumstances have not changed appreciably during the past five years (Figure 40 and Table 12F in Appendix F).

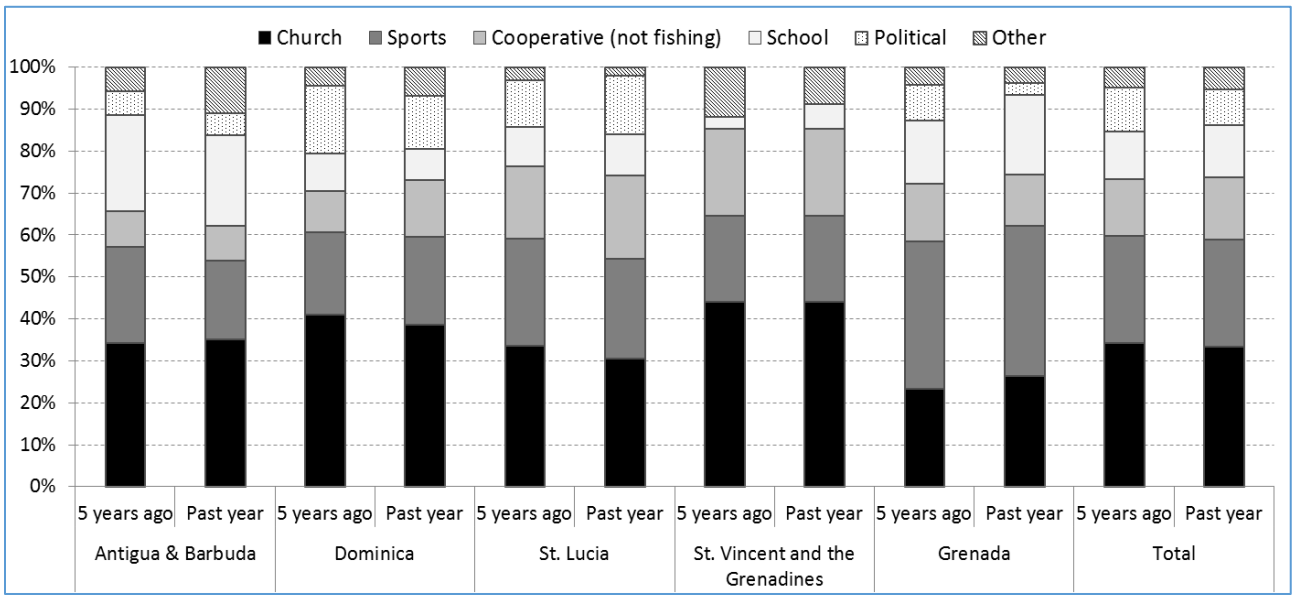

Figure 40. Respondents' involvement in community organizations.

Are you member of a fishing cooperative, association, and/or FAD group?

Approximately 45% of fishers interviewed currently belong to a fishing cooperative, association and/or FAD group. In general, present membership in these organizations has increased by 10% from five years ago (35%). Present membership is most significant on St. Vincent and the Grenadines (51%) and Grenada (65%); and least significant on St. Lucia (42%), Dominica (38%) and Antigua and Barbuda (30%) (Figure 41).

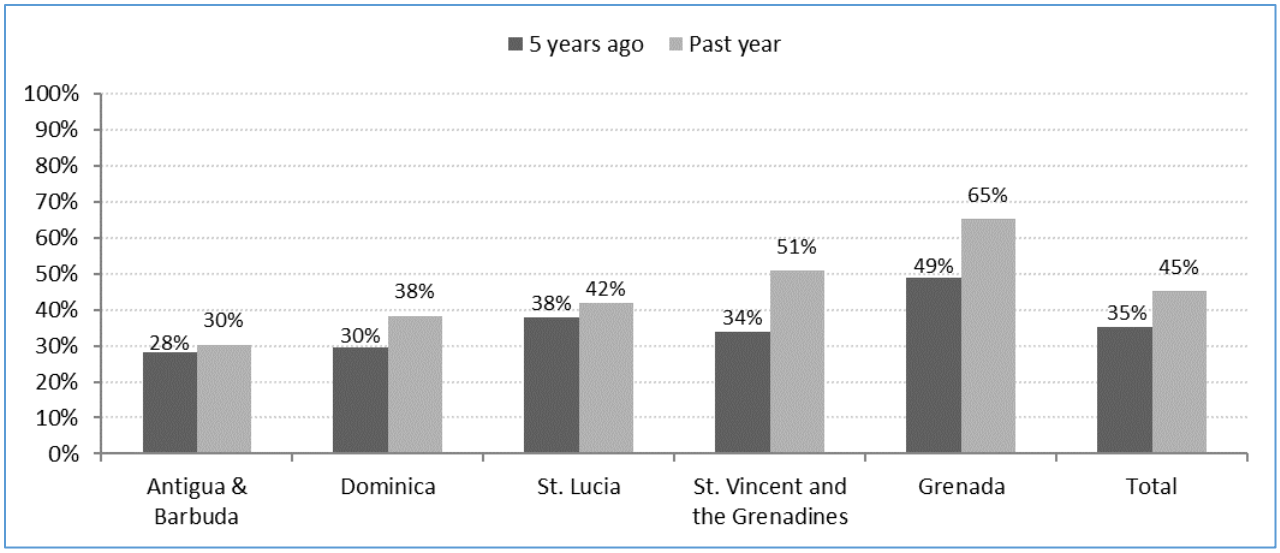

Figure 41. Percentage of respondents that were members of a fishing cooperative, association or FAD group in the past year and/or five years ago.

Results of Livelihood Analysis

Asset measures used in the livelihood analysis were constructed using between 2 to 4 survey questions (Table 7). A timeframe component (past year versus five years ago) was developed for all of the questions except for the human asset questions, which were limited to the present time (past year).

Table 7. Survey items used to construct each of the livelihood asset estimates.

Livelihood Assets
Natural Assets
How would you describe your success in offshore fishing?
How would you describe the abundance of fish?
Physical Assets
Possession of the assets
How many boats do you own, finance, borrow?
Human Assets
Respondents' participation in training programs
Respondents' highest level of education completed
Financial Assets
How would you describe your income from fishing?
How would you describe your general income (all sources)?
Do you save money?
Have you taken a loan?
Social Assets
Who do you turn rely on to provide financial support in times of need?
Who do you involve in business related activities?
Involvement in community organizations
Are you member of a fishing cooperative, association, and/or FAD group?

Regional Analysis

Respondents believe that there is a decrease in natural and financial assets from five years ago. Contrary, physical and social assets showed an increase from five years ago (Table 8 and Figure 42).

Table 8. Mean and standard deviation estimates for the livelihood assets (N=330).

	Past year		5 years ago		Difference between
Assets	Mean	St. Dev	Mean	St. Dev	**Past year – 5 years ago**
Natural**	0.66	0.17	0.74	0.15	Decrease
Physical**	0.45	0.19	0.39	0.22	Increase
Human	0.39	0.19	na	na	na
Financial**	0.57	0.18	0.63	0.22	Decrease
Social**	0.44	0.23	0.39	0.23	Increase

*** The difference between past year and 5 years ago is significant at p≤0.05. na=not applicable.*

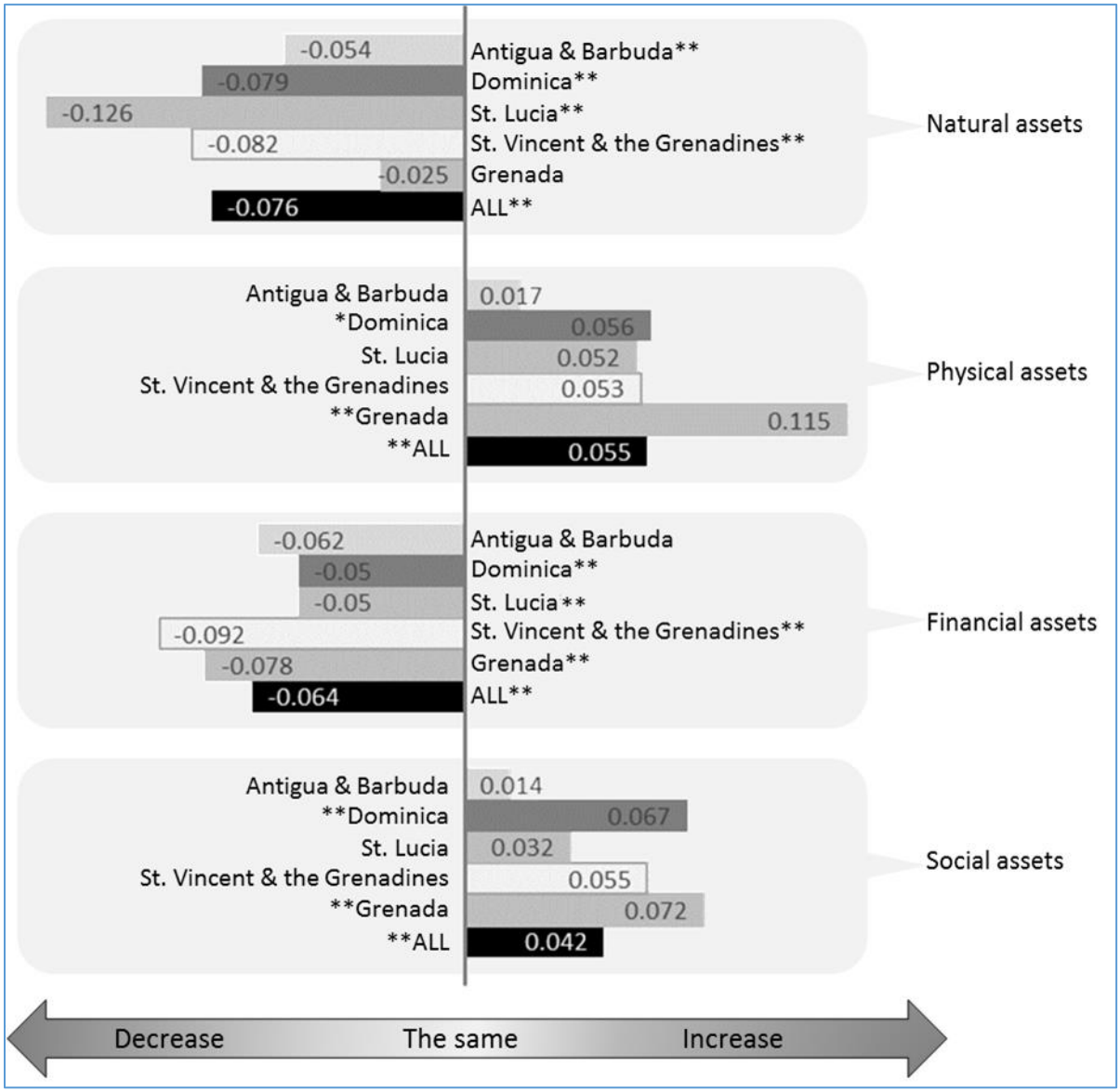

Figure 42. Differences in mean livelihood assets over time. Significant differences at the country level over time are illustrated by (**) at p≤0.05 or (*) at p≤0.10.

Significant changes are noted among all livelihood assets measured between the past year and five years ago ($p \leq 0.05$).

The most significant changes are associated with the natural asset (difference of -0.08). Participants expressed that natural assets were greater five years ago than in the past year. The financial assets were also perceived to be better five years ago than during the past year (difference of -0.06). Both the physical and the social assets of participants were greater during the past year as compared to five years ago (difference of 0.06 and 0.04, respectively).

The natural and the financial assets estimated for each of the CARIFICO islands also showed a significant decrease from five years ago, with the exception of Grenada, which showed a decrease that was not statistically significant. The physical and social assets showed an increase when both estimates are compared (past year vs. five years ago) but these differences are not statistically significant at the country level.

In short, at a country level, all CARIFICO islands showed the same general direction (decrease or increase) of the livelihood assets observed in the overall analysis that included all islands. However, there are differences in the strength of the direction for some islands (Figure 42). Specifically,

- Grenada fishers indicate less difference for the natural asset over time than fishers on other CARIFICO islands. Respondents from St. Lucia believe that their natural asset has decreased most significantly from five years ago.
- Grenada fishers showed the greatest increase in physical assets when compare with other CARIFICO islands. Antigua and Barbuda fishers showed the lowest increase in physical assets for the same period. Fishers from the other CARIFICO islands indicated a similar increase in their physical assets from five years ago.
- St. Vincent and the Grenadines fishers perceive the most significant decrease in their financial assets when compared to fishers representing the other CARIFICO islands.
- Grenada and Dominica fishers perceive greatest increase in their social assets when compared with fishers from other CARIFICO islands. Antigua and Barbuda fishers indicated a slight increase in their social assets.

Livelihood Assets Based on FAD Ownership (Private and/or Public FADs) and Timeframe

There were no statistically significant differences among FAD ownership groups regarding the natural assets for both timeframes ($p=0.60$, and $p=0.81$, respectively). Although respondents that deployed both private and public FADs tended to perceive a slightly stronger natural asset over time than the other groups.

Respondents who have set and/or maintained both private and public FADs indicated greater physical and human assets especially when compared with respondents who had deployed neither private nor public FADs over the past year ($p=0.02$) and five years ago ($p=0.07$) - (Table 9, Figures 43 and 44). "Neither private nor public FADs" refers to fishers who do not deploy FADs of any kind.

Respondents who had only set and/or maintained public FADs showed a greater social asset estimate than the other three FAD ownership groups evaluated over time ($p \leq 0.05$) – (Table 9 and Figure 43).

The financial asset is also greater for those respondents that set or maintain both private and public FADs but it is only statistically significant for the time-frame of five years ago ($p=0.04$) - (Table 9 and Figure 43).

Table 9. Livelihood assets estimate (mean, statistical test) categorized by type of FAD ownership.

