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**PROMOTING REGIONAL TRADE AND AGRIBUSINESS
DEVELOPMENT IN THE CARIBBEAN**

**CASE STUDIES ON LINKING FISHERIES TO
TOURISM-RELATED MARKETS**



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PROMOTING REGIONAL TRADE AND AGRIBUSINESS DEVELOPMENT IN THE CARIBBEAN

CASE STUDIES ON LINKING FISHERIES TO TOURISM-RELATED MARKETS

Preparation of Report

The 4 Case Studies that form the core of this report were prepared by consultants from Antigua and Barbuda (Ian Horsford), Barbados (Iris Monnereau), Belize (Vincent Gillett), and Grenada (James Finlay) under contract to the Caribbean Regional Fisheries Mechanism (CRFM) Secretariat. The report also benefited from an Expert Working Group meeting that met in Barbados, 17 - 18 March 2016, to review and provide comments to facilitate completion of the Case Studies. The Working Group was comprised of the Consultants plus, Davina Layne, Caribbean Tourism Organisation (CTO); Patrick McConney, CERMES, UWI; Christopher Parker, Fisheries Division, Barbados; and Peter A. Murray and Milton Haughton, CRFM Secretariat.

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Chapter 1: Introduction

Milton Haughton

Most Caribbean ACP States are highly dependent on imported food and agricultural products with little added value, and as a consequence, are very susceptible to changes in world food prices, which may trend upwards as climate change exacerbate droughts and floods in the world's major agricultural producing regions. Food is imported to supply domestic needs as well as demands in the tourism sector. The food import bill of the 15 CARICOM States is more than US\$4 billion per year (LaRocque, 2011). This not only contributes significantly to the balance of payment deficit in the countries, but also creates a worrying dependency on imported foodstuff, increases the region's vulnerability to external economic shocks, and contributes to the under-development of the domestic food production sector, including agriculture, fisheries, aquaculture and agro-processing.

According to the CRFM statistics, total fish imports in the CARICOM States in 2014 was 68,038 metric tons valued at US\$270 million, while total fish exports amounted to 74,067 metric tons valued at US\$269 million. This underscores the importance of the sector as an important commodity exporter in terms of earnings, despite battling with the adverse impact of climate change and the global financial and economic crises in recent years.

Both subsistence and commercial fishing, including aquaculture can contribute significantly to the well-being of the people and the social and economic development of the CARIFORUM countries. The living marine resources of the Exclusive Economic Zones (EEZ) have provided a vital source of food, employment, foreign exchange earnings and social stability of coastal communities. Similarly, aquaculture also offers an avenue for increasing local fish production to improve food security and reduce dependency on imported fish and seafood in response to growing demand from the tourism sector.

Tourism is the main pillar of the economy in most Caribbean States. The region is often described as "the most tourism-dependent region in the world". There were approximately 25 million visitors contributing \$49 billion or 14% of the region's gross domestic product in 2013 (Turner, 2014). Strengthening the linkages between fisheries and tourism can catalyse and add value to the socio-economic benefits each sector contributes to sustainable development in the countries. This is consistent with the development objectives enunciated in regional policy instruments such as the CARICOM Strategic Plan (2014 – 2019); the Caribbean Community Common Fisheries Policy, the Second CRFM Strategic Plan (2013 – 2021) (CRFM, 2013), the CARICOM Regional Food and Nutrition Security Policy (CARICOM, 2010), and the Caribbean Sustainable Tourism Policy Framework (CTO, 2009). Promoting sustainability in the fisheries sector also mitigates any threats of exploitation of the sector by illegal, unreported and unregulated (IUU) fishing, especially in relation to inshore coastal fisheries, which play a vital role in rural coastal economies. In this regard, reformation and revitalisation of the fishing sector can reinforce the linkages with the tourism sector, while also prioritising conservation and sustainable use of biodiversity in the coastal and marine environment. Increased utilization of locally produced fish and fishery products by the tourism sector would, therefore, also contribute to the saving of foreign currency, improvement in balance of payment deficit, and reduced the region's vulnerability to rising food prices and other forms of external economic shocks.

Conflict between Fisheries and Tourism

Conflict is a part of life in modern society and not surprisingly, is an ever present challenge between fisheries and tourism in the Caribbean region. The Merriam-Webster dictionary defines conflict as "a struggle for power, property, etc.; strong disagreement between people, groups, etc., that results in often

angry argument; a difference that prevents agreement.” Conflict between fisheries and tourism arise because of competition over the usage of the limited coastal resources on which both depend, and also as a consequence of the rapid social, economic and environmental changes that have taken place and are still taking place in the countries. Stakeholders in the fisheries and tourism sectors are often pursuing goals, which are incompatible with each other, and there are inadequate frameworks or mechanisms in place to facilitate cooperation, regulate and balance the interests of the two sectors, thus ensuring equitable benefits and win-win outcomes to operators in both sectors.

In the past, fishing was the primary economic activity in most coastal communities across the Caribbean region. The beaches, sea grass beds, mangroves, coral reefs and even the pelagic fishing spots in the coastal areas were almost the exclusive domain of local fishers, who used these natural assets to: store their boats and equipment, set and operate their gears, market their catch, and socialize and relax with friends and families between fishing trips. Fishing was the main source of employment, income, food and economic activity in the community. Fishermen, particularly the more successful ones, were the community leaders and decision-makers. This situation has changed dramatically, with the rapid development of coastal tourism, which has not only transformed the coastal landscape and architecture, but also the balance of power, distributions of wealth, quality of the environment, and state of the coastal resources.

Although some fishers have benefited from the growth of tourism in their communities mainly through their involvement in sports fishing, tour guiding and improved prices for their catch, the general impact appears to be one of marginalization due to their lack of capacity, resources and organizational skills to negotiate and compete with the powerful tourism brokers. While economically they may not be any worse off than they use to be before the arrival of tourism, their relative standing has been substantially eroded as a consequence of the new class of educated and refined business owners and professionals connected with tourism. In most cases the fishers have not been able to take advantage of the potential opportunities created by the growth of tourism either due to their limited access to investment capital, lack of skills training and limited access to and capacity to harness and apply scientific and marketing knowledge and technology, and lack of organization to represent their interests and articulate their concerns.

