

**Understanding the Current Fisheries and Available Marine Resources  
in Small Island Nations of the Caribbean:  
The Establishment of a Baseline for Native Governance to Manage Their Marine Resources**

**Comprensión de las Actuales Pesquerías y de los Recursos Marinos Disponibles  
en las Pequeñas Islas Naciones de los Caribes: Establecimiento de una  
Base de Referencia para los Gobiernos Locales en Fin de Gestionar sus Recursos Marinos**

**Une Compréhension des Pêcheries Actuelles et des Ressources Marines Disponibles dans les  
Petites Îles-Nations des Caraïbes: L'Établissement d'une Ligne de Conduite pour les  
Gouvernements Autochtones dans la Gestion de Leurs Ressources Marines**

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**ABSTRACT**

Caribbean island nations appear to have a sparse amount of knowledge on their own fish stocks. In order for any management plan to be successful, there is an essential need for all sectors within the fishing industry to be aware of the current fisheries and available marine resources. The Billfish Foundation (TBF) has investigated through previous research in Australia and Bermuda the importance of local stakeholders involvement when it comes to policy and decision-making. In these places, a top-down approach seems to be unsuccessful and is why TBF believes that research, communication and action must start with a bottom-up approach. When local governance is disregarded, stakeholders lose their pride and incentives to protect their own resource. Such self-reliance is critical for the local sectors as ultimately they are the ones who will be managing their fisheries. TBF understands the importance of artisanal fishermen and therefore is seeking to collaborate with them, and other resource users involved in both the post and pre harvest fishing industry sectors, in hopes of obtaining a baseline of statistical catch data. Without a baseline composed of actual numbers, there is no ground for policy makers or fisheries managers to stand on. TBF is engaged with stakeholders to collect relevant data in order to establish a model and creating a way for local stakeholders to manage their marine resources. Data collection will be gathered from indigenous fishermen since many of them could account for a majority of fish caught in their respective region. Through discourse with relevant stakeholders and local officials, TBF hopes to encourage active regional participation in fisheries management issues.

**KEY WORDS:** Fisheries management; native governance; data collection methods; bottom-up approach; Caribbean; fisherfolk knowledge; stakeholder participation

**INTRODUCTION**

Small-scale fisheries (SSF) have been characterized by low technology fishing gear over a limited spatial range, providing a vital protein source for livelihoods of many developing coastal and rural communities. It is estimated that over 50 million fishers are tied to SSF, and another 150 million livelihoods depend on SSF related occupation in both the post-harvesting pre-harvesting fishing industries (Andrade 2011). Despite these impressive figures, SSF continues to be overlooked by fisheries management practitioners, consultants, and policy makers. The vicious cycle that excludes small-scale fisheries from international debates is one that is predominately the result of data-limited fisheries. By continuously failing to account for the catch statistics in SSF, world fisheries catch statistics are substantially underestimated, and policy makers cannot effectively create sustainable fisheries management plans (FMP). Information that policy makers can trust is vital in empowering communities to improve their management of fisheries resources (Andrade 2011). There is a need for effective participation from the small-scale sector in order to implement a system where information is easily accessible to all resource user groups.

The Caribbean region has a major maritime space in comparison to its total land area. Approximately 82% of the area occupied by states is within the maritime space. Such a vast dominance in maritime space evidently leads to extreme importance and reliance of the fisheries sector. There is an estimated 120,000 fishers whose livelihoods directly depend on these marine resources. Another 180,000 people, predominately women, are indirectly linked to fisheries for employment in the processing, marketing, boat building, net making and other maritime related services (Haughton 2010). The Caribbean SSF sector is clearly a dynamic and diverse industry, operating at widely differing organizational levels from harvesting, processing and distribution. This multi-use and multi-user dimension needs to be properly understood in order to ensure that all resource user groups are included for formulating a sustainable data collection strategy.