	FAD ownership group	Natural	Physical	Human	Financial	Social
Past year	Neither Private nor Public FADs	0.66	0.42	0.35	0.57	0.41
	Only Public FADs	0.67	0.49	0.46	0.56	0.53
	Only Private FADs	0.63	0.47	0.40	0.54	0.45
	Private and Public FADs (both)	0.69	0.50	0.52	0.63	0.48
	Kruskal-Wallis test	1.9	10.7	30.5	3.6	16.4
	p-value	0.60	0.01**	0.00**	0.31	0.00**
5 years ago	Neither Private nor Public FADs	0.74	0.36	na	0.62	0.36
	Only Public FADs	0.73	0.40	na	0.66	0.49
	Only Private FADs	0.75	0.43	na	0.61	0.36
	Private and Public FADs (both)	0.77	0.44	na	0.69	0.43
	Kruskal-Wallis test	0.96	5.4	na	8.2	21.0
	p-value	0.81	0.14	na	0.04**	0.00**

*** Significant at the level of 5%.*

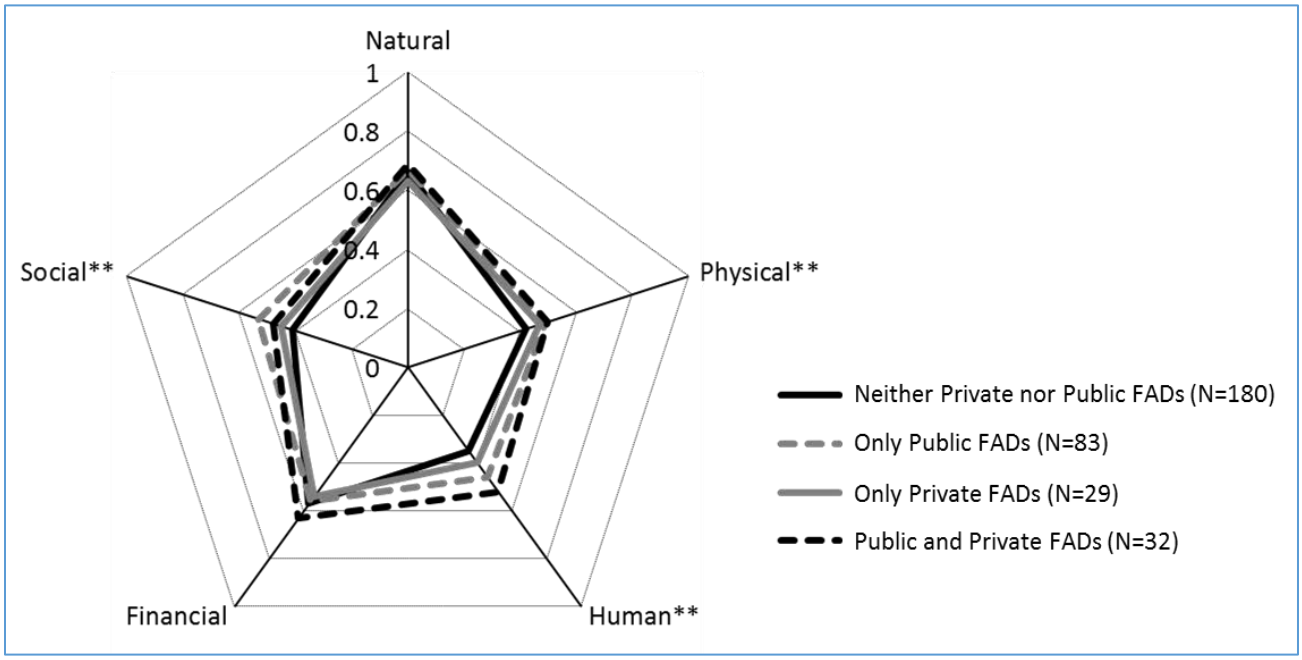

Figure 43. Past year livelihood asset estimates based on FAD ownership.

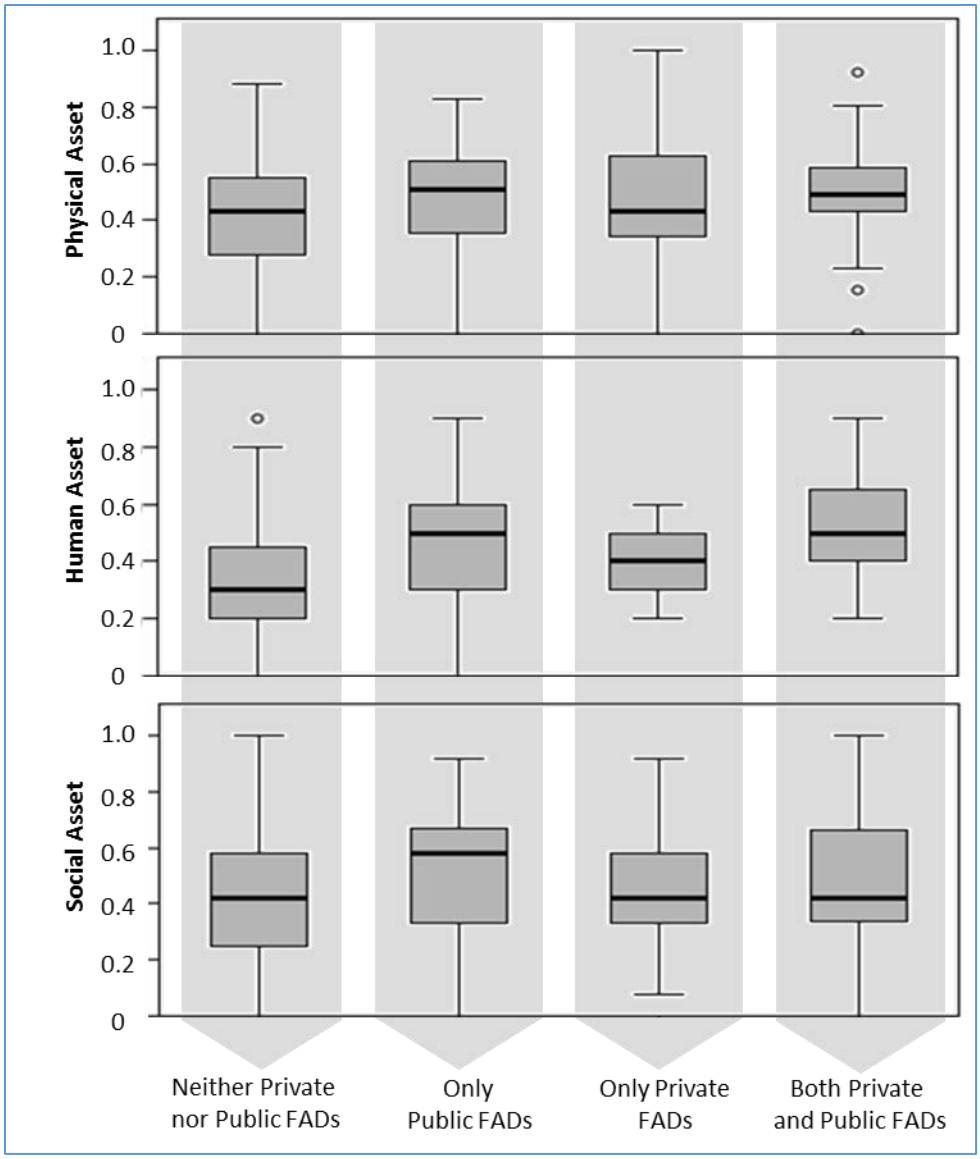

Figure 44. Box plot for the past year livelihood asset estimates that showed statistical significance among FAD ownership groups (p≤0.05).

Country-Specific Analysis

Antigua and Barbuda

The livelihood asset scores for the fishers setting and maintaining only private FADs reflect some particularities for this group. For instance, they have the greatest mean for the physical asset when compared with the other groups, but in the case of the human, financial and social assets they have the lowest scores. Nonetheless, these differences are not statistically significant.

Only the human asset showed statistically significant differences among groups. Fishers deploying both private and public FADs have a greater human asset (i.e., training and education) than the other groups (Table 10 and Figure 45), especially when compared with fishers not participating in any kind of FAD deployment.

Table 10. Past year livelihood assets estimate (mean and statistical test) categorized by type of FAD ownership.

FAD ownership group	Natural	Physical	Human	Financial	Social
Neither Private nor Public FADs	0.61	0.51	0.40	0.53	0.33
Only Public FADs	0.68	0.55	0.63	0.53	0.44
Only Private FADs	0.68	0.60	0.43	0.40	0.19
Private and Public FADs (both)	0.70	0.43	0.80	0.60	0.38
Kruskal-Wallis test	2.2	1.2	8.3	2.3	3.4
p-value	0.52	0.74	0.04**	0.51	0.34

** Significant at the level of 5%.

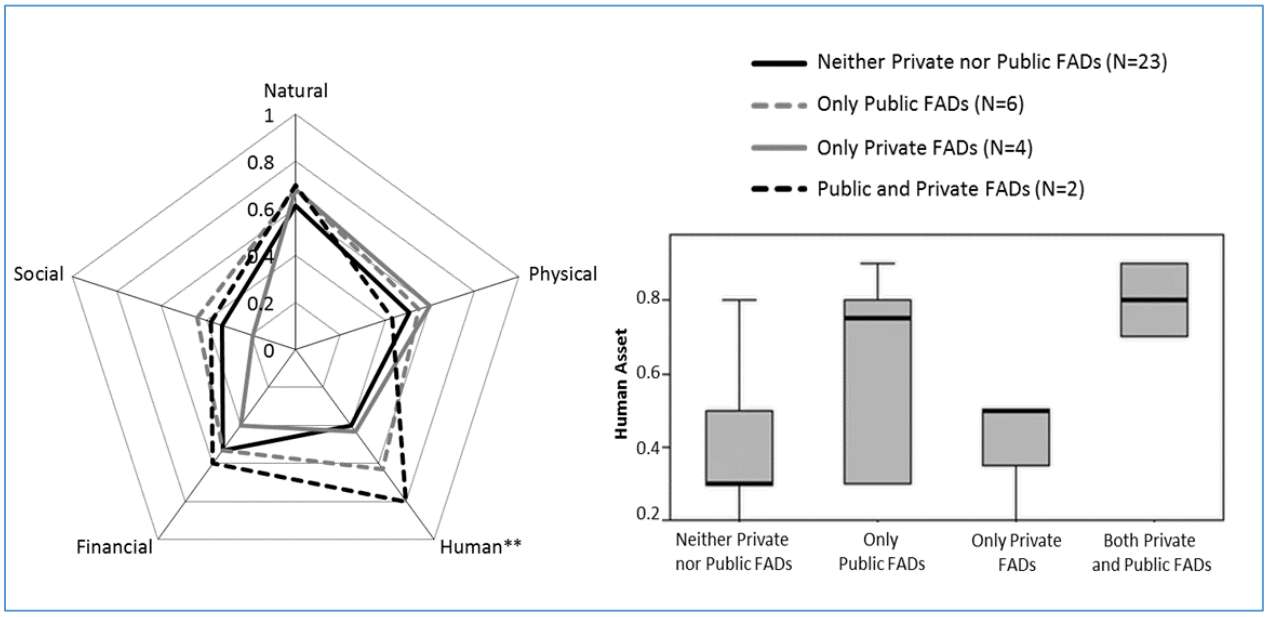

Figure 45. Past year livelihood asset estimates for Antigua and Barbuda based on FAD ownership. (**) Significant at the level of 5%. On lower right corner: Box plot of significant asset is shown on the lower right corner.

Dominica

Fishers that are deploying both public and private FADs have more physical and human assets than the other FAD ownership type groups (especially those who are deploying neither private nor public FADs). Fishers that are not using FADs had the lowest scores for the physical, human, and social assets. Even though, this group scores relatively high for the financial asset (Mean=0.60) when compared with the other groups this difference is not significant (Table 11 and Figure 46).

Table 11. Past year livelihood assets estimate (mean and statistical test) for Dominica.

FAD ownership group	Natural	Physical	Human	Financial	Social
Neither Private nor Public FADs	0.65	0.37	0.42	0.60	0.41
Only Public FADs	0.58	0.47	0.43	0.54	0.54
Only Private FADs	0.64	0.49	0.44	0.56	0.45
Private and Public FADs (both)	0.69	0.54	0.55	0.61	0.49
Kruskal-Wallis test	3.3	11.5	7.8	2.2	4.9
p-value	0.35	0.00**	0.05**	0.53	0.18

** Significant at the level of 5%.

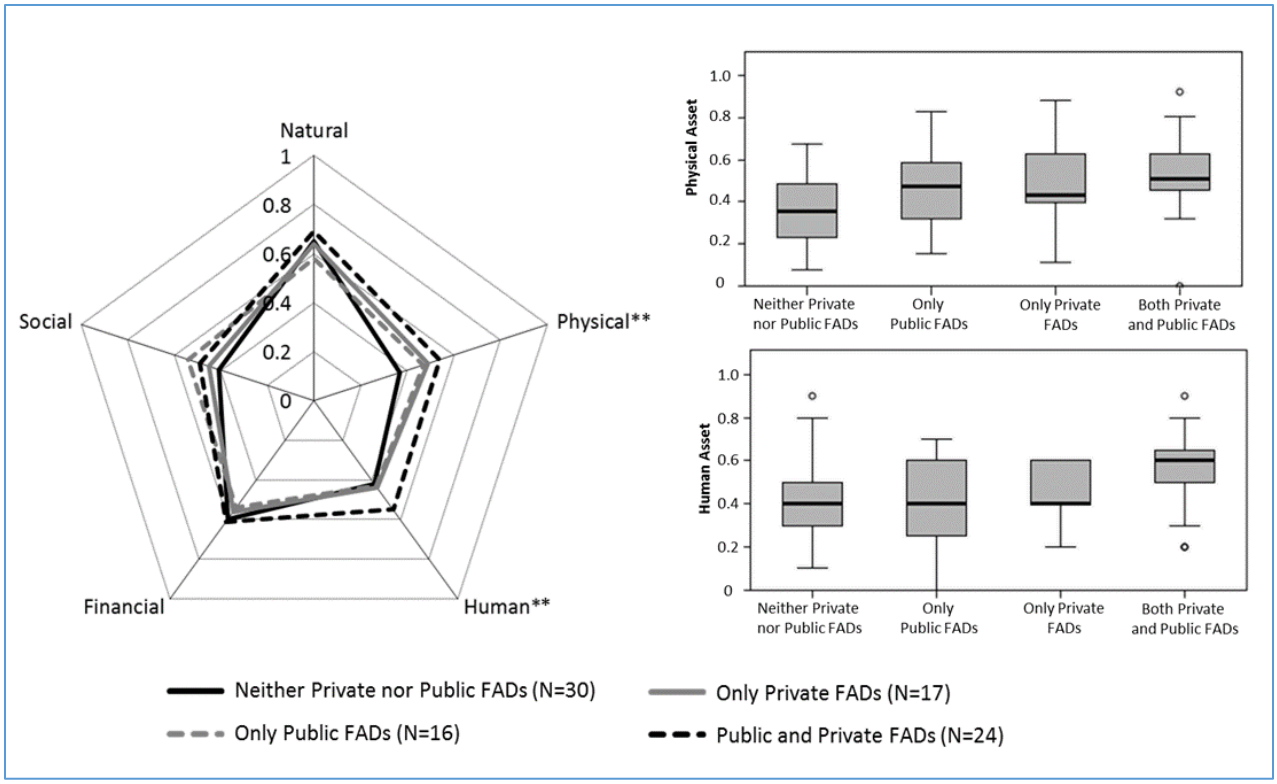

Figure 46. Past year livelihood asset estimates for Dominica based on FAD ownership. (**) Significant at the level of 5%. Box plots of significant assets are shown on the right side of the graph.

St. Lucia

Fishers setting public FADs in St. Lucia tended to have higher estimates for the physical and human assets than the other groups. However, these differences are not significant. A peculiarity of the livelihood assets estimates for St. Lucia is that fishers setting only private FADs shown the highest mean score for the social asset (Mean = 0.63) while the social asset estimate for fishers setting only public FADs was not as high as expected (Table 12 and Figure 47).

Table 12. Past year livelihood assets estimate (mean and statistical test) for St. Lucia.