As tourism developed over the past 40 years, fishers have witnessed substantial reduction in the areas (landing sites) from which they can operate, access to beach front property, and fishing grounds on which they are permitted to operate. Beach front properties are being taken over and used for hotels and other infrastructure development including the construction of mariners, restaurants, and water sports facilities to accommodate tourism development. Some of their traditional fishing techniques are considered offensive to tourist, and in some cases significant parts of their most productive fishing grounds have been set aside as marine parks or protected areas which are accessible for non-extractive tourist activities but not for fishing, or very restrictive types of fishing only. Fishers also constantly complain about the growing pollution problem, degradation of the coastal and marine habitat such as coral reefs, reduction in fish populations and fish catches, arising partly or wholly from tourism developments and related activities and developments in the coastal zone. Tourism interests on the other hand tend to blame the fishers and over-fishing for the growing environmental degradation and decline of the coastal ecosystems and fish stocks in the coastal waters.

The core problem is that much of the changes have occurred with little discussion or real effort by planners, stakeholders or policy-makers at regional, national or local levels to create win-win outcomes by strengthening cooperation and linkages between fisheries and tourism. Within the Caribbean, fishers, until recently, have generally been unable to participate meaningfully in the process of reallocation of access rights to beaches and other natural resources in the coastal environment or to take advantages of new economic opportunities associated with the growth of tourism. This is largely because they are individualistic, fragmented and not well organized. Although fishers have occupied and operated from

some specific beaches for many decades, they usually do not have titles to these areas, which are crown lands, to be disposed of, or reallocated by the government at its will. If an area occupied by fishers is identified for tourism development the normal course of action is to advise the fishers that they need to relocate to another area. They usually have no input in deciding where they go, and they are not normally compensated in any other way.

From the foregoing, it should be clear that the links between fisheries and tourism are not very strong and need to be further supported and reinforced to create economic opportunities for stakeholders, reduce food import bill and foreign exchange outflows, which will benefit coastal and rural communities and enhance sustainable development of the countries.

Opportunities for Cooperation and Value Addition

Development of fisheries and tourism has been pursued separately in the region. National and regional sectoral policies and institutions have not been geared toward fostering positive linkages and cooperation between the sectors, and those linkages that exist have not been well documented or promoted to optimize economic benefits to local stakeholders and communities.

Tourism establishments such as hotels, lodges, and restaurants require reliable supply of high quality food for their clients. Often the food purchasing bills of a tourism service provider is large in the context of the local economy, but much of this food is imported with relatively little sourced from local farmers or fishers. The challenges of increasing inter-sectoral linkages are numerous and include the mismatch between supply and demand and the lack of intermediary support structures that enable suppliers (fishers and sales agents) and buyers from the tourism sector to come together to better understand each other needs, and work together to satisfy the requirements of the market. Although the challenges of increasing the content of locally produced fish and seafood in tourism related establishments are considerable, yet if they can be addressed in ways that meet commercial needs and customer satisfaction, then these industries can significantly increase their contribution to local economic development.

The common problems of sourcing fish and fishery products locally are well known. They include, *inter alia*, inadequate quality and assurance of food safety, reliability of supply or volume of produce, inadequate product form, which are all exacerbated by poor transport and lack of communication and timely information sharing between supplier and purchaser. To service the tourist markets, local fishers and processors will therefore need to find profitable and competitive ways to meet the tourism industry's requirements and standards for volume, quality, form of the product, regularity, traceability and safety requirements. It is necessary, therefore, for fishers and seafood suppliers to better understand the markets, and adapt their product offerings to the specific needs and expectations of the markets, and therefore to derive optimum value from their production.

The ability of local fish and seafood systems to meet these requirements will be dependent both on supply factors (natural resource base, fish systems in place, processing and marketing capacity) and the kind of tourism development (mass tourism, high end niche, eco-tourism, branded product, certification etc). Additionally, the exposure of tourists to specific local products could also help to create a unique local experience as well as improve export market penetration when such visitors help build domestic demand upon their return home. A further consideration for demand for local fish and aquaculture products is the seasonality of visitor arrivals which implies that demand will vary over the year.

In the Caribbean the potential for significantly increasing catches of many traditional marine species is limited due to concerns over long-term resource sustainability. For this reason, processes designed to add value to existing catches would appear to be one of the credible options available to stakeholders to improve their economic situation. The strategy of diversification and pursuing marketing measures aimed at adding

value to local products in order to meet current and future market trends is already being actively considered by several states.

Marketing measures such as branding, certification and labeling of local and regionally produced fish and seafood offer significant potential for value addition. Branding is the process of creating and disseminating the brand name of a given fisheries product, country, region or company via advertising or other marketing campaigns – can boost Caribbean fisheries products both for local consumption and export. Through branding locals and tourists become more aware of Caribbean fisheries products, can contribute to sustainability and increase their revenue.

Certification is a process that can bring significant added value to a product and boost the products image and marketability. From the initial steps of the formal application for a fishery to be assessed against a certain standard by the certification client, to the assessment by the competent and recognized body, fisheries products can attain vital accreditation. This accreditation acts as an assurance from the accrediting body that the product, process and service conforms to agreed requirements and has been inspected along the production chain (based on ISO Guide and Principles for Food Import and Export certification for example). This not only boosts a products image, but certifies its quality.

Certification in the fisheries industry involves the establishment of voluntary or mandatory standards, often backed by a public or private sector instrument or institution, in order to provide consumer guarantee that certain pre-specified standards have been met for a specific product.

Labeling, including eco-labeling, additionally increases product value by certifying the given product with a distinctive logo or statement confirming that the product complies with conservation and sustainability standards, amongst others. This also involves the consumer who can make the choice to support, promote and sustain certain labels over others. This can also contribute to efforts to combat IUU. Certifications vary from the most stringent to the most flexible, and including initiatives such as organic labeling, fair trade or equitable labeling and other such schemes.