This research study has broken down the complex Caribbean SSF sector into three key components: subsistence fishing, artisanal fishing, and recreational fishing. Subsistence fishing is conducted for one's own consumption and has no commercial transaction involved. Artisanal fishing involves small inshore vessels whose purpose is to catch fish with the intention of selling and engaging in various commercial transactions (Zeller 2007). Finally, the recreational fishing sector is one that does not constitute the individual's primary resource to meet basic nutritional needs and are not generally sold or otherwise traded on export, domestic or black markets (FAO 2012). All three components of the SSF, including all resource

users within, must be integrated for the thorough development of an informative baseline for policy makers.

In addition to the dynamic nature of SSF, the Caribbean region itself is known to be culturally, ecologically, geographically, institutionally, politically, socially and otherwise diverse and complex (Berkes 2003). There are currently 15 Member States scattered across the wider Caribbean region that make up the Caribbean Community (CARICOM). All of these states have their unique coastal communities, characterized by their social-ecological traditions. Due to this extreme diversity, there is a need to develop data collection plans that are created through a human-designed approach. This approach is one known as Human Capacity Development (HCD), which seeks to increase an individual's knowledge, skills, and attitudes while at the same time strengthening the network of individuals (FAO 1997). The link for effective communication between sectors is the individual human. Individuals contain the knowledge, the capacity, and the motivation to share the knowledge to better their marine resources. The human is adaptive for he/she is the first recipient of change, the first to be effected by negative outcomes of poorly managed stocks, and the first to enjoy the potential benefits of properly managed fisheries. Yet for this approach to be successful, it is crucial for all humans/marine resource users, to be elevated on an equalizing platform in order to enhance the multi-directional flow of knowledge sharing. This paper will describe how such an equalizing platform can be reached, and why human-centered designs are necessary in the wider Caribbean region in order to develop sustainable solutions to the data-scarce SSF sector.

## METHODS

This literary research analyzed the three main sectors of the fishing industry: Haiti's subsistence fisheries, Saint Lucia's commercial artisanal fisheries, and Belize's recreational fisheries. Haiti's subsistence fisheries sector was studied in order to understand the current capacity for development of an efficient value fish supply chain. The country of St. Lucia was the chosen case study for the second sector: small-scale artisanal fishing sector. Finally, the recreational fishing sector in Belize was chosen as for the third component of SSF. These three case studies were analyzed with special attention on the user groups. This focused analysis led to understanding which resource user groups were most influential in their given sector. By studying the human dimensions and a community's needs, this paper then started to formulate a human-centered design project.

The concept of the human-centered approach was further studied in light of Fisheries Training Programs (FTP). Various FTP from the United States, Europe, and Australia were researched and recommendations from each program were extracted. Interviews with fellows that attended the FTPs were conducted to further understand the benefits and potential drawbacks of such programs. With the collaborative effort of The Billfish Foundation (TBF), this paper was able to use TBF's networking capacity in order to reach out to various recreational fishermen and sport-fishing anglers. Interviews with active

sport fishermen in Caribbean, Atlantic, and Pacific waters were also conducted in order to understand the various user conflicts within all resource user groups, especially in regards to fishing around fish aggregating devices (FADs).

The purpose of this paper was to develop an innovative solution to the lack of fishery data in SSF within the Caribbean region. All transferable data studied in this research was then compiled into a matrix to address the purpose of this research. The matrix formulated can then be used to build capacity for the development of locally managed self-dependent fisheries.

## RESULTS

### Subsistence Fishing Sector

*Haiti - Building capacity for fish supply chain for subsistence fishing sector* — The Republic of Haiti was chosen as the primary case study for this section due to their extreme dependency on fisheries as a source of protein and food security. There are around 50,000 subsistence fishers whose livelihoods depend on over-exploited and poorly managed coastal fisheries resources (Felix 2012). Haiti currently does not have a value chain for their fisheries, nor does it have a system for the collection and analysis of fisheries data, monitoring, surveillance, and enforcement of fisheries regulations (Felix 2012). In order to create a national data collection system, Haiti needs to first establish basic organizational and institutional capacity, which requires the expertise and cooperation of all stakeholders in the fishery.