FAD ownership group	Natural	Physical	Human	Financial	Social
Neither Private nor Public FADs	0.68	0.39	0.30	0.59	0.49
Only Public FADs	0.59	0.43	0.41	0.57	0.52
Only Private FADs	0.58	0.28	0.28	0.56	0.63
Private and Public FADs (both)	0.68	0.42	0.23	0.60	0.57
Kruskal-Wallis test	2.6	1.8	6.0	0.6	4.9
p-value	0.45	0.61	0.11	0.90	0.18

** Significant at the level of 5%. *Significant at the level of 10%.

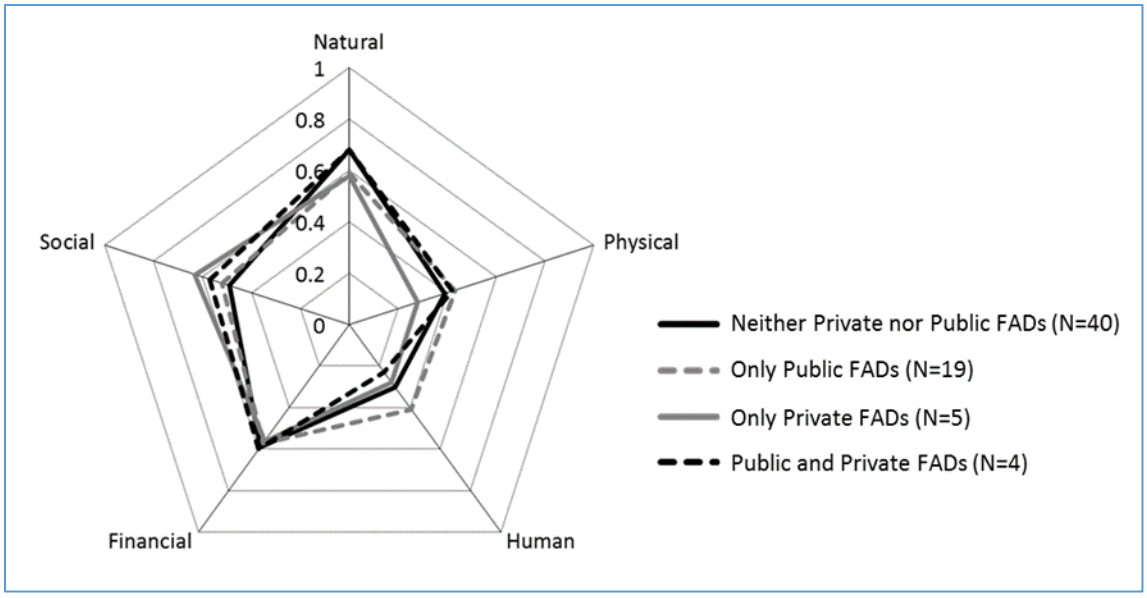

Figure 47. Past year livelihood asset estimates for St. Lucia based on FAD ownership. (**) Significant at the level of 5%. (*) Significant at the level of 10%.

St. Vincent and the Grenadines

In the case of St. Vincent and the Grenadines, none of the respondents set and maintain both types of FADs (public and private). This is the only country participating in the CARIFICO project that did not have this type of FAD ownership (N=62 surveys completed). There is a statistically significant difference between the FAD ownership groups regarding the physical asset but at a level of 10%. Following the general trend, fishers that are using FADs scored higher in the physical asset category than those that do not set FADs (Table 13 and Figure 48).

Table 13. Past year livelihood assets estimate (mean and statistical test) for St. Vincent and the Grenadines.

FAD ownership group	Natural	Physical	Human	Financial	Social
Neither Private nor Public FADs	0.64	0.41	0.32	0.55	0.32
Only Public FADs	0.71	0.50	0.42	0.49	0.44
Only Private FADs	0.80	0.79	0.40	0.70	0.58
Private and Public FADs (both)	0	0	0	0	0
Kruskal-Wallis test	1.8	5.0	3.7	2.7	3.4
p-value	0.40	0.08*	0.15	0.26	0.19

*** Significant at the level of 5%. *Significant at the level of 10%.*

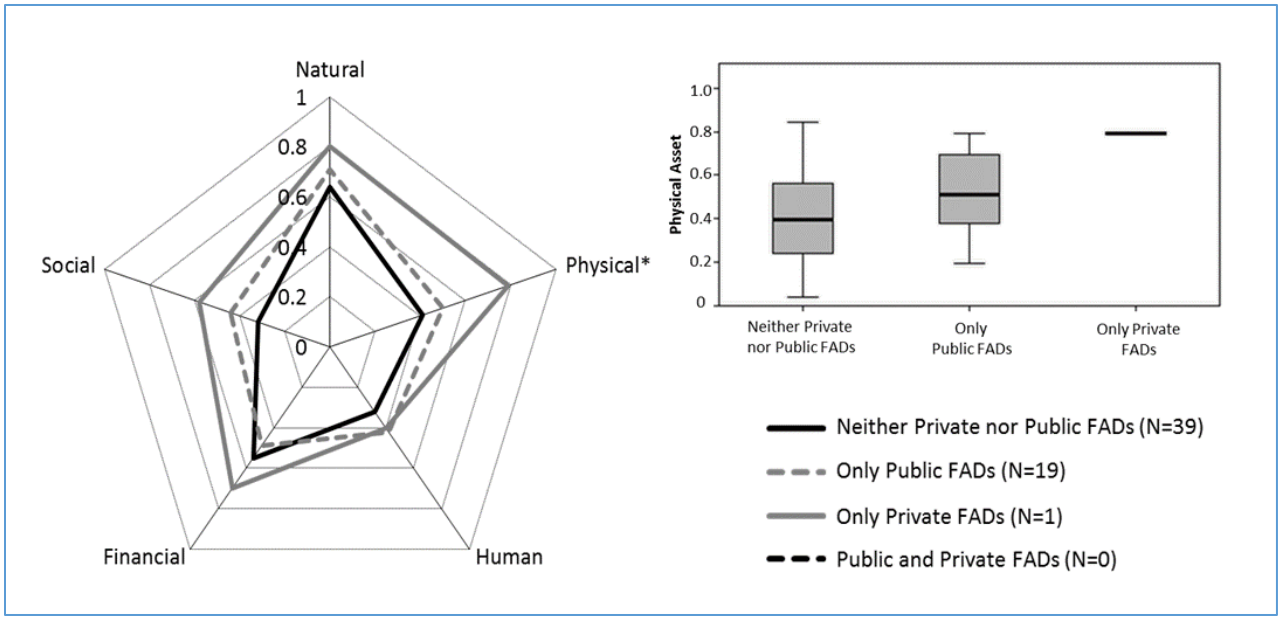

Figure 48. Past year livelihood asset estimates for St. Vincent and the Grenadines based on FAD ownership. (**) Significant at the level of 5%. (*) Significant at the level of 10%. A box plot of significant asset is shown on upper right side of the graph.

Grenada

Grenada livelihood assets estimates are different from the other CARIFICO islands. Fishers that are involved in deploying only public FADs are doing better in terms of the physical, human, financial, and social assets than the other groups (Table 14). Another discrepancy with the other island countries is that Grenada fishers who are setting private FADs showed the lowest mean score of all groups for the natural asset (Figure 49).

Table 14. Past year livelihood assets estimate (mean and statistical test) for Grenada.

FAD ownership group	Natural	Physical	Human	Financial	Social
Neither Private nor Public FADs	0.69	0.46	0.36	0.56	0.47
Only Public FADs	0.77	0.53	0.52	0.62	0.61
Only Private FADs	0.50	0.33	0.35	0.50	0.38
Private and Public FADs (both)	0.75	0.34	0.45	0.90	0.30
Kruskal-Wallis test	2.8	7.4	13.8	7.5	10.7
p-value	0.43	0.05**	0.00**	0.06*	0.01**

*** Significant at the level of 5%. *Significant at the level of 10%.*

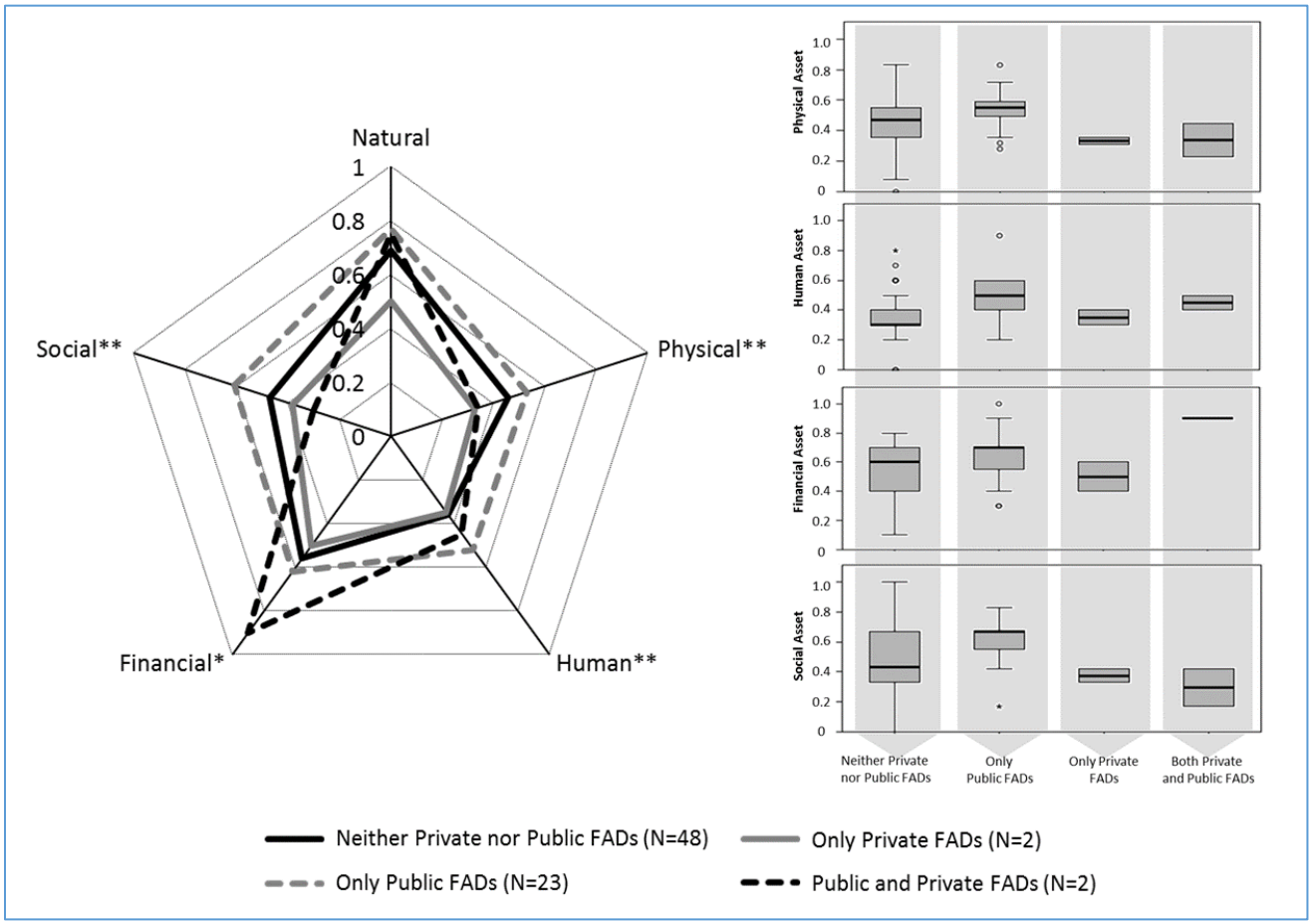

Figure 49. Past year livelihood asset estimates for Grenada based on FAD ownership. (*) Significant at the level of 5%. (**) Significant at the level of 10%. Box plots of significant assets are shown on the right side of the graph.

IV. Factors Influencing Fishers' Decisions to Set FADs

The Theory of Planned Behavior was applied to evaluate the tendency of fishers to set FADs, which is motivated by three things: attitude, subjective norm and behavioral control. To reiterate,

- Attitude measures the degree to which fishers view the behavior of setting FADs as a positive action;
- Subjective norm measures the degree to which others influence fishers to perform the behavior of setting FADs;
- Behavioral control measures the degree to which fishers believe that they possess the ability to perform the behavior of setting FADs.

Attitude

Most respondents either agreed or strongly agreed with the statement that setting and maintaining FADs (either public or private) will attract fish and help them help them catch more fish (Figure 50). They also perceived that setting and maintaining FADs takes a lot of time, is difficult and/or expensive, and that FADs are quickly lost. Respondents also believed that public or private FADs are attracting too many fishers, although answers to this statement for private FADs were shifted toward the neutral portion of the scale (Figure 51). Finally, most respondents perceived that the number of fishers using FADs can be controlled. The differences in mean scores for statements measuring attitudes for setting public and private FADs are not statistically significant (Mann-Whitney U test = 29.5, p=0.80).

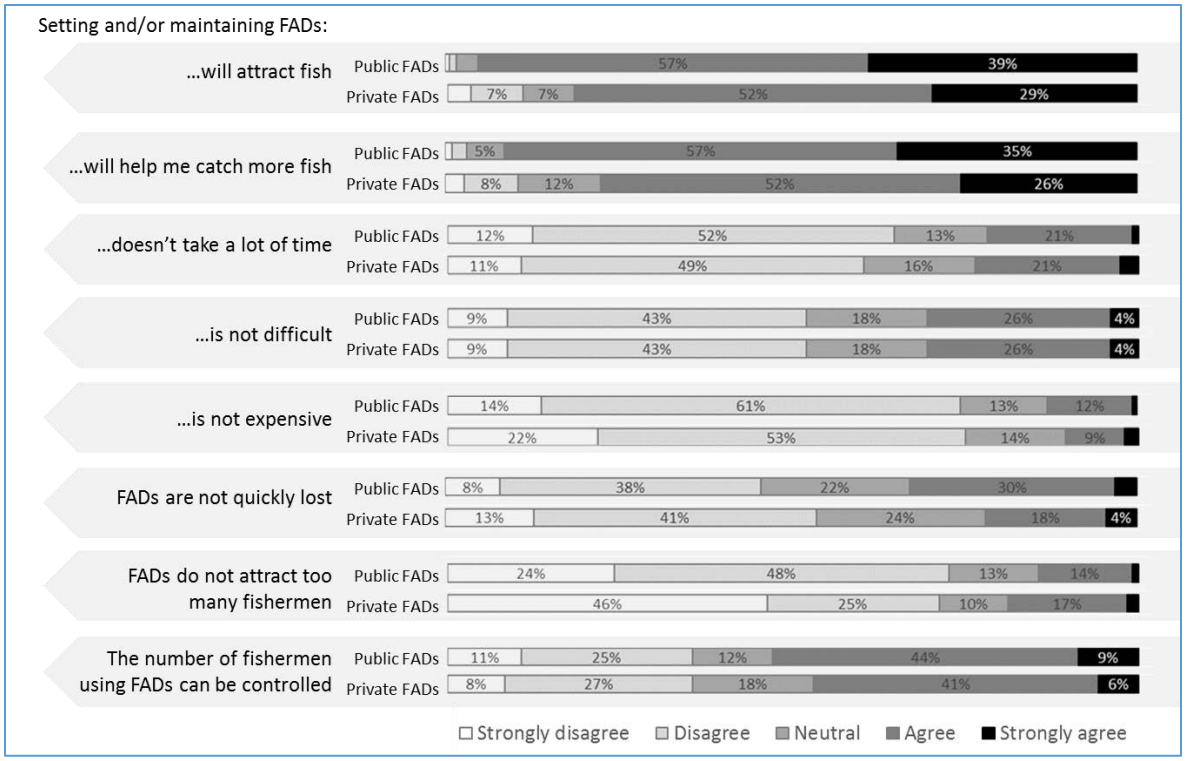

Figure 50. Analysis of attitude regarding setting and maintaining public or private FADs. For clarity percentages ≤3 are not labeled on the graph.