Eco-labeling (for niche markets in which a premium price is paid for ‘green’ products) presents an opportunity for some producers to add value to existing products, expand reach in existing markets, or maintain market share in a competitive environment through product differentiation and therefore provide these processors / exporters with potential to enhance their sales and earnings.

The opportunities for strengthening linkages are not confined to improving the consumption of locally produce fish and seafood in the catering sector. There are a variety of non-consumptive ways in which the fish and other living marine resources and biodiversity in the marine environment may be utilized to enhance linkages between the sectors to create new economic opportunities.

Case Studies Linking Fisheries and Tourism

This report consists of four case studies from different Caribbean States, examining ways of improving the linkages between fisheries and tourism to create economic opportunities for operators in the sectors as well as contribute to economic performance of the countries. The studies have been done in Antigua and Barbuda, Barbados, Belize, and Grenada

The documentation of these successful Caribbean experiences serves to enrich the exchange of knowledge amongst actors and contribute positively to economic growth and sustainable livelihoods through the promotion of stronger linkages between the fisheries (including aquaculture) and tourism sectors in the region.

The general objective of the case studies is to document successful business relationships between fish producers and fish processing businesses on the one hand, and tourism industry enterprises in the Caribbean on the other hand, in support of economic diversification, value addition, sustainable regional trade and employment creation.

The studies therefore explore existing linkages between fishing and tourism industries from different states and perspectives, analyzing key drivers of success and key limitations. They seek to identify good practices and the key innovations in building “win-win” market relationships amongst fishermen and fish-farmers, processors and entrepreneurs with the hotel / restaurant / foodservice sector at national and regional levels which increase local sourcing and value addition; and suggest key institutional and policy bottlenecks that need to be addressed in order to upscale benefits of business development between the fisheries and tourism sectors.

The report concludes with specific recommendations for enhancing linkages between fisheries and tourism in the region for the benefit of stakeholders in both sectors and the sustainable development of the countries. These recommendations will contribute to the achievement of Strategic Objective D of the Second CRFM Strategic Plan, 2013 -2021, and two of the core objectives of the Caribbean Community Common Fisheries Policy, that is, promoting the sustainable development of fishing and aquaculture industries in the Caribbean region as a means of, *inter alia*, increasing trade and export earnings, protecting food and nutrition security, assuring supply to Caribbean markets and improving income and employment opportunities; and improving the welfare and livelihoods of fishers and fishing communities.

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Chapter 2: Case Study 1 – Antigua and Barbuda

Linking Fisheries to Tourism-Related Markets: Antigua and Barbuda

Ian S. Horsford

Introduction

Fisheries Sector

Over the past fifty years, the small-scale fisheries of Antigua and Barbuda have undergone significant modernisation. Most of the traditional sloops and dories that dominated the sector in the 1970s have been gradually replaced by modern fibreglass launches and pirogues (Figure 1), equipped with the latest fishing technology (global positioning systems, depth sounder, hydraulic haulers, etc.). While there have been significant changes in terms of vessel construction and fishing technology, traps used to target the Caribbean spiny lobster (*Panulirus argus*), reef fishes and deep water snappers (*Lutjanidae*) and groupers (*Serranidae*) remain the dominant gear (Figure 2). Typical investment (including vessel, gear and fishing equipment) ranges from US\$16,000 for a 22-foot fibreglass pirogue to US\$78,000 for a 38-foot fibreglass launch (Horsford, 2007).

In 2014, there were 939 active fishers in Antigua and Barbuda, which is at least 1% of the national labour force. An addition 30 individuals were employed in an underdeveloped processing sector; high-energy costs associated with processing and inadequate access to capital have curtailed the development of this area. In terms of employment levels, values should be taken as conservative estimates since the fisheries sector acts as a “safety-net” for other economic activities



Figure 1. Traditional (left) and modern (right) trap-fishing launches (Photo: Ian Horsford).



Figure 2. Steel-framed arrowhead traps (Photo: Ian Horsford).

(Horsford, 2006). In other words, when there is a downturn in economic activity in tourism and construction, individuals re-enter or increase their activity in the fisheries sector.

Fisheries production for Antigua and Barbuda in 2014 was 3,114 metric tons (live weight) and valued at US\$12.78 million (based on ex-vessel prices). The spiny lobster, being one of the most valuable resources contributed to 15% of the value of production. Over the past decade the fisheries sector on average has contributed to about 50% of the agricultural gross value added or 1% of the gross value added (in current prices) to the national economy (Eastern Caribbean Central Bank, 2011).

Tourism Sector

Antigua and Barbuda was the first Member State of the Eastern Caribbean Currency Union to make the transition from traditional agricultural product (e.g., sugar) to a tourism-based economy starting in the late 1970s. Throughout the 1980s, Antigua and Barbuda fostering an economic development strategy that focused on exploiting the country's main natural resources – “sun, sand, and sea” – through the development of tourism infrastructure such as hotels, seaports (Figure 3), and international airport. This strategy saw a “booming” tourism sector in the 1980s, with



Figure 3. Cruiseline at St. John's Harbour (Photo: Ian Horsford).

gross domestic product growth averaged 6.8% (International Monetary Fund, 2006); growth then slowed to 3.4% (1990 to 2004) as tourism receipts declined due to increase competition both from within the Eastern Caribbean Currency Union and outside (e.g., new “players” such as Cuba and the Dominican Republic).

In recent times, the tourism sector has been struggling with tourist arrivals still over 5% below pre-global financial crisis (2008) levels and real gross domestic product was 14% lower (International Monetary Fund, 2015). Despite the negatives, there are signs of a modest recovery with stayover arrivals up 7.7% during the first half of 2014 and the 2013 winter tourist season was the most successful since 2009 (International Monetary Fund, 2015). Tourism is the mainstay of Antigua and Barbuda's economy and is the primary sector in terms of generating foreign exchange and providing employment. The World Travel and Tourism Council (2014) estimated that direct contribution of the tourism sector to the total gross domestic product was 16.4% in 2013 and indirect contribution from related sectors (including transportation) accounted for 46.5%.