Capacity can be understood as *the ability of people, organizations and society as a whole to manage their affairs successfully* (Salas 2011). One of the objectives of this paper is to develop methods of creating capacity that will catalyze change in fisheries data collection plans in the Caribbean region. Priorities for specific projects depend on the fishing community's needs of the respective country. There are various fields of activity in a Haiti's fishery, ranging from production development to marketing infrastructure. For the fishermen to effectively and efficiently use cold-storage plants, transportation and distribution units, port infrastructure, and other marketing and production elements, training in these various areas of expertise need to become available. The various fields of activity are dependent on strong and sustained training programs adapted to the targeted beneficiaries, designed to ensure that all beneficiaries become stewards of the new infrastructure and equipment of the compact (Haiti Libre 2010).

In Haiti, the emphasis of the training programs should be placed on projects for artisanal fishing cooperatives, designed for purposes of increasing productivity, preliminary processing, and marketing of fish (Gossling 2003). Inefficient fisheries management, inadequate post-harvesting sector, and an unproductive fish marketing sector have all caused a low fish consumption due to the limited fish supply available to the domestic market (European Commission 2004). The lack of a successful fish supply chain is therefore the focal problem of Haiti's subsistence fisheries sector. The main target for Haiti is to

break the current cycle of poverty that is entrapping the fishermen, by transforming the subsistence sector into a small-scale fisheries value chain with modernized methods of harvesting, storing, and marketing fish. As Haiti's subsistence fishermen begin to add value to their marine resources, they will then be able to allocate more time in data-collection processes that will lead to their active participation in the sharing of data with the support of regional fisheries mechanisms such as Caribbean Regional Fisheries Mechanism (CRFM).

*Training Workshops Specific to Improving Marketing Efficiency* — GlobeFish and FISH INFONetwork, both units in the FAO Fisheries and Aquaculture Department, work to assist fishery sectors particularly in developing countries and countries in transition. FAO Globefish conducted two training courses in Angola and Mozambique to improve market efficiency for the small-scale fisheries sector. These marketing training workshops explained in detail sources of information and prices, explored trade opportunities, and helped set up connections to buyers in the region and markets beyond. This two-year project also offered technical assistance and training in all aspects of production, from catch to market, small-scale processors and traders. Despite facing various challenges in remote communities, such as the lack of processing infrastructure, most fishers and small-scale traders received training for the first time and became aware of the idea of negotiating the sale of their products (FAO 2005). The overall benefit from this project was the capacity building in the communities.

Capacity development programs will present impartial analysis on key issues, involve key stakeholders groups, organize workshops, field trips and exchange visits to encourage dialogue and a shared understanding of critical issues (Williams 2010). Conducting workshops and training programs will identify “champions” to lead and train their respective communities, thereby continuing the process of education and sharing of knowledge. Another project, conducted by *SmartFish*, focused on the Training of Trainers (ToT) method in order to incentivize local participants to take ownership and responsibility of these fisheries training programs.

The ToT approach undertook training of trainer's capacity building program for community trainers and key fisheries in twelve countries. Provided by *SmartFish*, the ToT approach was conducted in a learning-by-doing fashion where the community trainers were demonstrated facilitation, presentation, and training skills to bring back to their own community situation. By instilling confidence in the trainers in showing them how to conduct their own training in a setting with no access to training equipment or proper facilities, the trainees gained a realistic experience that can feasibly be applied on a local level.

The need of such ToT programs arises from the lack of resources and lack of motivation amongst extension agents in developing countries. Small-scale fishing sectors, such as the subsistence fisheries in Haiti, can no longer depend on the traditional government extension services to deliver training to their communities; yet knowledge and greater awareness can still be shared and needs to be communal. In

other areas, where government support is steady and dependable, fisheries training programs can look at other stakeholders for support in enhancing the integration of various user groups within the fishing sector.

### Artisanal/Small-scale Commercial Fisheries Sector

*St. Lucia* — Since 1972, St. Lucia's fishery has drastically evolved from a subsistence fishery based sector to a predominately artisanal small-scale commercial fishing sector. From the time when the Fisheries Incentives Act of 1972 was implemented, the government support has been enabled to provide incentives to fishers and fisher organizations (Edwin 2011). Such incentives include rebate on the cost of fuel through the participating Fishing Cooperatives Societies, where fishermen are now entitled to 4500 gallons per year of fuel purchased for fishing expeditions (Edwin 2011). Other incentives implemented to increase fishermen participation include duty free concessions on boats, engines, and various forms of fishing equipment. In addition to providing incentives to fishers, improvement in collaboration with major stakeholders has also enabled St. Lucia's SSF to grow in efficiency.