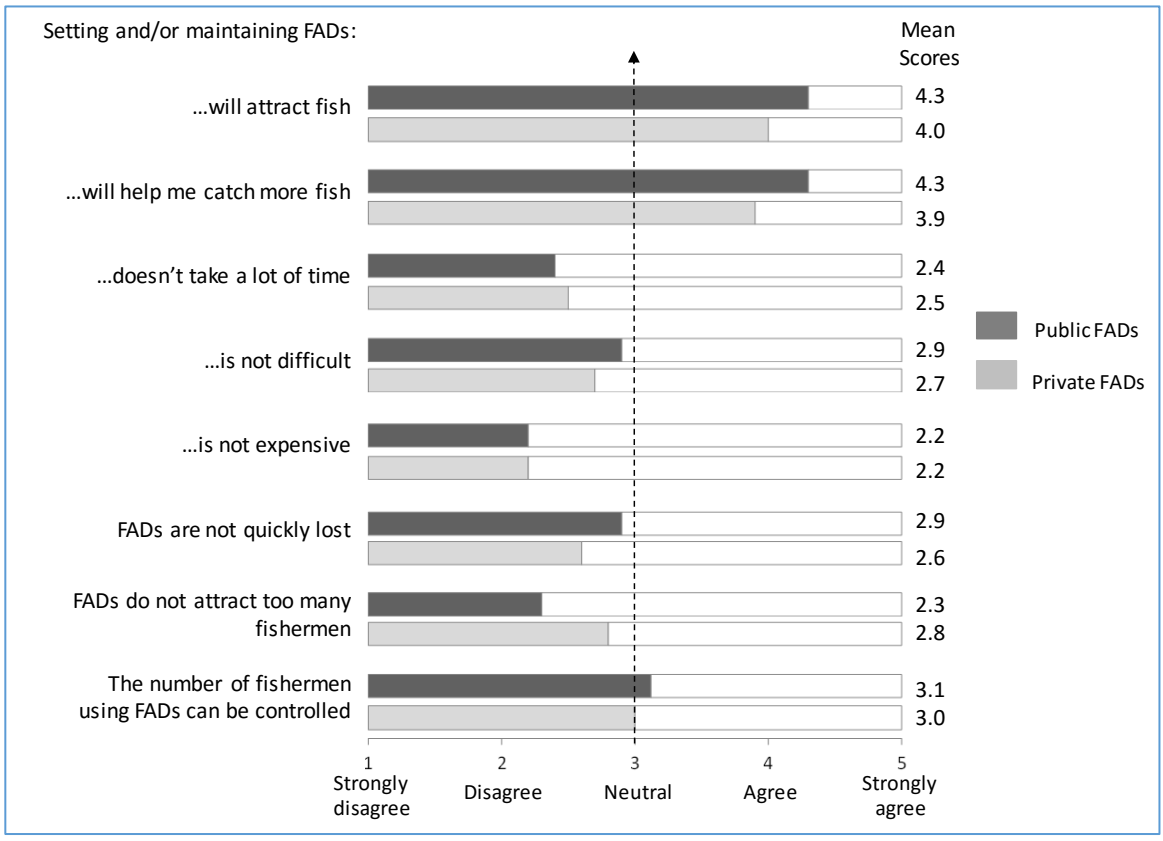

Figure 51. Respondents' mean scores regarding their level of agreement or disagreement with the items used to measure fishers' attitude toward FADs.

Subjective Norm

Mean scores and percentages for survey items that measure the subjective norm construct are presented in Figures 52 and 53. Overall, respondents agreed and/or were neutral regarding the statements. Lower scores are related with disregarding others opinion over the behavior under study. However, respondents tended to show lower mean scores for private FADs (mean=2.4–3.2) than they did for public FADs (mean=3.0–3.7) (Figure 52) and this difference was statistically significant (Mann-Whitney U test .5 p=0.01).

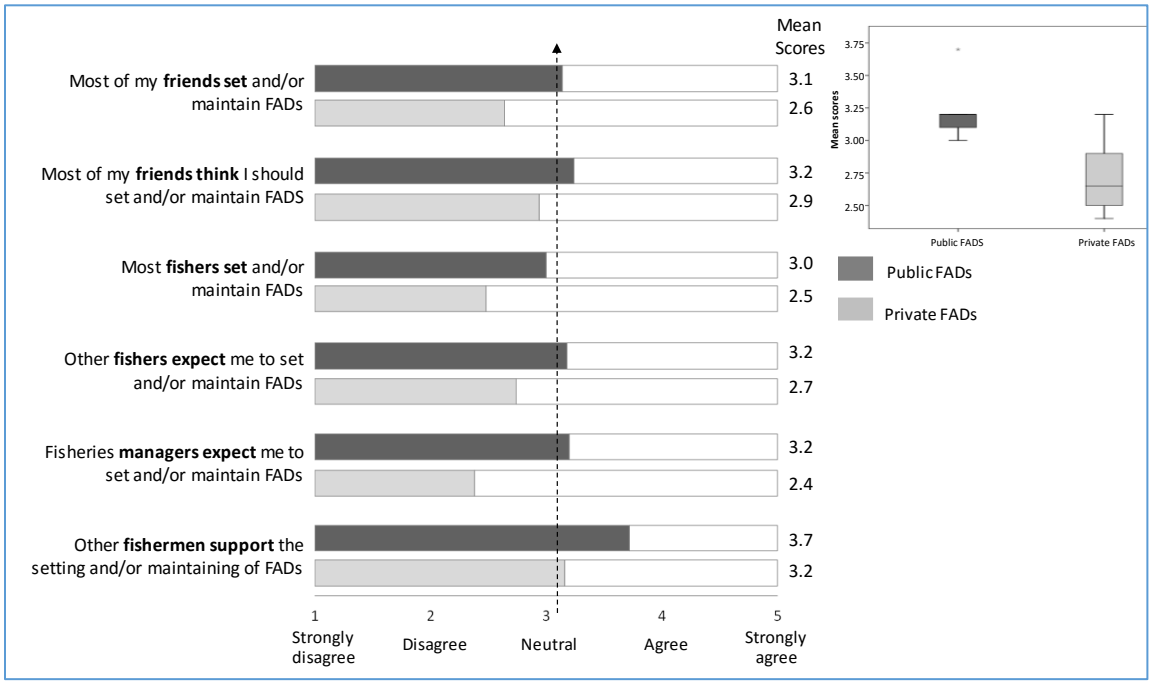

Figure 52. Respondents' mean scores regarding their level of agreement or disagreement with the items used to measure fishers' subjective norm related with setting and/or maintaining FADs. Level of agreement was scored on a scale of 1 to 5, with 5 being "strongly agree." The differences in mean scores between the public and private FADs are significant (Mann-Whitney U test = 3.5, p=0.01). Upper right corner: Box plot of mean scores.

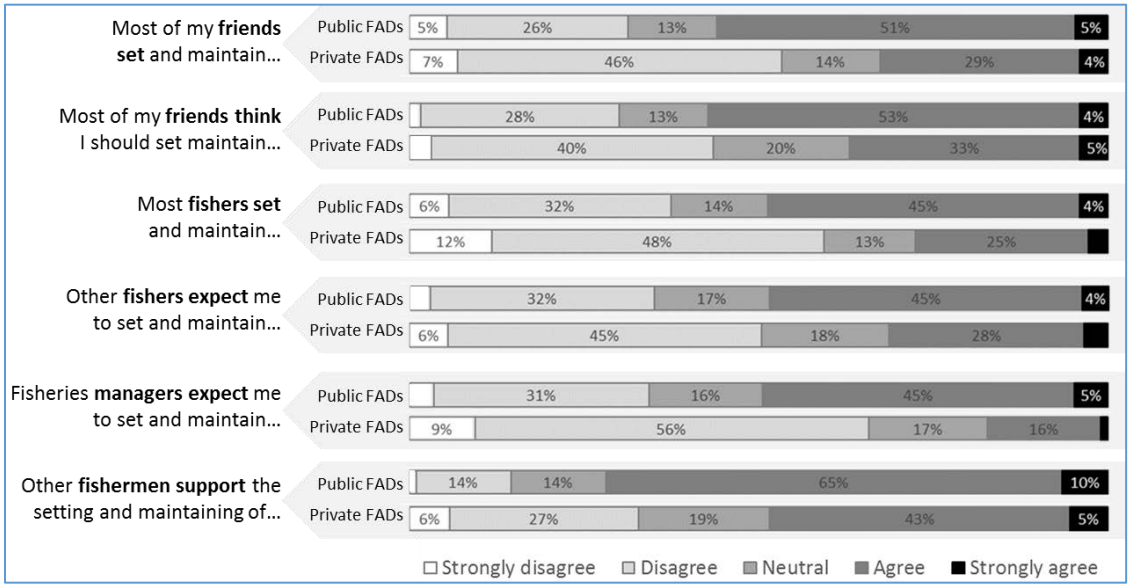

Figure 53. Analysis of the influence of others on a fishers' tendency to set and maintain public or private FADs. For clarity percentages ≤3 are not labeled on the graph.

Behavioral Control

Most fishers were confident with their capacity (ability and knowledge) to set and/or maintain public or private FADs (Figures 54 and 55). Similarly, most of them agreed with the statement that setting and maintaining FADs was entirely up to them. Many fishers interviewed also believed that they would benefit from additional training on this topic.

When the mean scores of the items measuring behavioral control (i.e., capacity) were compared for public vs private FADs, they were found not to be significantly different (Mann-Whitney U test = 5, p=0.15). However, there were significant differences in regards to their ability to secure sources of funding for setting and maintaining public versus private FADs. Most of the respondents were confident that the government and/or cooperative would provide the resources for public FADs (mean=3.7), whereas there was disagreement with the statement "I can get the money to set private FADs" (mean = 2.8).

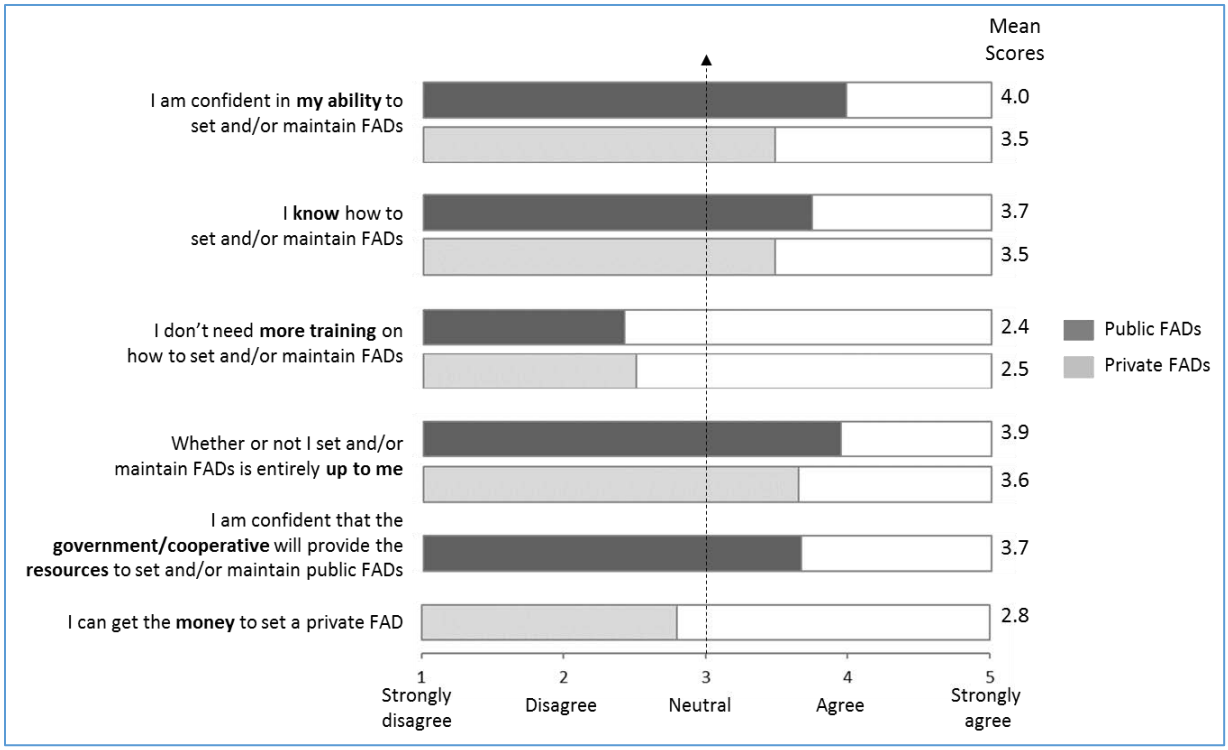

Figure 54. Respondents' mean scores regarding their level of agreement or disagreement with the items used to measure fishers perceived behavioral control regarding setting and/or maintaining FADs. Scoring was on a scale of 1 to 5, with 5 being "strongly agree." The differences in mean scores between the public and private FADs are significant (Mann-Whitney U test = 5, p=0.15). Upper right corner: Box plot of mean scores.

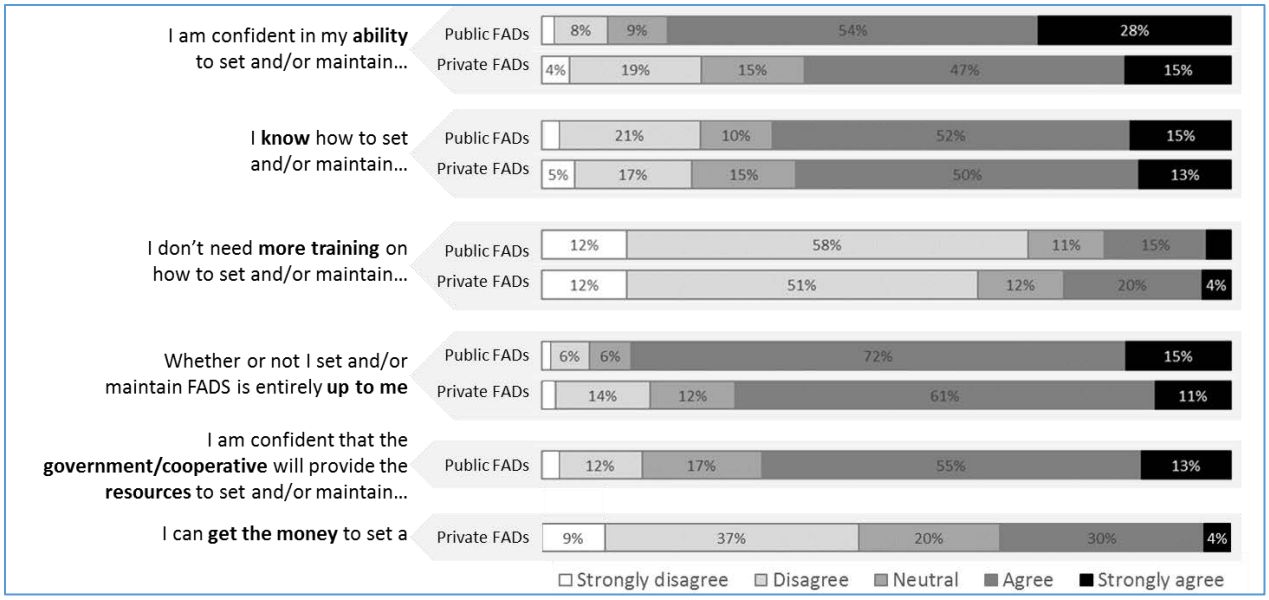

Figure 55. Fishers' capacity to set and maintain public or private FADs. For clarity percentages ≤3 were omitted from display on the graph.

Private FADs

The items used to measure three factors that underpin the TPB (attitudes, social norm, and perceived behavioral control) as applied to private FADs are listed in Table 15.

A Cronbach's alpha analysis and a factor analysis was used to confirm whether questions presented in Table 15 for attitude, social norm and behavioral control were appropriate and reliable for use in a logistic regression model to measure the influence that these three factors have on fishers' intention to set public and private FADs.

Table 15. Summary statistics and Cronbach's alpha estimate for the items used in each of the theory of planned behavior constructs for the setting and/or maintaining private FADs.