General Linkages between Fisheries and Tourism

In Antigua and Barbuda there are many fisheries related enterprises whose business models are based mainly or partially on providing goods and services to the tourism sector. Some examples include:

- the demersal capture fisheries for snappers (*Lutjanidae*), groupers (*Serranidae*), spiny lobster (*Panulirus argus*) and queen conch (*Strombus gigas*); these high-value species are primarily marketed to domestic hotels and restaurants or exported to satisfy tourism demand in neighbouring countries.
- the capture fisheries for the large pelagics – tunas (*Scombridae*), dolphinfish (*Coryphaena hippurus*), Wahoo (*Acanthocybium solandri*), billfishes (*Istiophoridae*), and swordfish (*Xiphias gladius*); which provide food and recreational services (e.g., sport fishing charters and tournaments) for tourists. The Antigua and Barbuda Sport Fishing Association sponsors at least three sport fishing tournaments annually, including an international billfish tournament which attracts about 30 to 40 vessels from neighbouring islands (Figure 4).
- the Annual Seafood Festival; started by the Fisheries Division and fisher folks from the villages of Urlings and Old Road, has become a regular fixture for locals and tourists interested in authentic local seafood (Figure 5).
- the emerging fishery for diamondback squid (*Thysanoteuthis rhombus*) is expanding the culinary delights for the tourism market.



Figure 4. Near record catch at the 2015 Annual Sport Fishing Tournament (Photo: Antigua and Barbuda Sport Fishing Association).

In terms of institutional arrangement between fisheries and tourism, with respect to planning and development, policy makers recognise that greater inter-sectoral collaboration is required to strengthen linkages. Hence, in 2010, a senior technician from the Ministry of Agriculture was assigned to the Community Tourism Department of the Ministry of Tourism to focus on expanding opportunities amongst sectors (including cultural industries).

Methodology

The case studies presented in this paper were developed from desk studies and interactions with key informants (owners, managers, supervisors, workers, etc.) as well as informal interviews with consumers of the various goods and / or services to facilitate



Figure 5. Urlings Seafood Festival (Photo: Antigua & Barbuda Food and Drink Guide).

validation of the information provided. In terms of the scope of the research, a “microeconomic perspective” was adopted with respect to assessing the linkages between fisheries and tourism; hence, case studies were limited to a specific business or a group of businesses as oppose to a sector-wise analysis. Based on the diverse ecosystem services provided by fisheries resources, case studies were selected from the consumptive and non-consumptive fisheries subsectors. Non-consumptive use included activities that did not diminish fisheries resources(e.g., eco-tourism or nature tours, recreational diving, catch and release sport fishing based on artificial lures) whilst consumptive use included aquaculture production, sport fishing where fish is landed or utilise natural bait (e.g., fish, squid), commercial capture fisheries and related activities (fish processing, trading, etc.). Note at first glance it may appear easy to distinguish between consumptive and non-consumptive use, however certain non-consumptive activities may indirectly diminish fisheries resources by damaging habitat or negatively affecting animal welfare or behaviour. For example, observing fish spawning aggregations and nesting turtles at too close a range can reduce spawning activity and discourage nesting.

In terms of a quantitative approach, the following data sets were used to explore the nature of the relationship between fisheries and the tourism sector (where available):

- Caribbean spiny lobster (*Panulirus argus*) production and exports from the Fisheries Division;
- Stayover arrivals from the Research and Statistic Department of the Ministry of Tourism; and
- Stayover arrivals from the Office Départemental du Tourisme, Guadeloupe (including Les Saintes, Desirade, Marie Galante, St. Barthelemy and St. Martin).

Note in 2007, St. Martin and St. Barthelemy were officially separated from Guadeloupe and became two separate overseas collectivities or first-order administrative divisions of France (Magras, 2007).

In the absence of data on local purchases of lobster by hotels and restaurants (i.e., local lobster supply to the tourism sector), simple linear regression was used to investigate the relationship between annual live lobster exports and annual stayover arrivals at hotels in Antigua and Barbuda. Adopting a similar approach, monthly live lobster exports to Guadeloupe was regressed on monthly tourist arrivals at hotels in Guadeloupe to explore local fisheries vis-à-vis tourism in neighbouring French Overseas Departments. All statistical analyses were conducted using Microsoft Excel 2010 and IBM SPSS Statistics Version 20.

In addition to limited data, access to quantitative data from key informants (mainly business owners and managers) was hampered by a fear of the information being used for tax purposes by government. Hence regarding financial matters, information presented in this document was restricted only to:

- (1) what the business owners or managers cared to have published, or
- (2) what was already available in the public domain.

Consumptive Use of Fisheries Resources

Case Study: Live Lobster Traders

For decades, the French territories in the region have been the main export market for live lobster traders due to their close proximity and favourable prices. With the formation of the single European market in January 1993, legislation governing the production of food were harmonised throughout the European Community. The key to European Food Law is the principle of quality management and process-oriented control throughout the production chain – from the fishing vessel to the consumer’s table. The stringent technical standards, the need for accompanying legislation and infrastructure make the process an arduous task for most developing countries. These changes have drastically affected the export sector. In 1990, domestic export of lobster from Antigua and Barbuda was 91metric tons and valued at US\$1.0 million (based on 2012 prices); this has decreased to 37 metric tons or US\$0.4 million, in 2012.In terms of market

share of capture production, exports on average accounted for 27% of capture production from 1993 to 2012, in contrast to 1989 to 1992 (prior to the single European market), when 49% of the lobsters captured were exported.

Of the five traders interviewed for this case study, four out of the five had at least 15 years of experience in the business and the lobster trade was an offshoot of their original venture of fishing. In all cases, profits generated from the fishing operations were used as capital to start-up the trading business. All of the businesses were microenterprises with fewer than 10 employees and ranged from sole proprietorship to family-owned operations.

There was a distinct difference between Antiguan traders and Barbudan 5 traders with respect to the target market. For the island of Barbuda, most of the lobsters landed were exported mainly to the French Overseas Departments (Guadeloupe and Martinique) and more recently the Dutch Overseas Country (Sint Maarten). This was due to highly favourable prices and weak local demand; resident population was 1,810 (Statistics Division, 2012) and there were only two seasonal high-end low-volume hotels on the island. In contrast, the island of Antigua with most of the tourism infrastructure and on average 827,840 total visitors per year (Research and Statistics Department, Ministry of Tourism, Economic Development, Investment and Energy, 2015), traders primarily targeted the local hotels and restaurants which offered competitive prices.