Even though St. Lucia's Department of Fisheries (DOF) has effectively grown over the past two decades, the methodology approach regarding data management and collection has lagged behind (Edwin 2011). Saint Lucia's data collection system initially relied on census-based surveys. From 1979 to 1981, all vessels returning from fishing trips were sampled each day in order to collect catch and effort data. The Statistical Unit and Ministry of Agriculture would then process and analyze the data received from the incoming vessels. It was then assumed that data collectors only reported 50% of the actual landings (DOF 2006). The responsibility for analyzing data was then transferred to the Fisheries Unit in 1981, which now based their assumptions on a 60% confidentiality estimate (CRFM 2010.)

This system of data collection and “assuming percentages of confidence” is not based on an individual incentive structure and is therefore not allowing the individuals of the fishery to become motivated in the data collection process. There is too much dependence on scientific consultants to analyze the data and not enough community based efforts to collect data. Qualitative data are more usable than explicit quantitative data (Prince 2013). Having a plethora of qualitative data that has been collected in simple methods by fishermen themselves will cover a wider area than precise, funded-based, scientific quantitative data sets. St. Lucia already has the local political support, organized fishing cooperatives, and a valuable fishery market chain in order to produce reliable data sets. Despite these assets, they are lacking a self-monitoring system to collect simple data that does not allocate a great deal of impost on the fishermen.

In creating such a data-collection plan, there needs to be a midpoint house between fishery independent data provided by scientific advisors, and fishery-dependent data that is derived directly from the fishery and provided by the fishermen themselves. To inform the fishers of the potential benefits that can come from a valuable data

collection plan, there needs to be an increase in outreach and education activities. These outreach and education goals should emphasize the need of simple and fisher-friendly management processes that have regulations that match how the fishery is prosecuted. Such programs should be ecosystem-based where fishers are considered part of the ecosystem and capacity is increased on the existing resources within the sector.

*United Nations University - Fisheries Training Program* — The United Nations University (UNU) offers a 6-month Fisheries Training Program (FTP) in Iceland that aims to strengthen the professional capacity of the attending participant to actively contribute to the work down in their respective fisheries and to recognize developmental potential in their home countries (Felix 2012). The fellows of the program, two of which come from the Caribbean each year, are trained in several courses in order to gain a holistic view of fisheries and be able to put their own fisheries into a regional perspective. Training includes courses in Fisheries Policy and Planning, Resource and Stock Assessment, Quality Management of Fish Handling and Processing, Fishing Technology, Sustainable Aquaculture, and Management of Fisheries. After taking all six of these 6-week based courses, the fellows then create a project proposal that must address important issues in fellow's home country. This research paper looked at one of these final projects in detail and conducted an interview with the respective UNU-FTP fellow.

Yvonne Edwin, a current employee of the Department of Fisheries in Saint Lucia, attended the 6-month FTP at UNU where she completed her final project on the *Fisheries Data Collection System in Saint Lucia*. The information that she collected for her project was used in this research paper in order to comprehend the dimensions within the SSF sector in Saint Lucia. Not only was the paper informative, but it also reflected a tremendous amount of local knowledge rarely seen in many research papers. During the interview with Yvonne Edwin, she mentioned the various benefits that the UNU FTP training program provided her and her local community. By meeting a diverse group of new people, fisheries experts from around the world, and learning from their data collection methods, she was able to bring a tremendous amount of information back to her Fisheries Department in Saint Lucia. She learned from experts, who had knowledge far beyond her own, and able to work one-on-one with these experts as she formulated her final project. As part of her graduation from the UNU-FTP program, Yvonne Edwin was also expected to conduct a mission report in her local community. This report had to explain in detail how the fellow plans on using the knowledge they gained back into their local community. Part of using the knowledge requires the teaching of their new acquired skills to other fisheries officers, fishermen, or any other resource users in their community. In this way, as Yvonne Edwin said, "The knowledge is not lost, and you have the opportunity to impact your community and strengthen capacity in the future." (Personal interview, 2014).