Items	Mean	St. Deviation	Cronbach's alpha
ATTITUDE			
Setting and/or maintaining a private FAD takes a lot of time.	2.56	1.0	0.75
Private FADs are difficult to set and/or maintain.	2.74	1.1	
Private FADs are expensive to set and/or maintain.	2.17	0.9	
Private FADs are quickly lost.	2.60	1.1	
Private FADs attract too many fishers.	2.75	1.1	
SOCIAL NORM			
Most of my friends set and/or maintain private FADs.	2.77	1.1	0.83
Most of my friends think I should set and/or maintain private FADs.	2.94	1.0	
Most fishers set and/or maintain private FADs.	2.61	1.1	
Other fishers expect me to set and/or maintain private FADs.	2.80	1.0	
Fisheries managers expect me to set and/or maintain private FADs.	2.43	0.9	
Other fishers support the setting and/or maintaining of private FADs.	3.13	1.1	
PERCEIVED BEHAVIORAL CONTROL			
I am confident in my ability to set and/or maintain private FADs.	3.53	1.1	0.50*
I do not know how to set and/or maintain private FADs.	3.52	1.1	
Whether or not I set and/or maintain private FADs is entirely up to me.	3.66	0.9	

** The statistical threshold (Cronbach's alpha ≥ 0.7) that measure the strength of association among items was not met for the perceived behavioral control.*

The Cronbach's alpha estimates indicate that the questions used to measure attitude (α=0.75) and social norm (α=0.83) were reliable proxies for measuring those two factors. The questions used to measure behavioral control (α=0.50) were low. However, the questions selected for measuring each factor of the TPB did associate correctly with their respective factor when analyzed using a principal component analysis (Table 16).

Table 16. Factor loading using principal component analysis with varimax rotation for the items used in each of the theory of planned behavior constructs for the setting and/or maintaining of private FADs.

Items	1	2	3
ATTITUDE			
Setting and/or maintaining a private FAD takes a lot of time.	0.806		
Private FADs are difficult to set and/or maintain.	0.763		
Private FADs are expensive to set and/or maintain.	0.736		
Private FADs are quickly lost.	0.669		
Private FADs attract too many fishers.	0.463		
SOCIAL NORM			
Most of my friends set and/or maintain private FADs.		0.779	
Most of my friends think I should set and/or maintain private FADs.		0.758	
Most fishers set and/or maintain private FADs.		0.705	
Other fishers expect me to set and/or maintain private FADs.		0.755	
Fisheries managers expect me to set and/or maintain private FADs.		0.654	
Other fishers support the setting and/or maintaining of private FADs.		0.598	
PERCEIVED BEHAVIORAL CONTROL			
I am confident in my ability to set and/or maintain private FADs.			0.767
I do not know how to set and/or maintain private FADs.			0.703
Whether or not I set and/or maintain private FADs is entirely up to me.			0.600

Cumulative percentage of variance explained = 52.05%. Factor loading values <0.40 were suppressed.

The model correctly predicted 74.5% of the cases (or fisher responses) for the intention to set private FADs – the dependent variable. Social norm and perceived behavioral control are the most influential predictors on the intention to set and/or maintain private FADs (Table 17). Stronger intentions to set and/or maintain private FADs were associated with social influences that support the use of private FADs. Furthermore, fishers believe that if they have the ability, skills and economic resources their intention to set private FADs will be greater (Table 17).

Table 17. Logistic regression output measuring intentions to set and/or maintain private FADs.

Predictor variables	Odd Ratios	95% Confidence interval	p-value
Attitude	0.73	0.48 — 1.10	0.13
Social Norm	2.09	1.40 — 3.13	0.00
Perceived Behavioral Control	2.87	1.90 — 4.35	0.00

Nagelkerke R2=0.27

In Table 17, the odd ratio measures the tendency of fishers to set private FADs. For example: 1) Fishers who are most influenced by others to perform the behavior of setting private FADs are 2.09 times more likely to engage in that activity than those who are not. 2) Fishers who believe that they have the capacity (i.e., skills, knowledge and resources) to set private FADs are 2.87 times more likely to set private FADs than individuals that do not possess the capacity.

Public FADs

The items used to measure three factors that underpin the TPB (attitudes, social norm, and perceived behavioral control) as applied to public FADs are listed in Table 18.

The Cronbach's alpha estimates indicate that the questions used to measure social norm (α=0.79) were reliable proxies for measuring this factor. The questions used to measure attitudes (α=0.66) and behavioral control (α=0.38) were low. However, the questions selected for measuring each factor of the TPB did associate correctly with their respective factor when analyzed using a principal component analysis (Table 19).

Table 18. Summary statistics and Cronbach's alpha estimate for the items used in each of the theory of planned behavior constructs for the setting and/or maintaining public FADs.

Items	Mean	St. Deviation	Cronbach's alpha
ATTITUDE			
Setting and/or maintaining a public FAD takes a lot of time.	2.44	1.0	0.66*
Public FADs are difficult to set and/or maintain.	2.85	1.0	
Public FADs are expensive to set and/or maintain.	2.25	0.9	
Public FADs are quickly lost.	2.83	1.0	
SOCIAL NORM			
Most of my friends set and/or maintain public FADs.	3.22	1.1	0.79
Most of my friends think I should set and/or maintain public FADs.	3.27	1.0	
Most fishers set and/or maintain public FADs.	3.09	1.1	
Other fishers expect me to set and/or maintain public FADs.	3.14	1.0	
Fisheries managers expect me to set and/or maintain public FADs.	3.18	1.0	
Other fishers support the setting and/or maintaining of public FADs.	3.68	0.8	
PERCEIVED BEHAVIORAL CONTROL			
I am confident in my ability to set and/or maintain public FADs.	3.99	0.7	0.38*
I do not know how to help to set and/or maintain public FADs.	3.55	1.0	
Whether or not I set and/or maintain public FADs is entirely up to me.	3.96	0.9	

**The statistical threshold (Cronbach's alpha ≥ 0.7) that measure the strength of association among items was not meet for the perceived behavioral control.*

Table 19. Factor loading using principal component analysis with varimax rotation for the items used in each of the theory of planned behavior constructs for the setting and/or maintaining public FADs.

Items	1	2	3
ATTITUDE			
Setting and/or maintaining a private FAD takes a lot of time.	0.764		
Public FADs are difficult to set and/or maintain.	0.783		
Public FADs are expensive to set and/or maintain.	0.693		
Public FADs are quickly lost.	0.552		
SOCIAL NORM			
Most of my friends set and/or maintain public FADs.		0.713	
Most of my friends think I should set and/or maintain public FADs.		0.751	
Most fishers set and/or maintain public FADs.		0.728	
Other fishers expect me to set and/or maintain public FADs.		0.721	
Fisheries managers expect me to set and/or maintain public FADs.		0.714	
Other fishers support the setting and/or maintaining of public FADs.		0.528	
PERCEIVED BEHAVIORAL CONTROL			
I am confident in my ability to set and/or maintain public FADs.			0.722
I do not know how to set and/or maintain public FADs.			0.675
Whether or not I set and/or maintain public FADs is entirely up to me.			0.562

Cumulative percentage of variance explained = 50.64%. Factor loading values <0.40 were suppressed.

The model correctly predicted 91.9% of the cases (or fisher responses) for the intention to set public FADs – the dependent variable. Only the perceived behavioral control construct was found to be strongly associated with the intention to set and/or maintain public FADs (Table 20). If fishers believe that they have the ability, skills, and resources then their intention to help set and/or maintain public FADS will be higher.

Table 20. Logistic regression output measuring intentions to set and/or maintain public FADs.

Predictor variables	Odd Ratios	95% Confidence interval	p-value
Attitude	1.52	0.80 — 2.91	0.20
Social Norm	1.65	0.90 — 3.03	0.10
Perceived Behavioral Control	5.41	2.48 — 11.84	0.00

Nagelkerke R^2=0.20

In table 20 the odd ratio measures the tendency of fishers to set private FADs. For example, fishers who believe that they have the capacity (i.e., skills, knowledge and resources) to set private FADs are 5.41 times more likely to set private FADs than individuals that do not possess the capacity.

CHAPTER 5. DISCUSSION AND CONCLUSIONS

I. Demographic and Fishing Profile

A comparative analysis of demographic profiles and fishing practices indicates that:

- The broad range in the age of fishers interviewed is indicative of a profession that has been capable of sustaining an adequate livelihood for fishers, but is attracting younger adults as well.
- Overall, pelagic fishers were broadly representative of the population at large in terms of family size, ethnicity and education level (i.e. pelagic fishing is not an activity associated only with particular social groups).
- Fishers are generally positive about their current offshore fishing success. This viewpoint is tempered by the overall perception that offshore fishing success and abundance of fish had declined a bit during the past five years while the number of fishers had increased.
- Fishers generally expressed a positive outlook on the future of offshore fishing to provide them with a satisfactory standard of living. This positivity is linked to the belief by an overwhelming majority of fishers that FADs helped them to catch more fish.
- An increasing reliance on FAD technology is an important contributor toward fishing success. The contribution of FADs to fishing success is supported by the strong interest among offshore fishers to help set new public FADs and to set their own private FADs.

Opportunity: FAD fishing is an expanding activity that should be monitored and possibly regulated to preserve its economic viability and sustainability. Data that fishers provide can be used to evaluate resource utilization or conflicts that may arise from wider expansion of the FAD program before potential issues become critical.

II. Satisfaction with Fisheries Co-Management

Knowledge of and Adherence to Fishing Rules

Awareness of rules, whether formal (promulgated by government) or informal (local traditions or customs), regarding the deployment, use or maintenance of public and private FADs was generally low for all CARIFICO islands, with the exception of Grenada for public FADs – 61%. Of those fishers who were knowledgeable about rules, a greater proportion expressed awareness of formal rules for public FADs, such as paying a license fee and procedures for FAD deployment. Generally, a smaller proportion of fishers were aware of rules for private FADs. The setting of private FADs is not a widespread tradition on most CARIFICO islands. It is therefore logical that fishers on CARIFICO islands would be more knowledgeable about formal rules regulating use that have been codified by local governments commensurate with recent CARIFICO public FAD programs. In keeping with this,

the following opportunities are arranged in sequence and their level of applicability will vary according to local circumstances.

Opportunity: Further investigate mechanisms to identify and integrate existing informal rules (fishing traditions) with more formal rules though a consultative process. This activity may be beneficial to underpin the development of mutually agreed upon FAD governance policies.

Opportunity: Provide additional opportunities to increase awareness about established fishing traditions and more formal rules though a consultative engagement process.

Opportunity: Reaffirm outcomes that may include a mixture of formal and informal rules to influence socially acceptable behaviors and mitigate user conflicts.

Satisfaction with Opportunities for Input into Management Decisions

The majority of fishers were either "satisfied" or "neutral" regarding the information that they received about fisheries management. This is consistent with the fact that a large number of fishers interviewed (about 50%) indicated that they participated in and benefitted from meetings and consultations organized by the CARIFICO project. Fewer fishers were "satisfied" about opportunities afforded to them to provide input into fisheries management decisions. Fewer fishers still believed that they actually had "power to influence fisheries management." Thus, while ample occasions to receive information about fisheries management are being provided to fishers, there is a perception that these consultations do not yield tangible opportunities for the average fisher to participate meaningfully in the management process or benefit directly as individuals from management decisions. Strengthening opportunities for consequential fisher input to decision-making will benefit the co-management process.

Opportunity: Encourage greater involvement of fishers in the process of governance though consultation that emphasizes two-way dialog and feedback opportunities for fishers and government.

Satisfaction with Fishing-Related Services and Facilities

Overall, fishers were not particularly satisfied with the facilities and services provided at landing sites. When asked about their satisfaction level they tended to mark options on the dissatisfied side of the scale and, at best, their assessment was "neutral." During the interviews, a number of fishers voiced displeasure about the lack of fish cold storage capacity, the unreliability of refrigeration and the lack of available fishing gear. Some fishers also believed that as members of cooperatives they should be entitled to discounted services, including fuel and fishing equipment. The services provided by fishing cooperatives received the lowest rating of the factors evaluated.

Opportunity: Investigate user needs and satisfaction with landing site facilities and services provided and/or desired. This may reveal specific infrastructure features and services that are best matched to fishers' needs and formalize responsibilities for the use and care of facilities and equipment though a consultative process.

Opportunity: Create and/or expand upon existing specialized training programs (e.g., business operation) for current and prospective managers and staff of fishing cooperatives and landing site facilities to maintain a high level of management and service delivery.

III. Trends in Livelihood Assets

An important component of the socio-economic analysis evaluated trends in the livelihood status of fishers, both past and present. The Sustainable Livelihoods Framework was applied to evaluate current livelihood status and to show trends (improvements or declines) in natural, physical, human, financial, and social assets over a five-year period. Some small, yet statistically significant differences in assets were identified during the five-year period, commensurate with the implementation of the CARIFICO project. While it is not possible to quantify the direct influence of CARIFICO on these trends, anecdotal evidence from fishers' suggest that CARIFICO actions have had meaningful influence on livelihoods, particularly natural (fishing success) and financial (income) assets – though those assets appear to be in decline, generally. A more detailed investigation evaluated the degree to which participation in training was related to the perception of greater level of fishing success and income. However, there is no statistical support for an increase in income and fishing success with the number of trainings taken by fishers.

In the CARIFICO region, there appears to be a significant decrease in natural and financial assets from that of five years ago; conversely, physical and social assets have significantly increased. Human assets were not measured over time (past year versus five years ago).

When applied to specific CARIFICO islands, the livelihoods framework results showed similar trends as the regional application: decrease in natural and financial assets; increase in physical and social assets. However, differences in the magnitude of the perceived decline or increase in assets is clearly evident among participating CARIFICO islands. For example, Grenada shows a significant increase in physical assets and the lowest decline in natural assets compared to the other islands.

A more detailed description of trends for individual livelihood factors is provided below.

Natural Assets

The general decline in the perception of natural assets may be related to the perception that more fishers are fishing now that five years ago. Increased competition for fishery resources may be driving the perception of declining fish abundance.

Physical Assets

Overall, the possession of physical assets increased significantly (house, land, boat, computer) which indicates that fishers have attained a higher standard of living.

The possession of private FADs has declined which may be linked to the establishment of local policies that emphasize support for setting public FADs and discourage the setting of private FADs.

Human Assets

The possession of human assets including training participation and educational attainment variables were not measured over the five-year time-frame as were the other livelihood assets. For this reason, temporal trends in this livelihood asset were not calculated. Nonetheless, some opportunities are identified based on the results for this factor. For example, participation in government and CARIFICO trainings was generally low (below 50%) for fishers who participated in the survey. However, almost all of the fishers who participated in the various trainings indicated that they were beneficial.

An assessment of CARIFICO trainings suggests that opportunities for participation were limited in number and geographic scope. Fishers in CARIFICO participating islands would benefit from broader implementation and greater access to participate in these training opportunities.

Opportunity: Expansion of existing training programs (particularly FAD setting and maintenance, safety at sea, navigation, and icebox construction) would likely yield substantial benefits. Almost all the fishers who participated in those trainings stated that they benefited from them. Those who did and did not participate expressed interest in more opportunities to learn these skills and, in particular, to help with FAD setting and maintenance.

Opportunity: Expansion of opportunities for fishers to participate in government sponsored data collection programs may increase the perception among fishers that their contribution is a meaningful, recognized and valued component of the management process. The results show that fishers who had participated in government sponsored data collection programs saw value in it. Outreach to fishers in this regard may increase their perception of the value in providing catch and effort data.

Financial Assets

Fishing is inherently unpredictable, so a significant number of fishers interviewed (about 50%) secure income from multiple sources (e.g., agriculture and construction). Income both from fishing and from other sources has undergone a perceived decline among fishers during the past five years. The perception of reduced income is generally consistent with perceptions of a drop in fish abundance and fishing success, as well as with an increase in the number of fishers. However, the perceived decline in financial assets does not necessarily mean that fishers are making less income than five year ago. Stagnant income may also result from fish prices that are not keeping pace with increases in fishing costs and rising prices for other commodities necessary for livelihoods.