Figure 6. Regulatory compliance (minimum size, reproductive state, etc.) checks and organoleptic inspection of live spiny lobster bound for neighbouring French Overseas Departments (Photo: Mitsuhiro Ishida).

Relationship between Lobster Trade and Tourism

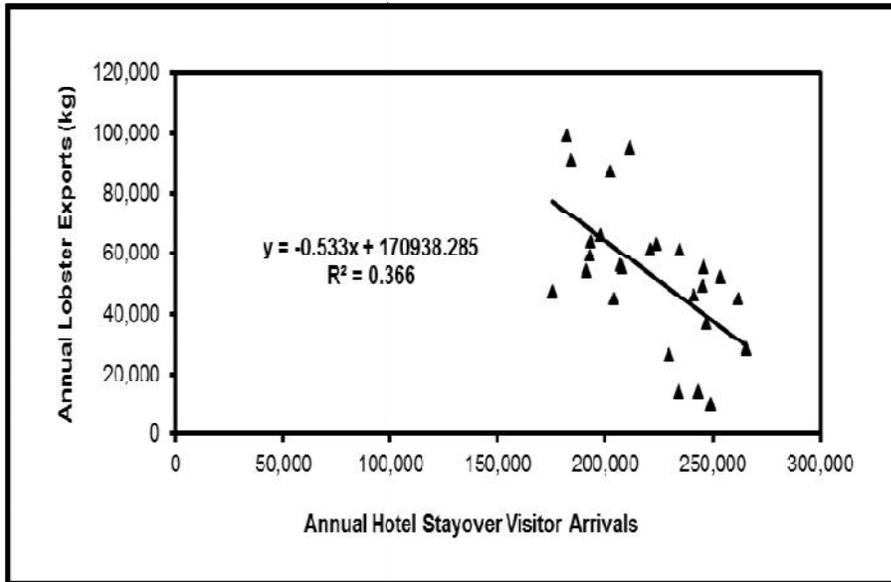


Figure 7: Relationship between annual live lobster exports and annual stayover visitor arrivals at hotels in Antigua and Barbuda from 1989 to 2014.

versus regional prices) that were not taken into account in the analysis due to incomplete data. The regression model predicted that for every additional stayover visitor per year in Antigua and Barbuda, on average export of live lobster decreased by 0.533 kg or between 0.238 kg and 0.829kg (based on the 95% confidence interval for the slope of the regression line). In other words, on average, for every 1000 hotel stayover guests arriving in Antigua and Barbuda per year, 533 kg less lobster is exported annually; hence, domestic export of live lobster is negatively correlated with stayover visitor arrivals.

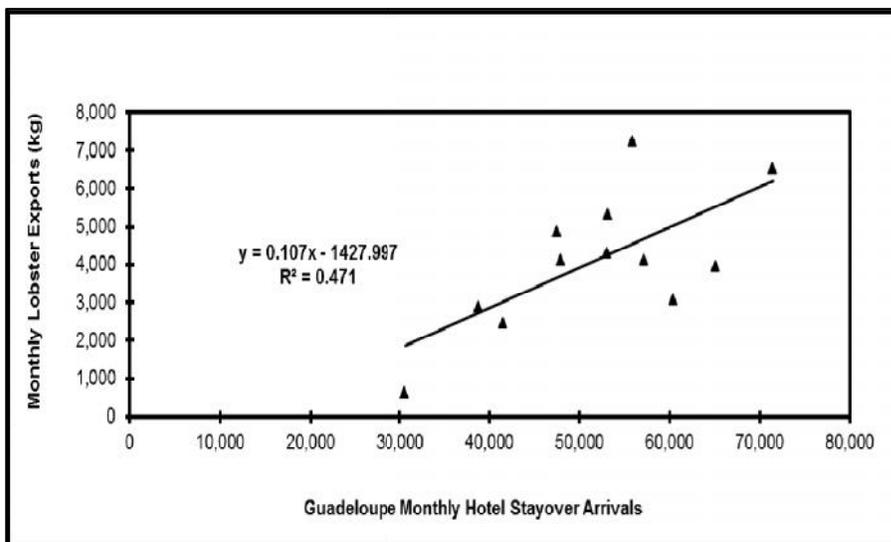


Figure 8. Relationship between monthly live lobster exports from Antigua and Barbuda and monthly stayover arrivals at hotels in Guadeloupe (including St. Barthelemy and St. Martin) in 2000.

Hotel stayover visitor arrivals was useful as a predictor of lobster exports; regression was significant, $p = 0.001 < 0.01$. The coefficient of determination indicated that 36.6% of the variation in annual lobster exports can be explained by annual stayover tourists at hotels in Antigua and Barbuda (Figure 7). The remaining 63.4% was due to individual variation and may be explained by other factors (e.g., local

Concerning the relationship between lobster exports and tourism in the destination market of Guadeloupe, linear regression was significant ($p < 0.05$); limited data from 2000 indicated that 47.1% of the variation in monthly lobster exports to Guadeloupe (including St. Barthelemy and St. Martin) can be explained by monthly tourist arrivals at hotels in Guadeloupe

(Figure 8). Other factors that may influence variation in monthly lobster exports to Guadeloupe included local demand (particularly from the tourism sector), supply from other neighbouring countries and market prices (local versus regional). The model predicts that a one unit increase in monthly hotel stayover arrivals in Guadeloupe (including St. Barthelemy and St. Martin) is associated with a 0.107 kg increase in the mean monthly live lobster exports from Antigua and Barbuda. In other words, on average, for every 1000 hotel guests arriving in Guadeloupe (including St. Barthelemy and St. Martin) per month, 107 kg more lobster is required per month from Antigua and Barbuda.