Not only was Yvonne Edwin able to reflect the work and knowledge gained during her time at UNU, but she

also presented her views by shedding new light on her community. She believes that if more people are trained, you strengthen the capacity of the policy makers, from data managers to scientists. Another recommendation that she believes could be beneficial to fishing communities is to have a multi-directional flow of information, and have the scientists from Iceland come to the respective fellow's community. In this method, more people can benefit from the knowledge being shared at a lower cost.

## Recreational Fisheries Sector

*Belize - Linking Fisher Knowledge with Recreational Anglers* — In order to connect the entire SSF industry in the Caribbean region, there is one more vital component that needs to be analyzed – the recreational fishing sector of SSF. Recreational fisheries exist in developed countries as a pastime and in underdeveloped countries as a tourist attraction (FAO 2012). The Caribbean has developed a tourism industry of "big game" fishing as part of the recreational fishing portfolio. The large pelagics, such as tunas, marlins, and swordfish provide a particular exotic sporting image and are the main target species for recreational anglers - a growing tourism industry especially in Belize (Gillet 2003). These offshore species though are also the main target for the market of longline fisheries (Gray 2010). In order to develop an efficient data collection method for pelagic species, there needs to be active collaborative participation with the various user groups targeting these highly migratory species (HMS). The Caribbean countries of Belize and Grenada were used as case studies to demonstrate areas where lack of stakeholder involvement leads to inefficient information systems. Yet both of these countries have tremendous potential of using their available human capacity and expert fisher knowledge to improve their fisheries data.

Belize has become one of the most popular recreational fishing destinations, especially for the lucrative catch-and-release fishing activity. It has been estimated that in 2007 alone, the recreational fisheries sector of Belize contributed USD\$58.3 million in direct, indirect, and induced effects on the gross domestic product of Belize (Hayes 1986). In addition of the economic contribution to the national and local economies, the recreational fisheries sector has provided 1,864 full-time jobs, employing more than 100 fishers as independent fishing tour guides (Fedler 2007). Despite all these social and economic benefits, there is very little local effort from the government of Belize to invest in research in order to understand the biological, ecological, and economic aspects of recreational fisheries (Guillet 2003). Instead, the Belize Fisheries Department (BFD) has partnered up with various organizations, such as the Environmental Defense Fund (EDF) and the Sustainable Fisheries Initiative (SFI) in order to promote market-based incentives to align fishermen's economic interest with conservation outcomes (Gregussen 2001). These adaptive management approaches, which include methods such as individual transferable quotas (ITQs) and territorial user rights fisheries (TURFs) have led to efficient feedback mechanisms for collection and analysis of catch data from licensed fishers in Belize's market-based SFF sector. These

impressive improvements in data collection and multiple-resource user participation are admirable for the market based fisheries sector, but it still does not solve the missing gap of fisheries information from the recreational sector. Since the majority of the government support is allocated towards the value chain of SSF, the recreational fisheries sector needs to depend on another strategy to collect data.

In fishing sectors such as Belize, the focus area of training should be on developing the capacity for the multi-species and multi-purpose fishery sector to share resources through training of improved conflict-resolution mechanisms between alternative uses and users. The goal of such training workshops will be to develop an appropriate multidisciplinary research to identify methods of integrating the various fishery sectors. Incorporating the incentives and needs of all user groups will lead to socially optimal utilization of the marine resources. Interaction between various stakeholders through acquired adaptive management skills will enhance the synergies and links between the sectors. Workshops will need to focus on integrated coastal areas management on an ecosystem-based management approach. Fisheries in these sectors have the possibility to flourish, yet in a competitive environment with various incentives and needs, this success depends on the socio-economic potential compared to other alternative uses of marine space. In understanding this complex competitive nature of fisheries, training workshops will offer practical ways of mobilizing participation and facilitating negotiation among stakeholders.