Fishers believe that they are saving less money now than five years ago, but reliance on loans among fishers has also dropped significantly during the past five years, from an average of 26% five years ago to about to 6%

presently. The decrease in fishers' financial assets when compared to an increase in physical assets may be explained by the circumstance that fishers now possess significantly more physical assets than they did five years ago (e.g., land, house, boat ownership). This suggests that the perception of the decline in income may be offset by less reliance on loans and a lower incidence of debt. In other words, fishers may possess greater material wealth and have lower debt now, but they also may have less disposable income.

Opportunities: Support existing efforts to maintain and enhance the economic performance of FAD fisheries by promoting shared yet limited access to FAD fishery resources and by promoting seafood processing and marketing alternatives.

Social Assets

Family and relatives continue to be most relied-upon by a large percentage of fishers when financial support is needed. Family and relatives also play a significant role in helping fishers with their business-related activities. This suggests that fishers exhibit strong family and social ties with other fishers and friends (who are typically other fishers). However, they are not particularly well-represented in community organizations that exercise broader social influence, such as cooperatives or political organizations. But this trend seems to be changing. The results show that throughout the region more fishers are participating in fishing cooperatives and associations which has been motivated by the CARIFICO project.

Opportunity: Government can continue to play an important role in helping fishers organize and develop their collective voice through a continued process of engagement that emphasizes collaborative partnerships with fishers and the tangible benefits derived from co-management that can accrue at both group and individual levels.

Opportunity: Promote continuing education for Fisheries Division staff and local fisher stakeholders to participate in engagement activities that can facilitate dialog and processes for shared-governance.

Livelihood Assets Based on FAD Ownership

The livelihood analysis was expanded to determine asset strength profiles based on FAD ownership and use. Generally, fishers who deploy public and private FADs show the most robust livelihood assets, particularly physical, social and human. Fishers who deploy only public FADs showed the greatest strength in the possession of social assets but also scored strongly in human assets. This finding is encouraging in that a primary objective of the CARIFICO program is to strengthen social cohesion and organization through its activities, such as FAD deployment.

Additional findings of the socio-economic analysis suggest that fishers are not particularly well-connected with influential community and government institutions, which is indicative of a generally weak social status. They also lack financial capital that would allow them to acquire physical assets (e.g., vessels and equipment) that can allow them to more fully exploit natural assets. Last, fishers lack access, opportunity (and/or the motivation) to acquire new skills necessary to improve their professional capacities for business, organization and management.

The results show that there is still significant room for strengthening the livelihood assets of fishers through co-management programs that can improve their capabilities to more effectively organize and manage their activities and sustainably exploit natural assets.

Overall, the strength of livelihood assets available to and utilized by fishers were quite different depending on the island. This suggests that different types of interventions may be required to develop the livelihood of fishers.

The benefits derived from education and improving skills thought trainings is a common theme on all CARIFICO islands. For example, there is a tendency for fishers with strong human assets (educational attainment and participation in trainings) to participate in public FAD programs. Conversely, fishers who deploy private FADs show weaker strengths in human assets. As such, the level of education of fishers may indicate a greater willingness to participate in group-oriented activities which may be a significant factor influencing the future success of CARIFICO related FAD programs.

Opportunity: Evaluate the social and behavioral factors that may constrain some fishers from participating in group-related activities and initiate outreach that increases their capacity to participate.

IV. Factors Influencing Fishers' Decisions to Set FADs

The setting of private FADs, while generally discouraged and even considered illegal by some authorities, is a traditional fishing practice on some CARIFICO islands. The desire for and practice of setting private FADs may be a manifestation of a temperament that emphasizes an independent and entrepreneurial spirit that may be contrary to social norms (e.g., trust, sharing and cooperation) that underlie the principle of co-management. Absence of these desired social norms may affect the tendency of certain fishers to participate in CARIFICO activities. The Theory of Planned Behavior (TPB) was applied to evaluate the influence that attitude, social norms and behavioral control have on a fisher's desire and tendency to place public and private FADs.

Attitude

Fishers are in agreement that FADs attract fish and that setting and/or maintaining FADs will help them catch more fish. Notwithstanding, the general perception that FADs are difficult and time-consuming to set, expensive and are quickly lost may limit their broader appeal, particularly in the absence of continued subsidies. This is particularly true of setting public FADs which were also perceived to attract too many fishers. Interestingly, the majority of fishers believed that the number of fishers using FADs can be controlled presumably through mandatory licensing or user fees.

Opportunity: Continue to promote mechanisms (e.g., licensing and management) to ensure a regular supply of materials and government assistance needed to deploy and maintain an array of FADs adequate for demand in the longer-term. This could take the form of a specialized fisheries officer charged with managing and developing the FAD program in collaboration with fishers.

Subjective Norm

Fishers do not seem to be motivated by pressure from others (fishers, friends or government) to set or maintain FADs. This is particularly true regarding their interest in setting private FADs. In other words, fishers perceived more pressure from friends other fishers and managers to set and maintain public FADs than they do for setting private FADs. This finding is consistent with government policy and CARIFICO-related outreach that communicates the positive benefits of setting public FADs. This behavior may be reinforced by the support from other fishers who believe that setting public FADs helps them to catch more fish.

Opportunity: Reinforce positive benefits accrued through participation in public FAD programs because this outreach strategy seems to be working to influence desired behaviors in this regard. For example, provide opportunities for product marketing, further access to trainings and continued support for collective organization.

Behavioral Control

Perceived behavioral control was the most influential factor driving the intention to set and or maintain public and private FADs. If fishers believe that they have the ability, skills and financial resources, then their intention to set and/or maintain FADs will be significantly greater. One factor that may erode fishers' confidence in co-management is that most of the respondents were confident that government would provide the resources for deploying and maintaining public FADs in the future. It should be made clear to fishers that government cannot provide the resources necessary to maintain FAD programs in the long-term without a robust co-management structure, which is supported financially by fishers through licensing fees or other governance/organizational mechanisms.

Opportunity: Further communication or outreach efforts to promote the fact that co-management will be required to sustain the FAD fishery in the long-term will be beneficial.

Opportunity: A stronger and potentially longer-term outreach/communication effort may be valuable to stimulate CARIFICO participation by fishers and sustain FAD programs. In addition, further support and trainings for government fisheries and cooperative divisions to increase the effectiveness of management for landing site facilities and services can motivate greater interest among fishers to participate in co-management.

V. Conclusions

The contribution of CARIFICO to fishing success is supported by the strong interest among offshore fishers to help set new FADs, independently and/or in collaboration with other fishers. Further, the intent to set FADs is strongest among fishers who believe that they have the ability, skills and financial resources to do so, which are

being strengthened by participation in CARIFICO activities. The intent to set FADs is corroborated by the study results, which show that almost all of the fishers who had participated in CARIFICO activities and trainings believed that they benefitted from the skills and knowledge gained. This presents a genuine opportunity for CARIFICO to expand these trainings to the broader fisher community.

CARIFICO is also helping to address the perception that fish abundance is declining, which may be the result of greater competition among larger numbers of fishers for FAD resources. Licensing and data collection programs being implemented through CARIFICO can (1) serve to boost the profitability of FAD fishing by maintaining optimal ratios of fishers to FADs; and (2) help to monitor the status of FAD fishery resources, such that fish attracted to FADs are harvested in a sustainable manner.

Through CARIFICO, opportunities now exist for sharing management strategies related to formal and informal rules regarding the use, maintenance, and deployment of FADs. This is supported by the study, which shows that fishers on islands with a longer history of FAD use were more aware of FAD rules and regulations than fishers on islands where this technology has been more recently introduced. Thus, fisheries co-management may benefit from the establishment of rules that acknowledge existing social norms and fishing traditions.

CARIFICO is providing opportunities to strengthen fishers' social cohesion, organization and their collective voice, thereby, increasing their influence in the management of the resources upon which their livelihoods depend. This is supported by the study results that show an increase in fishing cooperative and association membership among fishers.

CARIFICO can influence the ability of governments and fishers to work collaboratively but attainment of a sustainable FAD fishery will require a longer-term commitment among stakeholders. This commitment will benefit from formalized and continuous processes of engagement adapted to local situations, such that tangible benefits derived from co-management can accrue to fishers at both group and individual levels.

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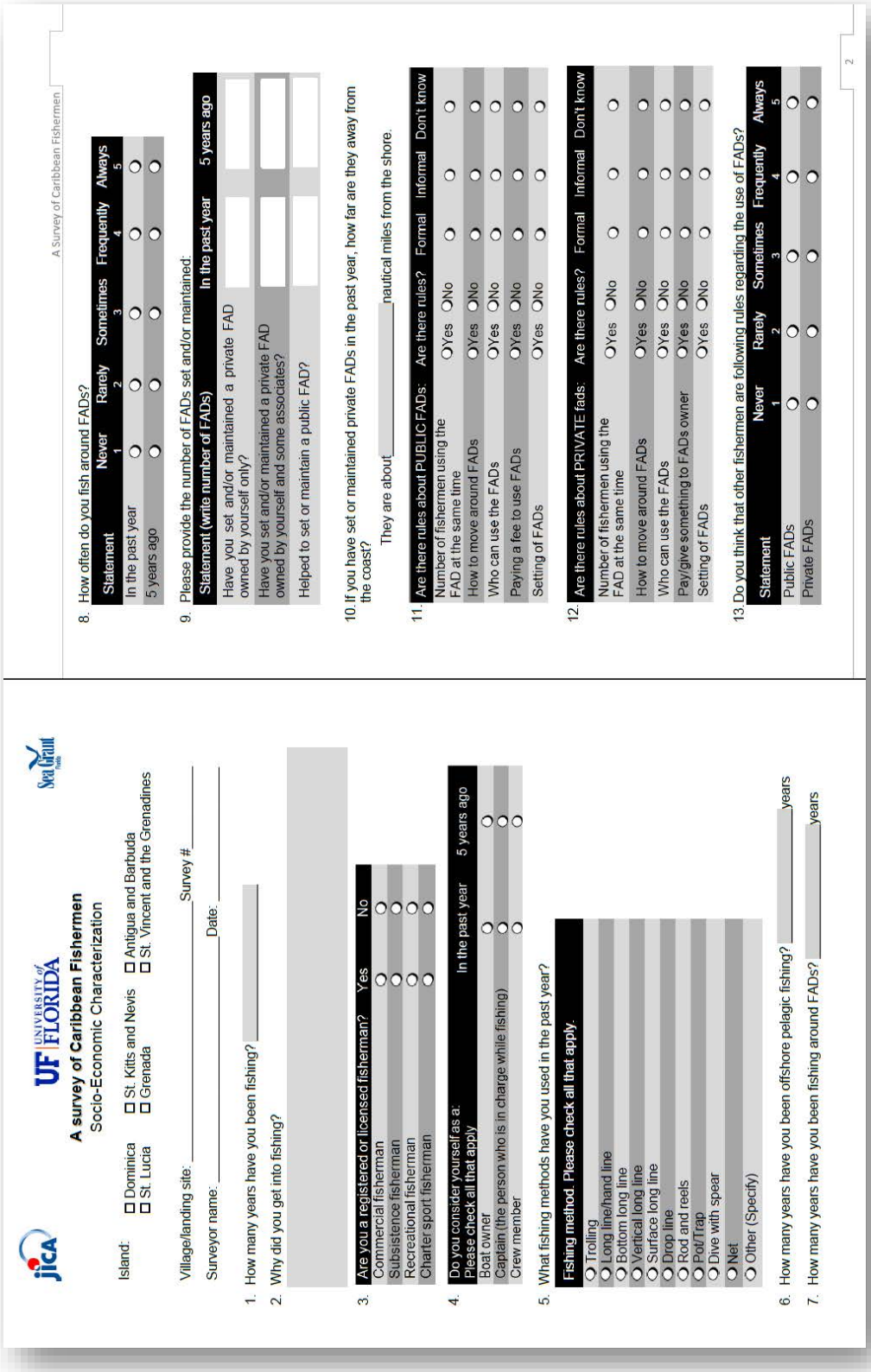
APPENDICES

Appendix A: Survey instrument



A survey of Caribbean Fishermen

A survey of Caribbean Fishermen
Socio-Economic Characterization

Island: ☐ Dominica ☐ St. Kitts and Nevis ☐ Antigua and Barbuda
☐ St. Lucia ☐ Grenada ☐ St. Vincent and the Grenadines

Village/landing site: _____ Survey #_____

Surveyor name: _____ Date: _____

1. How many years have you been fishing? _____
2. Why did you get into fishing?
3. Are you a registered or licensed fisherman?

	Yes	No
Commercial fisherman	○	○
Subsistence fisherman	○	○
Recreational fisherman	○	○
Charter sport fisherman	○	○

4. Do you consider yourself as a: Please check all that apply

	In the past year	5 years ago
Boat owner	○	
Captain (the person who is in charge while fishing)	○	○
Crew member	○	○

5. What fishing methods have you used in the past year?

Fishing method. Please check all that apply.
- ○ Trolling
- ○ Long line/hand line
- ○ Bottom long line
- ○ Vertical long line
- ○ Surface long line
- ○ Drop line
- ○ Rod and reels
- ○ Pot/Trap
- ○ Dive with spear
- ○ Net
- ○ Other (Specify)

6. How many years have you been offshore pelagic fishing? _____ years
7. How many years have you been fishing around FADs? _____ years

8. How often do you fish around FADs?

Statement	Never 1	Rarely 2	Sometimes 3	Frequently 4	Always 5
In the past year	○	○	○	○	○
5 years ago	○	○	○	○	○

9. Please provide the number of FADs set and/or maintained:

Statement (write number of FADs)	In the past year	5 years ago
Have you set and/or maintained a private FAD owned by yourself only?		
Have you set and/or maintained a private FAD owned by yourself and some associates?		
Helped to set or maintain a public FAD?		

10. If you have set or maintained private FADs in the past year, how far are they away from the coast?
They are about _____ nautical miles from the shore.