Key Drivers of Success

The key drivers of success for live lobster traders included:

- Access to the lucrative European Union market; Antigua-Barbuda and Grenada were the only two independent Member States of the Organisation of Eastern Caribbean States authorised to export fishery products to the European Community (within the Caribbean Community: The Bahamas, Belize, Guyana, Jamaica and Suriname in addition). European Union imports grew at a substantial rate of 3% in value between 2011 and 2012 and reached €19.2 billion (European Market Observatory for Fisheries and Aquaculture Products, 2014).
- Proximity to market; within 20 minutes by air, lobster traders can have their product shipped to the European Union via Member States Overseas Countries and Territories (Guadeloupe and Sint Maarten). The European Market Observatory for Fisheries and Aquaculture Products (2014) cited the European Union as the largest importer of seafood products, absorbing 24% of the total value of world trade. For traders targeting the local tourism sector (mainly hotels and restaurants), Antigua and Barbuda received on average 242,147 air or stayover arrivals per year from 2010 to 2014 (Research and Statistics Department, Ministry of Tourism, Economic Development, Investment and Energy, 2015).
- France high expenditure on seafood; €10.0 billion in 2012 and ranked second in the European Union in terms of expenditure (European Market Observatory for Fisheries and Aquaculture Products, 2014). France imports from all sources of whole live lobsters was estimated at 3,974 metric tons and valued at €53 million for the same period (Canadian Trade Commissioner Service, 2014).
- Lobster was an expensive, high-end product (i.e., economically perceived as a “luxury good”); crustaceans (including lobster) have become the main European Union imports in value (€3.6 billion) since 2012 despite providing less volume than groundfish, salmonids and tuna and tuna-like species (European Market Observatory for Fisheries and Aquaculture Products, 2014). Ex-vessel value for live Caribbean spiny lobster (*Panulirus argus*) in 2014 was as follows: Antigua and Barbuda, US\$9.80 to US\$12.25 per kg; Guadeloupe and Martinique, US\$25.27 to US\$29.26 per kg; and Florida Keys, US\$19.07 to US\$21.87 per kg (Wadlow, 2015).
- Vertical integration of operations; traders generally retained fishing as part of their operations to reduce costs and improve efficiency with respect to fish supply. Fishing was originally their primary source of income.
- Diversification of revenue streams; most traders diversified their cash inflows through reinvestments in other ventures (hotels, restaurants, supermarkets, fishing vessels, loan services, etc.).
- Control of supply; in Barbuda and to a lesser extent in Antigua, loan services to fishers was one strategy by which certain traders ensured loyalty in the supply of lobster during times of fierce competition with rivals; traders may also own boats which were hired to fishers in exchange for a portion of the catch (as part payment) and exclusive rights to lobster sales (Van der Meer, 1998).

Limitations and Challenges

Critical issues affecting the operations of lobster traders included:

- An over-reliance on French Overseas Departments (Guadeloupe and Martinique) and more recently Dutch Overseas Country (Sint Maarten); in 2009, exports during the peak tourist season (December to April) declined drastically due to the impact of general strikes in Guadeloupe and Martinique on the tourism sector. The general strikes ran from January 20 to March 4, 2009 and were related to the cost of living, the prices of basic commodities and demands for an increase in the monthly salaries of low income workers (“Guadeloupe strike ends”, 2009).
- Vulnerability to exogenous economic shocks (e.g., 2008 financial crisis, 2009 global recession) that can negatively impact the tourism sector (both locally and regionally) and ultimately the demand for lobster. Live lobster exports plummeted from 45 metric tons in 2007 to 28 metric tons in 2008 and an over two-decade low of 14 metric tons in 2009 owing to the combination of general strikes in Guadeloupe and Martinique and the global recession. Note the International Monetary Fund (2005) indicated that the correlation between industrial country output and domestic output was strongly positive for Antigua and Barbuda (0.7); hence, domestic business cycle fluctuations were highly correlated with business cycle fluctuations in industrial countries.
- Susceptibility to natural disasters; according to the Centre for Research on the Epidemiology of Disasters, Antigua and Barbuda was one of the most highly exposed countries in the world to natural disasters, ranking among the top four countries by land area and population affected by disasters from 1970 through 2002 (International Monetary Fund, 2004). Cumulative value for the loss of gear (mainly traps) due to Hurricane Luis, Georges, José and Lenny was US\$1.8 million (Horsford, 2000). Estimated value for the damage done to fishing vessels and infrastructure by Hurricane Luis and Georges was US\$1.57 million and US\$1.24 million, respectively. In addition, the aforementioned storms caused cumulative damage of about 40% of gross domestic product (International Monetary Fund, 2004). A number of lobster traders had to rebuild their businesses due to the losses suffered in terms of stocks, infrastructure (fishing vessels, gears, etc.) and clients (locally and regionally).
- Absence of or inadequate insurance; a financial appraisal of Antigua and Barbuda’s fishing fleet indicated that only five out of 52 units sampled (9.6%) had insurance covering the vessel including the engine (Horsford, 2007). Of the five traders interviewed during this study, insurance was limited to the capture production and transportation aspects of the business; two had their fishing vessels insured and all had motor vehicle insurance. Assets such as buildings and equipment were not insured. Traders cited the absence of insurance (in the case of certain processing and fishing equipment), its high cost and inadequate coverage (e.g., the maritime limit of fishing vessel policy was normally less than the distance covered by fishing operations) as obstacles toward further investment.
- Accessing financial resources was difficult; similar to the insurance companies, lending institutions perceived capital investment in the fisheries sector as being high risk despite several studies provided information to the contrary (Horsford, 2001; Tietze, Prado, Le Ry, & Lasch, 2001; Food and Agriculture Organization of the United Nations, 2002; Tietze, Thiele, Lasch, Thomsen, & Rihan, 2005; Horsford, 2007). Note Antigua and Barbuda ranked poorly (152 out of 189 countries) in the World Bank’s (2016) *Doing Business* report in the “ease of getting credit” category; the average ranking for “ease of getting credit” in Latin America and the Caribbean was 87.
- Trade requirements (sanitary and phytosanitary measures, mandatory food safety programme such as Hazard Analysis Critical Control Point, catch certification, traceability, etc.) to maintain market access; whilst Antigua and Barbuda passed the 2002 inspection of the Food and Veterinary Office of the European Commission and third party audit of the catch certification programme indicated that “the monitoring and control system is as good as it can be developed for

artisanal fisheries” (Guele, 2012), losing market access remains an “imminent threat” in light of the constantly changing technical requirements for trade. Note a catch certification programme is required with respect to the implementation of European Council Regulation 1005/2008 on illegal, unreported and unregulated fishing. Some traders mentioned that the uncertainty associated with future inspections and / or audits was also a deterrent towards further investments (i.e., whether Antigua and Barbuda would be able to maintain market access to the European Union).