A grass-root fisher knowledge expert system, based on approachable ideologies of apprenticeships, mentorship, and information sharing, is now implemented in the Regional Workshop for the Fisherfolk Leaders Action Learning Group, a project funded by CRFM. This workshop's goal is to help build capacity of commercial fishermen, as well as recreational fishermen to participate in fisheries management and governance. By integrating fisheries development and management into broad-based frameworks, various stakeholder groups will be able to share the marine resources, space, and political support instead of competing in user-conflict issues. This type of approach will therefore also enable recreational fishermen to participate in this collaborative data collection method.

## DISCUSSION

### Understanding the Various Resource Users and their Specific Needs

To ensure sustainability and effectiveness, human capital development must be made a core function of any organization, through capacity development of youth, specific leadership training, business, and administrative capacities (FAO 2014).

By integrating the local fishing community's socio-cultural values and traditions, fishermen will have self-determination to advocate for the sustainable exploitation of their marine resources. Such processes need to be allowed sufficient time to gather all relevant information from all participating resource user groups. This type of methodology is in line with the human rights approach, which emphasizes that it is not charitable act to include all

user groups- it is simply their right to be recognized and included in collective participation to successfully break the vicious cycle of SSF.

In fully combining all three SSF populations, the synchronization of data is then fused together in order to create links for optimum communication of vital information in all resource user groups. By connecting all relevant stakeholders, fisheries data can be easily accessible by all sectors and thus become a valuable and predictable baseline for policy makers. Predictability is an essential concept to achieve in order to attract investors and businesses in SSF sectors. By providing a reliable source of information, through the manifestation of an effective fisheries management plan, all three sectors of SSF will be able to benefit from the sustainable use of the oceans.

The situation of fisheries sectors across the Caribbean is extremely variable, and thus appropriate research on numerous island nations must be conducted in order to properly assess the situation as a regional mechanism. Some CARICOM members may have to focus on building capacity for the implementation of storage facilities, preservation of catches, and accessibility to large quantities of ice; while others may benefit more from the development of fish aggregating devices (FAD) in order to improve the capacity of fishermen. In all cases though, building capacity for the development of an interconnected fisheries data collection method will lead to greater opportunities and growth of the CARICOM fishery sector. Data collection plans do not need to be uniform throughout the various Caribbean island nations, but a network that connects all data collection efforts needs to be in place in order to provide dependent fisheries information for the implementation of sound decision-making policies.

Another recommendation is to provide practical training directly aimed at the fishermen as the primary audience. Case studies show that the fishermen need to be incentivized in order for them to influence their fishing community. By providing practical training on simple data collection plans, fixing a boat engine, or building a legal sized fishing net, the fishermen can gain a skill, which they can then provide to their community. Capacity building is a process towards empowerment, and by empowering the individual with knowledge, you are creating an endurable incentive for him/or her to collaborate with one another and share information on an equalizing platform. By using the existing resources of a local community, such as students from local universities, fishermen from local fishing cooperatives, fish-harvesters and traders from local restaurants and fish-markets, the entire industry can then become involved in the science and data collection process. Integrated solutions, where fishermen are considered part of the ecosystem, will yield to better data collection models that reflect all the knowledge within a fishing community.

Participating user groups must adopt an integrated vision of what a successfully managed fishing industry would resemble (FAO Satia 2005). This vision needs to be shared within all critical stakeholders: resource users within all three branches of SSF, the harvest sector, post and pre harvest sector, and local governance including policy makers and regional consultants. Once this vision is created, shared, and fully understood by all resource user

groups, managers can then implement adaptive management approaches and tools that can tolerate the dynamic nature of fisheries. In creating an efficient FMP, a thorough understanding of how fishermen cope individually, and collectively as a fishing community/cooperative, is necessary in order to secure the wellbeing and livelihoods of SSF dependent societies. In order to include all resource users in this FMP, it is also necessary to understand which institutional mechanisms will enable an adaptive methodology for coping with resource depletion crisis.

## CONCLUSION

### Participation Through Training

The approach of training workshops relies on the concept of decentralizing knowledge in order to form cognitively diverse collaborations for managing natural resources. These methods of sensitizing all resource users belonging to a variety of stakeholder groups will lead to a designed serendipity. By cultivating the skills from people, on a diverse scope, this approach can lead to a dynamic division of labor. Time and effort needs to be allocated into building a platform that relinquishes control to local entities, reducing conditional demands on funding agreements and for all resource user groups to become aware and accepting of alternative models.