11. Are there rules about PUBLIC FADs:

	Are there rules?	Formal	Informal	Don't know
Number of fishermen using the FAD at the same time	○Yes ○No	○	○	○
How to move around FADs	○Yes ○No	○	○	○
Who can use the FADs	○Yes ○No	○	○	○
Paying a fee to use FADs	○Yes ○No	○	○	○
Setting of FADs	○Yes ○No	○	○	○

12. Are there rules about PRIVATE fads:

	Are there rules?	Formal	Informal	Don't know
Number of fishermen using the FAD at the same time	○Yes ○No	○	○	○
How to move around FADs	○Yes ○No	○	○	○
Who can use the FADs	○Yes ○No	○	○	○
Pay/give something to FADs owner	○Yes ○No	○	○	○
Setting of FADs	○Yes ○No	○	○	○

13. Do you think that other fishermen are following rules regarding the use of FADs?

Statement	Never 1	Rarely 2	Sometimes 3	Frequently 4	Always 5
Public FADs	○	○	○	○	○
Private FADs	○	○	○	○	○

2

14. Is catching fish more difficult/the same/ or easier now than it was 5 years ago?

More difficult	The same	Easier
❍	❍	❍

15. If more difficult or easier, why?

16. Did you participate in and/or benefit from the following training programs?

Training programs	Did you participate?	Did you benefit?
FAD setting/maintenance	❍Yes ❍No	❍Yes ❍No
Fish gear and methods	❍Yes ❍No	❍Yes ❍No
Fish handing and quality	❍Yes ❍No	❍Yes ❍No
Navigation	❍Yes ❍No	❍Yes ❍No
Outboard motor repair	❍Yes ❍No	❍Yes ❍No
Safety at sea	❍Yes ❍No	❍Yes ❍No
Personal fishing record keeping	❍Yes ❍No	❍Yes ❍No
Government data collection program	❍Yes ❍No	❍Yes ❍No
Vertical long line methods	❍Yes ❍No	❍Yes ❍No
Ice box construction	❍Yes ❍No	❍Yes ❍No
Organized meetings/consultations	❍Yes ❍No	❍Yes ❍No
Other (specify)	❍Yes ❍No	❍Yes ❍No

17. Are you teaching or have you taught anyone your fishing skills and knowledge? Please check all that apply

- ❍ Spouse
- ❍ Children
- ❍ Siblings
- ❍ In laws
- ❍ Other relatives (e.g., nephew, cousin)
- ❍ Friends
- ❍ Other fisherman in my community
- ❍ Other fisherman outside my community
- ❍ No one

18. What is your highest level of education completed?

- ❍ None
- ❍ Primary
- ❍ Secondary
- ❍ College or University
- ❍ Vocational (identify)

19. In which year were you born? _____ year

20. What is your ethnicity? Please check all that apply

- ❍ Caucasian
- ❍ Hispanic
- ❍ Black
- ❍ Asian
- ❍ Kalinago
- ❍ Arawak
- ❍ East Indian
- ❍ Other (identify)

21. Other than yourself, who lives in your household? Please enter a number for all that apply.

Relatives	Number of relatives
Spouse	
Children	
Parents	
Grandparents	
Brother(s) and sister(s)	
Other relatives	
I live alone ❍	

22. Are there less/the same/ or more offshore fishermen now than 5 years ago?

Less	The same	More
❍	❍	❍

23. How would you describe your success in fishing offshore?

Statement	Poor 1	Fair 2	Average 3	Good 4	Very good 5
In the past year	❍	❍	❍	❍	❍
5 years ago	❍	❍	❍	❍	❍

24. How would you describe the abundance of fish?

Statement	Poor 1	Fair 2	Average 3	Good 4	Very good 5
In the past year	❍	❍	❍	❍	❍
5 years ago	❍	❍	❍	❍	❍

25. How would you describe your income from fishing?

Statement	Poor 1	Fair 2	Average 3	Good 4	Very good 5	Not applicable
In the past year	❍	❍	❍	❍	❍	❍
5 years ago	❍	❍	❍	❍	❍	❍

26. Which of the following are activities do you do for a living?

Statement	Percentage
Fishing (just catching fish)	
Agriculture	
Construction/maintenance	
Retirement income	
Remittances (money from relatives abroad)	
Other (specify)	

100%

27. How would you describe your general income (all sources)?

Statement	Poor 1	Fair 2	Average 3	Good 4	Very good 5	Not applicable
In the past year	❍	❍	❍	❍	❍	❍
5 years ago	❍	❍	❍	❍	❍	❍

28.

Do you save money?	Yes	No
In the past year	❍	❍
5 years ago	❍	❍

29.

Have you taken a loan?	In the past year	5 years ago
No, I haven't taken a loan	❍	❍
Yes, to purchase a boat	❍	❍
Yes, to purchase fishing gear and equipment	❍	❍
Yes, to invest in another business that is not fishing related	❍	❍
Yes, for other personal use (e.g., land, house, motor vehicle, etc.)	❍	❍

30. Please indicate your possession of the following assets:

Assets	Do you own now	Have you owned 5 years ago
Land	❍Yes ❍ No	❍Yes ❍ No
House	❍Yes ❍ No	❍Yes ❍ No
Boat	❍Yes ❍ No	❍Yes ❍ No
Ice box on boat (if they own a boat)	❍Yes ❍ No	❍Yes ❍ No
Engine	❍Yes ❍ No	❍Yes ❍ No
GPS	❍Yes ❍ No	❍Yes ❍ No
Refrigerator	❍Yes ❍ No	❍Yes ❍ No
Television	❍Yes ❍ No	❍Yes ❍ No
Air conditioner	❍Yes ❍ No	❍Yes ❍ No
Washing machine	❍Yes ❍ No	❍Yes ❍ No
FAD	❍Yes ❍ No	❍Yes ❍ No
Motor vehicle	❍Yes ❍ No	❍Yes ❍ No
Computer	❍Yes ❍ No	❍Yes ❍ No
In-door toilet	❍Yes ❍ No	❍Yes ❍ No

31. Please let us know the status of your boat ownership:

Status	In the past year	5 years ago
Own boat	❍	❍
Finance boat	❍	❍
Borrow/rent boat	❍	❍

32. How many boats do you own, finance, or borrow? Please enter a number.

	In the past year	5 years ago
Number of boats		

33. How many boats suitable for pelagic fishing do you possess?

Fiberglass	Wood	With cabin?	Length(feet)
❍	❍	❍Yes ❍No	
❍	❍	❍Yes ❍No	
❍	❍	❍Yes ❍No	
❍	❍	❍Yes ❍No	
❍	❍	❍Yes ❍No	
❍	❍	❍Yes ❍No	

34. In times of need, who do you turn to to provide financial support?
Please check all that apply

Sources of support	In the past year	5 years ago
No one	❍	❍
Immediate family member	❍	❍
Relative	❍	❍
Friend	❍	❍
Other fishermen (non-related)	❍	❍
Community leader(s)	❍	❍
Fishing cooperative or association	❍	❍
Government	❍	❍
Bank or lending institution	❍	❍
Other (specify)	❍	❍

35. Who do you involve in business related activities?
Please check all that apply

Business associates	In the past year	5 years ago
No one	❍	❍
Immediate family member	❍	❍
Relative	❍	❍
Friend	❍	❍
Other fishermen (non-related)	❍	❍
Community leader(s)	❍	❍
Fishing cooperative or association	❍	❍
Government	❍	❍
Bank or lending institution	❍	❍
Other (specify)	❍	❍

36. In which of the following community organizations do you participate?
Please check all that apply

	In the past year	5 years ago
Church	❍	❍
Political	❍	❍
Professional	❍	❍
School	❍	❍
Sports	❍	❍
Cooperative or association (not fishing)	❍	❍
Other (specify)	❍	❍

37. Are you a member of a fishing cooperative, association, and/or FAD group?

	In the past year	5 years ago
Yes, I am a member	❍	❍
No, I am not a member	❍	❍
Not applicable, there are no fishing cooperatives, associations or FAD group in my community that I am aware of.	❍	❍
Name of fishing cooperative, association, and/or FAD group:		

38. If you are currently a member of a fishing cooperative, association, and/or FAD group what are the things that you value most about being affiliated with fishing cooperative(s), association(s), and/or FAD group(s)?

39. Please indicate your level of satisfaction with the following:

Statement	Very Dissatisfied 1	Dissatisfied 2	Neutral 3	Satisfied 4	Very Satisfied 5
Landing sites services	○	○	○	○	○
Landing sites facilities	○	○	○	○	○
Services provided by fishing cooperatives	○	○	○	○	○
Fishing regulations	○	○	○	○	○
Information you receive about fisheries management	○	○	○	○	○
Opportunities to provide input in fisheries management	○	○	○	○	○
Your power to influence fisheries management	○	○	○	○	○
Enforcement of fishing regulations	○	○	○	○	○

40. Please indicate how much you agree or disagree with each of the following statements about PRIVATE FADs:

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
Setting and/or maintaining a private FAD will attract fish	○	○	○	○	○
Setting and/or maintaining a private FAD will help me catch more fish	○	○	○	○	○
Setting and/or maintaining a private FAD takes a lot of time	○	○	○	○	○
Private FADs are difficult to set and/or maintain	○	○	○	○	○
Private FADs are expensive to set and/or maintain	○	○	○	○	○
Private FADs are quickly lost	○	○	○	○	○
Private FADs attract too many fishermen	○	○	○	○	○
The number of fishermen using private FADs can be controlled	○	○	○	○	○

41. Please indicate how much you agree or disagree with each of the following statements about PRIVATE FADs:

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
Most of my friends set and/or maintain private FADs	○	○	○	○	○
Most of my friends think I should set and/or maintain private FADs	○	○	○	○	○
Most fishers set and/or maintain private FADs	○	○	○	○	○
Other fishers expect me to set and/or maintain private FADs	○	○	○	○	○
Fisheries managers expect me to set and/or maintain private FADs	○	○	○	○	○
Other fishermen support the setting and/or maintaining of private FADs	○	○	○	○	○

42. Please indicate how much you agree or disagree with each of the following statements about PRIVATE FADs:

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
I am confident in my ability to set and/or maintain private FADs	○	○	○	○	○
I do not know how to set and/or maintain private FADs	○	○	○	○	○
I need more training on how to set and/or maintain private FADs	○	○	○	○	○
Whether or not I set and/or maintain private FADs is entirely up to me	○	○	○	○	○
I can get the money to set a private FAD	○	○	○	○	○

43. Do you intend to set a PRIVATE FAD in the future? ○ Yes ○ No

44. Please indicate how much you agree or disagree with each of the following statements about PUBLIC FADs:

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
Setting and/or maintaining a public FAD will attract fish	❍	❍	❍	❍	❍
Setting and/or maintaining a public FAD will help me catch more fish	❍	❍	❍	❍	❍
Setting and/or maintaining a public FAD takes a lot of time	❍	❍	❍	❍	❍
Public FADs are difficult to set and/or maintain	❍	❍	❍	❍	❍
Public FADs are expensive to set and/or maintain	❍	❍	❍	❍	❍
Public FADs are quickly lost	❍	❍	❍	❍	❍
Public FADs attract too many fishermen	❍	❍	❍	❍	❍
The number of fishermen using public FADs can be controlled	❍	❍	❍	❍	❍

45. Please indicate how much you agree or disagree with each of the following statements about PUBLIC FADs:

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
Most of my friends help to set and/or maintain public FADs	❍	❍	❍	❍	❍
Most of my friends think I should help to set and/or maintain public FADs	❍	❍	❍	❍	❍
Most fishers help set and/or maintain public FADs	❍	❍	❍	❍	❍
Other fishers expect me to help set and/or maintain public FADs	❍	❍	❍	❍	❍
Fisheries managers expect me to help set and/or maintain public FADs	❍	❍	❍	❍	❍
Other fishermen support the setting and/or maintaining of public FADs	❍	❍	❍	❍	❍

46. Please indicate how much you agree or disagree with each of the following statements about PUBLIC FADs:

Statement	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
I am confident in my ability to help set and/or maintain public FADs	❍	❍	❍	❍	❍
I do not know how to help to set and/or maintain public FADs	❍	❍	❍	❍	❍
I need more training on how to set and/or maintain public FADs	❍	❍	❍	❍	❍
Whether or not I help to set and/or maintain public FADs is entirely up to me	❍	❍	❍	❍	❍
I am confident that the government/cooperative will provide the resources to set and/or maintain public FADs	❍	❍	❍	❍	❍

47. Do you intend to participate in PUBLIC FAD setting and/or maintenance in the future?

❍ Yes ❍ No

48. Can you provide the name of other fishermen that we can contact to participate in this survey?

❍ Yes ❍ No

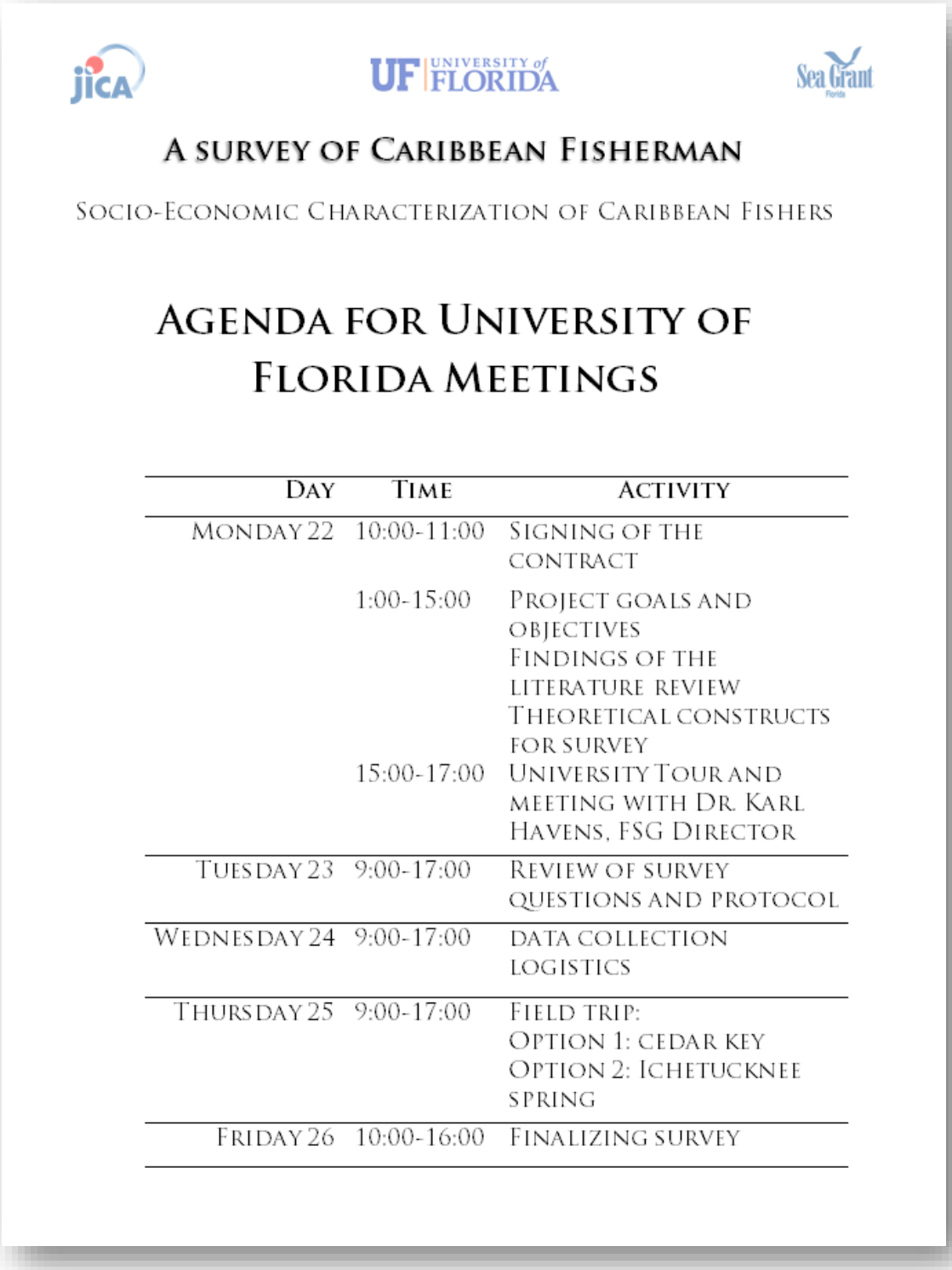
NAME: _____ COMUNITY: _____ PHONE #: _____

NAME: _____ COMUNITY: _____ PHONE #: _____

49. Any additional comments:

Thank you very much for all your help!!!