- “Perception” about the sustainability of the resource; while various studies have concluded that the local spiny lobster fishery was sustainable at the current level of fishing (Horsford, 2004; Food and Agriculture Organization of the United Nations, 2007; Horsford et al., 2014), traders were concerned that the regional resource may follow the same narrative as the queen conch (*Strombus gigas*). In 1992, the queen conch was included under Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; in 2007, Brazil proposes an Appendix II listing for the Brazilian populations of the Caribbean spiny lobster and the smooth tail spiny lobster (*Panulirus laeviscauda*), however, both species were not listed after review. Traders chided local and regional fisheries authorities for not promoting the success stories and indicated that environmentalists have succeeded in painting a “bleak image” of the entire fisheries in the Caribbean whilst the best available scientific evidence presented information to the contrary. The petition by the WildEarth Guardians (an environmental non-governmental organization) to list the queen conch as “threatened” or “endangered” under the United States Endangered Species Act was given as an example of what could happen when perception distort reality. Note WildEarth Guardians were not successful in their petition to the United States Secretary of Commerce; a listing of the queen conch would have resulted in the prohibition of conch exports from the Caribbean Community Member States.
- Low level of information and communications technology (ICT) use in businesses; of the five traders interviewed only one had invested in a website and none had an electronic record keeping or accounting system. All traders used e-mail or other ICT applications (e.g., Skype, WhatsApp) to interact with their clients.
- Language was seen as a barrier to trade; whilst most French and Dutch clients spoke English as a second language disputes often arose due to miscommunication and / or cultural differences.
- High energy cost limited value addition (frozen whole lobster, frozen lobster tails, etc.). The high cost of electricity was identified as a major constraint on doing business in Antigua and Barbuda, as noted by 45% of respondents to the World Bank's *2010 Enterprise Surveys* cited by the Inter-American Development Bank (2013).
- Upsurge in the use of cheap substitutes (e.g., imitation crab or lobster meat) in the menus of the hotels and restaurants. Traders raised the issue of food fraud or economically motivated adulteration when hotels and restaurants intentionally add imitation crab or lobster meat to a meal for the purpose of reducing the cost of production whilst at the same time selling the meal as being composed entirely of “real” lobster.

Recommendations

Implementation of the following recommendations is necessary to address the various limitations and challenges as well as improve the social and investment climate:

1. In order to improve business resilience with respect to overdependence on the French Overseas Departments and vulnerability to exogenous economic shocks, traders should consider additional markets such as the cruise-tourism sector as well as directly marketing to the 28 Member States of the European Union; the United Kingdom may be the best option due to the fact that there are at least five direct flights per week and there is a large “untapped” Caribbean diaspora residing in the United Kingdom. Orozco (2008) proposed that the diaspora has a significant demand for nostalgic goods and that many of the small businesses created by the diaspora rely on the

importation of such goods. Note markets such as the United States of America and Canada are economically less viable due to the impact high costs of production (fuel, electricity, etc.) has on profit margins and comparable prices can be obtained for the domestic tourism sector (Horsford, 2006). With Antigua and Barbuda receiving on average 557,666 cruise-ship passengers per year based on data from 2010 to 2014 (Research and Statistics Department, Ministry of Tourism, Economic Development, Investment and Energy, 2015), the sector represents an immense opportunity for traders with respect to provisioning. One trader had limited success with this option; economies of scale with respect to production and preference for processed products (e.g., frozen lobster tails) were some of the factors identified as barriers to market penetration.

2. In terms of susceptibility to natural disasters and the absence of or inadequate insurance, “risk pooling” and spreading the risks across a large population are two prudent strategies for small, vulnerable, economies like Antigua and Barbuda (Horsford, 2007). According to the Arrow-Lind theorem, risk pooling involves having a “wise” portfolio of investments where the risks of losses are to be counterbalanced by those investments securing higher net benefits than expected (Pearce & Nash, 1981). Hence agencies offering fisheries-related insurance would be prudent to have other investments with higher net returns and less risk. With a small population in Antigua and Barbuda requiring insurance for fisheries assets (at most 338 vessel owners and 5 traders / processors), an insurance scheme for the fisheries sector may have to be done at a minimum at the sub-regional level (e.g., the Organisation of Eastern Caribbean States) to be effective since one may end up in a situation similar to Florida where the state-run insurance company is dangerously undercapitalised thereby exposing itself to tremendous financial risk (“Wishing the wind”, 2007). In other words, if risk is shared out among a large number of risk bearers, individual or country risk is minimised as in the case of the Caribbean Catastrophe Risk Insurance Facility. Note a United States of America led initiative involving the Food and Agriculture Organization of the United Nations, the World Bank, the Caribbean Regional Fisheries Mechanism, the Caribbean Network of Fisherfolk Organization and other stakeholders are currently developing an insurance product for fisheries industry assets in the Caribbean; this policy intervention is a step in the right direction given the “market failure” that exists with respect to fisheries-related insurance and the potential implications of climate change (e.g., increase in the frequency and intensity of storms).
3. To improve access to financing, *The Private Sector Assessment Report for Antigua and Barbuda* commissioned by the Inter-American Development Bank (2013), suggests the setting up a public credit registry and support for the establishment of a private credit bureau (i.e., credit-information sharing system) as key policy interventions. These measures should reduce information asymmetries and increase synergy among agencies thereby assisting in reducing the cost of, and improving access to, commercial finance.
4. Marketing is critical towards establishing a positive image of sustainability, safety and quality for the local Caribbean spiny lobster. Given that lobsters are produced under sanitary and phytosanitary standards verified as being equivalent to the European Union and catch certification programme is considered adequate based on a third party audit (Guele, 2012 April), traders should use these achievements not only to market their product but ultimately create a “brand” that differentiate their product from those of other traders. Traders may opt to develop their own “brand” or collaborate with other stakeholders to pursue industry certification under existing brands and / or eco-labelling options (Fair Trade Certified Capture Fisheries, Marine Stewardship Council, Seafood Watch, etc.).
5. Traders should embrace the use of information and communications technology in all aspects of their business (from record keeping to marketing) to enhance productivity and efficiency. At a minimum, all traders should have a presence on the World Wide Web whether through a business website, Facebook Page or LinkedIn Company Page.
6. Traders targeting the French and Dutch markets should address the issue of language in their business plan. This could include adding summary pages in French and Dutch to business