Through the research conducted in this paper, it has become apparent that data collection plans need to be focalized on the specific region of implementation. Each small Caribbean island nation have their own specific fisheries management issues and therefore need to create a fisheries management plan that is specific to their needs. In order to construct such FMPs that include efficient data collection method plans, this paper recommends the effective use of local resources and local scientists. By having local fisheries specialists analyze their own marine resources, the individual communities will be empowered to manage their fisheries stocks and become their own advocate.

Local fisheries scientists, fisheries managers, and other relative resource user groups should be given more opportunities to join Fisheries Training Programs, such as the ones provided by Florida Sea Grant and the UNU, in order to incorporate and embed the knowledge from international successful fisheries into their own community. The host universities must also understand that this exchange is based on a multi-directional flow of information, and they too need to learn from the local fisheries experts attending their university. A further recommendation for fisheries training programs is for them to spend the same amount of time in the respective island nation of the local fisheries expert in order to conduct a true “exchange” program. The transcending information from both fisheries expert will undoubtedly enrich both fishing sectors and enhance the formation of links between different environmental, cultural, and economic boundaries.

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**Figure 1.** Establishment of training courses relevant to commercial based sectors' needs

Category	Indicators	Type of Training Course Needed	Inputs for Training	Goals of Training
Commercial SSF Sector	<ul style="list-style-type: none"> <li>-Lack of biological data for stock assessment use</li> <li>-Lack of consistency in data collection and analysis throughout different landing sites</li> <li>-Inefficient methods of reviewing and validating catch and effort data collected at fish landing sites</li> <li>-Financial and manpower constraints limiting ability to assess and monitor the majority of fish populations</li> <li>-Lack of collaboration between major stakeholders in the sector for better data collection</li> </ul>	<ul style="list-style-type: none"> <li>-Training that aims to build skills and capacities from the local programs already in existence</li> <li>-Training in increasing the capacity of local employees by providing management training programs and apprenticeships</li> <li>-Training in long-term strategy to invest in local educational institutions that will develop local talent and skills that are aligned with the current available human knowledge and organizations</li> </ul>	<ul style="list-style-type: none"> <li>-Establish and improve local, regional, and national networking within all resource users and stakeholders</li> <li>-Strengthen data collection mechanism at landing sites</li> <li>-Maintain strong liaison with existing programs</li> <li>-Create system of discussing management issues and research findings to improve flow of information and feed back among the stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>-Strengthen the capacity of the data unit staff to carry out analysis in a more methodological and systematic way</li> <li>-Provide level of framework for implementing policies and changes for the management of fishery</li> <li>-Provide various feedback mechanisms to revise inaccurate information in order to ensure quality of data</li> </ul>

**Figure 2.** Establishment of training courses relevant to recreational sectors' needs

Category	Indicators	Type of Training Course Needed	Inputs for Training	Goals of Training
Recreation Fishing SSF Sector	<ul style="list-style-type: none"> <li>-Management of recreational fishery not recognized by governmental fishery managers</li> <li>-Unclear allocation of licenses and fee collections for recreational fishermen</li> <li>-User conflicts between market-based SSF and recreational SSF</li> <li>-Inadequate data collection methods for recreational fishing activities</li> <li>-Wide range within the typology of users amongst recreational fisheries/unclear definition of recreational fishing gear and activities within sector</li> <li>-Limited integration of local management practices and local stakeholder's knowledge with recreational fisheries tourism</li> <li>-Limited local government support for data collection of catch and effort information within recreational fisheries</li> </ul>	<ul style="list-style-type: none"> <li>-Training focuses on creating links between fisher knowledge of local fishermen and recreational anglers</li> <li>-Training of mentors workshop aimed at enhancing another persons growth, knowledge and skills</li> <li>-Training and workshops aimed on building from current knowledge</li> <li>-Training will focus on conceptualizing technological and ecological knowledge from fishers into information used for decision-making processes</li> <li>-Training workshops will use the adaptive fisher expert system of collection data to develop collection systems based from local fishermen knowledge</li> </ul>	<ul style="list-style-type: none"> <li>-Establishment of partnerships with various agencies in order to identify initiatives and establish synergies</li> <li>-Establish synergies through the development of working groups, each comprised of a representative from the respective agency</li> <li>-Increase use of media, press releases, short documentaries, interviews with fisherfolk and recreational anglers to advocate for greater links between various user groups</li> <li>-Application of videos, exchanges, sharing of case studies as means for fisherfolk from the Caribbean to learn from other co-management options between fisheries and tourism-lessons from the Pacific networking</li> <li>-Greater use of local universities to facilitate exchanges with fisher folk from other countries</li> </ul>	<ul style="list-style-type: none"> <li>-Improved data collection system in pelagic fisheries by using all available resource user groups and enhancing human capital in using the local expertise and existent knowledge as a baseline</li> <li>-Actively sharing practical knowledge and experience amongst recreational fishermen and market-based SSF</li> <li>-Increased communication between fisheries cooperatives and recreational fisheries sectors</li> <li>-Application of exchange programs by using local university networking and capacity</li> <li>-Empowering participants to share practical knowledge and engage in decision-making processes</li> <li>-Successfully gather new perspectives by including all resource user groups to solve major constraints</li> </ul>