Appendix B: Survey planning agenda



A SURVEY OF CARIBBEAN FISHERMAN

SOCIO-ECONOMIC CHARACTERIZATION OF CARIBBEAN FISHERS

AGENDA FOR UNIVERSITY OF FLORIDA MEETINGS

DAY	TIME	ACTIVITY
MONDAY 22	10:00-11:00	SIGNING OF THE CONTRACT
	1:00-15:00	PROJECT GOALS AND OBJECTIVES FINDINGS OF THE LITERATURE REVIEW THEORETICAL CONSTRUCTS FOR SURVEY
	15:00-17:00	UNIVERSITY TOUR AND MEETING WITH DR. KARL HAVENS, FSG DIRECTOR
TUESDAY 23	9:00-17:00	REVIEW OF SURVEY QUESTIONS AND PROTOCOL
WEDNESDAY 24	9:00-17:00	DATA COLLECTION LOGISTICS
THURSDAY 25	9:00-17:00	FIELD TRIP: OPTION 1: CEDAR KEY OPTION 2: ICHETUCKNEE SPRING
FRIDAY 26	10:00-16:00	FINALIZING SURVEY

Appendix C: Letter of informed consent that accompanied the questionnaire

Consent Form

Hello, my name is (name of Interviewer) and I am working with the (name of country) Fisheries Division.

The (name of country) Fisheries Division is partnering with the University of Florida Sea Grant College Program (FSG) and the Japan International Cooperation Agency (JICA) to conduct a social survey of offshore fishermen. To accomplish this, we need your help.

The information that you provide during this interview will be important to Fisheries Division efforts to improve the livelihood of fishers and to help improve services that make your fishing more efficient, safe and profitable.

The interview will take about 45 minutes of your time.

There are no risks to you for participating in the interview. There are no right or wrong answers. Your responses will remain strictly confidential: Your name will not be taken or associated with your responses. Your participation is voluntary and you can stop the interview at any time without penalty. You also do not have to answer any question that you do not want to.

If you have any questions about the survey or if you would like more information about your rights as a participant in the survey please contact the (name of country) Fisheries Division or the University of Florida Institutional Review Board at P.O. Box 112250, Gainesville, FL 32611, (352)392-0433. You may also contact the project's Principal Investigator, Dr. Charles Sidman, at csidman@ufl.edu.

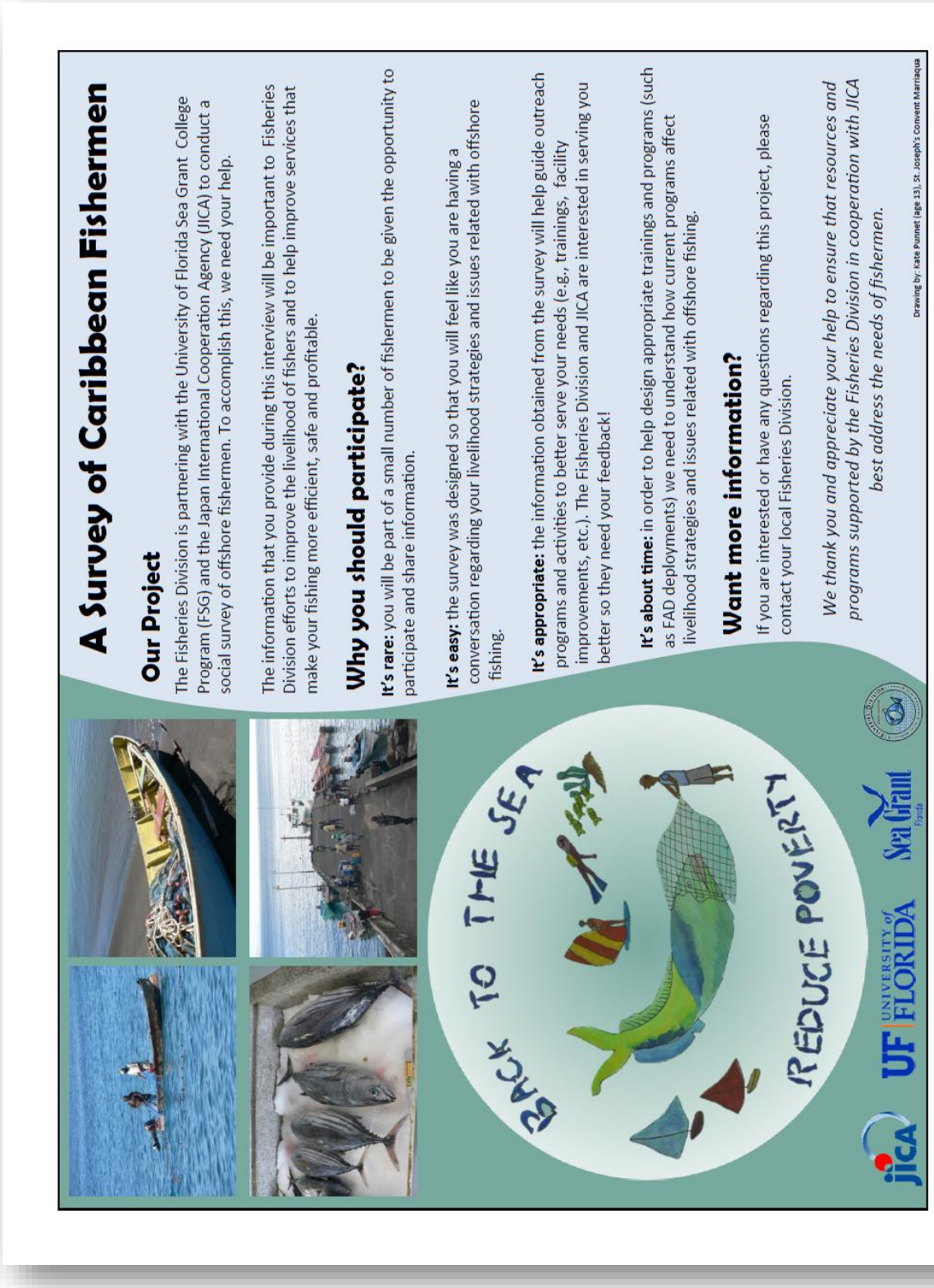
We thank you and appreciate your help to ensure that resources and activities supported by the (name of country) Fisheries Division in cooperation with JICA best address the needs of fishermen.

Sincerely,

Charles Sidman

Dr. Charles Sidman, Florida Sea Grant, University of Florida
Mr. Minoru Tamura, Japan International Cooperation Agency
Mr. (name of local Chief Fisheries Officer)

Appendix D: Project announcement



A survey of Caribbean Fisherman

Socio-Economic Characterization of Caribbean Fishers

Agenda for JICA Liaison Training for Survey Implementation:

Roseau Dominica

Day	Activity	Location
Monday, September 12		
2:00PM-2:15PM	Introductions and Agenda	Dominica Fisheries Division Conference Room
2:15PM-2:45PM	JICA CARIFICO Update (Tamura and Honda)	
2:45PM-3:45PM	Project Background and Study Design (Montes)	
3:45PM-4:30PM	Introduce Survey Instrument (Montes and Sidman)	
4:30PM-5:00PM	Question and Answer Period	
5:00PM-5:15PM	Wrap Up	
Tuesday, September 13		
9:30AM-10:00AM	Update on Dominica Pilot Test and Data Collection (Sidman, Montes, Birmingham)	Dominica Fisheries Division Conference Room
10:00AM-10:30AM	Introduce Survey/Interview Protocol (Sidman)	
10:30AM-11:00AM	Question and Answer Period	
LUNCH		
1:00PM-3:00PM	Practice Interviews with Guest Fishers from Fond Cole' and St. John	
3:00PM-4:00PM	Debrief on Interviews with Guest Fishers	
4:00PM-4:15PM	Wrap Up	
Wednesday, September 14		
9:00AM-10:00AM	Date Entry Protocols (Montes)	Dominica Fisheries Division Conference Room
10:00AM-11:30AM	Practice Data Entry	
11:30AM-12:00PM	Question and Answer Period	
LUNCH	Develop Data Collection Plans	
2:00-4:00PM	Wrap Up	
4:00PM-4:15PM		
Thursday, September 15		
9:00AM-2:00PM	Field Trip	Trafalgar Falls and Freshwater Lake
LUNCH		
3:00M-6:00PM	Site Visits to Practice Data Collection	Villages of Mahaut, Fond St. Jean and Stowe

Appendix F: Supplementary tables

Table 1F. Highest level of education.

Group	None	Primary	Secondary	College
Antigua & Barbuda	2%	36%	50%	12%
Dominica	4%	54%	33%	9%
St. Lucia	4%	71%	24%	0%
St. Vincent & the Grenadines	0%	50%	43%	7%
Grenada	1%	51%	38%	9%
Total	3%	53%	37%	7%

Table 2F. Are you a registered or licensed fisherman?

Group	Commercial	Subsistence	Recreational	Charter sport
Antigua & Barbuda	90%	2%	5%	3%
Dominica	99%	1%	0%	0%
St. Lucia	98%	2%	0%	0%
St. Vincent & the Grenadines	60%	35%	4%	0%
Grenada	91%	6%	1%	1%
Total	88%	9%	2%	1%

Table 3F. Do you consider yourself a captain or crew member?

Group	Captain		Crew member	
	Past year	5 years ago	Past year	5 years ago
Antigua & Barbuda	53%	47%	53%	47%
Dominica	52%	48%	56%	44%
St. Lucia	55%	45%	50%	50%
St. Vincent & the Grenadines	52%	48%	53%	47%
Grenada	61%	39%	46%	54%
Total	54%	46%	52%	48%

Table 4F. Boat ownership.

Group	Owned a boat 5 years ago and past year	Owned a boat 5 years ago but NOT past year	Owned a boat past year but NOT 5 years ago
Antigua & Barbuda	83%	17%	0%
Dominica	83%	10%	7%
St. Lucia	89%	6%	6%
St. Vincent & the Grenadines	88%	7%	5%
Grenada	77%	15%	8%
Total	84%	11%	5%

Table 5F. Boat characteristics.

Group	Boats with cabin		Boat length			Boat made of:			
	%	N	Mean	St. Dev.	N	Fiberglass	Wood	Fiberglass and wood	N
Antigua & Barbuda	45%	40	29	5.4	55	100%	0%	0%	54
Dominica	22%	65	21	4.7	69	48%	19%	33%	69
St. Lucia	5%	39	25	1.9	42	95%	5%	0%	42
St. Vincent & the Grenadines	7%	45	21	7.1	47	50%	27%	23%	48
Grenada	10%	59	19	4.9	69	3%	84%	13%	68
Total	15%	281	23	6.1	282	54%	30%	15%	281

*Table 6F. How would you describe your success in fishing offshore?**

Group	Timeframe	Poor	Fair	Average	Good	Very good	N
Antigua & Barbuda	5 years ago	2	7	45	39	7	44
	Past year	2	12	50	29	7	58
Dominica	5 years ago	3	9	32	43	14	79
	Past year	9	12	32	35	12	85
St. Lucia	5 years ago	0	5	18	60	18	62
	Past year	6	11	39	36	8	66
St. Vincent & the Grenadines	5 years ago	9	5	24	38	24	58
	Past year	15	5	27	40	13	60
Grenada	5 years ago	5	3	36	36	19	74
	Past year	5	16	19	40	19	77
Total	5 years ago	4	6	31	43	17	317
	Past year	8	11	33	36	12	346

** Percentages*

*Table 7F. How would you describe the abundance of fish?**

Group	Timeframe	Poor	Fair	Average	Good	Very good	N
Antigua & Barbuda	5 years ago	2	4	53	33	7	45
	Past year	4	26	46	23	2	57
Dominica	5 years ago	1	9	30	41	20	81
	Past year	6	23	31	25	15	87
St. Lucia	5 years ago	0	8	18	61	14	66
	Past year	7	9	50	32	1	68
St. Vincent & the Grenadines	5 years ago	3	7	17	43	29	58
	Past year	12	12	24	32	20	59
Grenada	5 years ago	1	4	24	50	20	74
	Past year	5	9	19	47	19	77
Total	5 years ago	2	6	27	46	19	324
	Past year	7	16	33	32	12	348

** Percentages*

*Table 8F. How would you describe your income from fishing?**

Group	Timeframe	Poor	Fair	Average	Good	Very good	N
Antigua & Barbuda	5 years ago	4	11	43	41	0	46
	Past year	5	19	49	26	0	57
Dominica	5 years ago	5	17	22	45	11	82
	Past year	6	13	37	39	6	88
St. Lucia	5 years ago	2	17	26	39	16	69
	Past year	0	4	20	54	22	70
St. Vincent & the Grenadines	5 years ago	4	15	22	40	20	55
	Past year	17	10	25	41	7	59
Grenada	5 years ago	1	8	23	44	23	73
	Past year	9	8	19	42	22	77
Total	5 years ago	2	11	26	44	17	325
	Past year	9	13	29	39	10	351

** Percentages*

*Table 9F. How would you describe your general income (all sources)?**

Group	Timeframe	Poor	Fair	Average	Good	Very good	N
Antigua & Barbuda	5 years ago	4	10	35	51	0	51
	Past year	5	12	50	33	0	58
Dominica	5 years ago	4	15	26	40	16	81
	Past year	10	18	24	34	14	88
St. Lucia	5 years ago	0	3	25	59	13	64
	Past year	4	9	46	36	4	69
St. Vincent & the Grenadines	5 years ago	7	14	23	35	21	57
	Past year	10	13	17	48	12	60
Grenada	5 years ago	1	10	14	51	24	71
	Past year	5	8	18	50	18	76
Total	5 years ago	3	10	24	47	15	325
	Past year	7	12	30	40	11	351

** Percentages*

*Table 10F. Who do you rely on to provide financial support in times of need? Check all that apply**

Group	Timeframe	No one	Family & relatives	Friends & other fishers	Institutions	# of responses	N
Antigua & Barbuda	5 years ago	29	27	26	18	73	58
	Past year	32	26	26	16	73	58
Dominica	5 years ago	15	37	13	35	114	76
	Past year	19	35	12	34	129	88
St. Lucia	5 years ago	11	47	17	26	103	63
	Past year	10	49	16	25	110	68
St. Vincent & the Grenadines	5 years ago	23	41	15	21	73	59
	Past year	23	38	20	20	80	59
Grenada	5 years ago	12	46	8	34	85	71
	Past year	11	38	11	40	94	76
Total	5 years ago	17	40	15	28	448	327
	Past year	17	36	15	32	513	349

** Percentages.*

*Table 11F. Who do you involve in business related activities? Check all that apply**

Group	Timeframe	No one	Family & relatives	Friends & other fishers	Institutions	# of responses	N
Antigua & Barbuda	5 years ago	27	42	21	10	73	58
	Past year	29	41	21	10	73	58
Dominica	5 years ago	22	31	31	15	134	89
	Past year	13	32	38	18	144	89
St. Lucia	5 years ago	21	48	21	11	102	69
	Past year	15	56	19	10	99	69
St. Vincent & the Grenadines	5 years ago	41	45	8	6	64	60
	Past year	32	46	14	8	65	59
Grenada	5 years ago	19	45	13	23	95	78
	Past year	13	36	15	36	98	78
Total	5 years ago	25	41	20	14	468	354
	Past year	18	41	23	18	481	353

** Percentages.*

*Table 12F. Who do you involve in business related activities? Check all that apply**

Group	Timeframe	Church	Sport	Cooperative (not fishing)	School	Political	Other	# of responses	N
Antigua & Barbuda	5 years ago	34	23	9	23	6	6	35	58
	Past year	35	19	8	22	5	11	37	58
Dominica	5 years ago	41	20	10	9	16	4	112	89
	Past year	39	21	13	8	13	7	119	89
St. Lucia	5 years ago	34	26	17	9	11	3	98	70
	Past year	31	24	20	10	14	2	101	70
St. Vincent & the Grenadines	5 years ago	44	21	21	3	0	12	34	60
	Past year	44	21	21	6	0	9	34	60
Grenada	5 years ago	23	35	14	15	9	4	94	78
	Past year	26	36	12	19	3	4	106	78
Total	5 years ago	34	25	14	11	10	5	373	355
	Past year	34	25	15	12	9	5	397	355

** Percentages.*

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