**Figure 3.** Establishment of training courses relevant to subsistence sectors' needs

Category	Indicators	Type of Training Course Needed	Inputs for Training	Goals of Training
Subsistence Fishing SSF Sector	<ul style="list-style-type: none"> <li>-Inefficient fish marketing-lack of organizational structure</li> <li>-No current assessment or extremely limited data collection plans of marine resources</li> <li>-Limited organizational capacity, limited fishing cooperatives, lack of designated fish landing sites</li> <li>-Lack of political stability and limited government support</li> <li>-Limited/no distribution chain</li> <li>-Inefficient middleman/manipulate fisheries and fish prices/ Inefficient marketing channels</li> <li>-Inefficient fish handling/processing/preservation</li> <li>-No storage facilities, no ice making plant, no industrial processing</li> <li>-Low fish consumption leading to low domestic fish supply</li> <li>-Insufficient fish supply not meeting high demand and leading to low food security</li> <li>-Unregulated boat making Inadequate fishermen license system</li> <li>-Lack of incentives for fishermen to contribute to data collection</li> </ul>	<ul style="list-style-type: none"> <li>-Training in Creating Value Chain for Fisheries and strengthening fishers associations</li> <li>-Training of basic hygiene, fish handling and preservation, packing</li> <li>-Training in theoretical sessions with AND physical training practice involving exchange visits between communities in the same project area of training</li> <li>-Technical training with mentoring component for local fishermen that includes coaching, exposure to best practices of value supply chains through field visits of successful marketing sectors</li> <li>-Training must have a strong component for non-skilled and unemployed fishers in order to enable them to gain pre-entry skills and prepare for employment opportunities</li> </ul>	<ul style="list-style-type: none"> <li>-Financial resources, funding for workshops, training and fieldwork</li> <li>-Access to credit for investment in fishing boats, motors and equipment</li> <li>-Improve access to markets through construction/improvement of road and market-related infrastructure</li> <li>-Investments by private value chain drivers (larger processors, traders, transporters)</li> <li>-Establishment of adequate fish landing facilities at designated strategic landing sites</li> <li>-Establishment of training courses relevant to community's needs</li> <li>-Participation in training programs, short courses, and workshops</li> <li>-Establishment and implementation of staff development programs for managers and researchers</li> <li>-Trained support staff and extension service (quality inspectors, fisheries managers, scientists)</li> <li>-Training must be aligned with local government development plans and must use a strategy that is understood by all relevant stakeholders</li> <li>-Establish local technical training center to deliver training for specific skill sets needed by fishermen</li> </ul>	<ul style="list-style-type: none"> <li>- Increase sectors' ability and capacity to develop employment within sector</li> <li>-Improve food security by increasing value of fish products, thereby reducing poverty</li> <li>-Improve development of modern methods of processing and preservation of fish products</li> <li>- Increase remuneration through higher value of catch</li> <li>- Outcome will be more productive local workforce and a decentralized cognitive knowledge field that enhances the division of labor amongst the available human capital</li> </ul>