- website, hiring a translator when required or acquiring language skills through staffing and training.
7. Investment in alternative sources of energy is required to reduce the costs of cold storage as well as make value addition more viable; PT Contained Energy Indonesia has developed and successfully deployed stand-alone, off-grid, 100% solar-powered cold storage facilities designed for use in remote communities (“Solar powered cold storage”, 2012). Note the local power company (Antigua Public Utilities Authority) currently allows producers of renewable energy to sell electricity back to the grid at a retail price up to the amount of consumption, thereby achieving a “zero bill”.
 8. Review and upgrade existing legislation and draft bill (the *Public Health Act*, the *Consumer Protection and Safety Act*, the *Food Safety Bill*, etc.) concerning consumer protection and food fraud.

Additional Observations and Recommendations

In order to achieve the necessary “economies of scale” to address issues such as certification and eco-labeling, it is critical that traders collaborate, whether through: 1) a joint venture arrangement, where traders engage in a solitary commercial enterprise without actual partnership or incorporation, or 2) as a retailers’ (marketing) cooperative, where traders use their purchasing power to acquire discounts from suppliers and share marketing expenses. Further these issues may be best handled under public-private partnership. The Bahamas Department of Marine Resources, The Bahamas Marine Exporters Association, Friends of the Environment in Abaco, The Nature Conservancy and other conservation partners are currently working with the World Wildlife Fund to move The Bahamas spiny lobster fishery towards meeting the Marine Stewardship Council standard for sustainable fisheries. The appropriateness of the aforementioned “model” for Antigua and Barbuda needs to be determined given the small-scale nature of the spiny lobster fishery and the cost associated with achieving and maintaining certification. Globally, The Bahamas is the fifth largest exporter in terms of quantity of rock lobster and other sea crawfish (*Palinurus spp.*, *Panulirus spp.*, *Jasus spp.*) (Factfish, 2015) and exporters include multinational seafood companies (e.g., Tropic Seafood, Ltd., a subsidiary of Beaver Street Fisheries Inc., one of the leading seafood distributors in the United States). In contrast, lobster businesses in Antigua and Barbuda were family-owned microenterprises with few than 10 employees or sole proprietorship.

With respect to a joint venture arrangement or the formation of a retailers’ cooperative, most traders in Antigua and Barbuda were satisfied with their current scale of production and were reluctant to collaborate with their competitors. This may be related to a desire to preserve “socio-emotional wealth”, defined in the case of family businesses as the “non-financial aspects of the firm that meet the family’s affective needs, such as identity, the ability to exercise family influence, and the perpetuation of the family dynasty” (Gómez-Mejía et al., 2007). This preference to preserve “socio-emotional wealth” often result in risk aversion and the pursuit of lower risk strategies (Gonzalez et al., 2013) and may explain the reluctance to embrace external support to facilitate growth. One trader cited the old adage “partnership is a leaky ship”, indicating that he may not have fully understood exactly what a joint venture arrangement entails. Note actual partnership or incorporation is not required in the case of a joint venture, the venture is “stand-alone” entity, separate and apart from the parties’ other business interests. Hence basic education about the various types of collaborative business strategies may be required if the aforementioned options are to be viable.

Non-consumptive Use of Fisheries Resources

Case Study: Stingray City (Antigua) Limited

Located in the village of Seatons, on the north-east coast of Antigua, Stingray City (Antigua) Limited is an ecotourism business that offers interactions with southern stingrays (*Dasyatis americana*) in their natural environment primarily for cruise-ship passengers, but also for hotel guests and locals (Figure 9). Kayaking and snorkeling around the offshore islands (Guiana Island and Great Bird Island) in the area are also provided. Established in 2002 by Mr. Andrew Moody-Stuart, Stingray City Antigua is currently ranked number one of “things to do in Antigua and Barbuda”, based on 960 reviews by travelers on the American



Figure 9: Stingray City Antigua located on the north-east coast of Antigua (Photo: Stingray City Antigua Ltd).

travel website company Trip Advisor (2015). Stingray City Antigua has been awarded Trip Advisor’s “certificate of excellence” in 2011, 2013 and 2014 for consistently earning great reviews from travelers (Stingray City Antigua, 2009; Antigua Nice Limited, 2014). In 2013, Stingray City hosted the crew and cast of the United Kingdom edition of the popular television music competition *The X Factor* while filming in Antigua (Antigua Nice Limited, 2013).

Key Drivers of Success

The key drivers of success for Stingray City Antigua included:

- Niche marketing to the cruise-tourism sector; with cruise-ship arrivals averaging 557,666 passengers per year from 2010 to 2014 (Research and Statistics Department, Ministry of Tourism, Economic Development, Investment and Energy, 2015) there was sufficient demand to sustain the business.
- Offering a “unique” experience in a relatively safe environment; most of the target demographic (cruise-ship passengers) have not had an up-close and personal experience with stingrays in the wild.
- The use of sound market intelligence; by knowing the expectations and limitations of their customers they were better able to guide product development (i.e., they knew their customers).
- Pricing to suit the target demographic; since most cruise-ship passengers were low to upper middle-income earners, tours were affordably priced at US\$50 as opposed to US\$100 or greater for a typical marine-related tour (Adventure Antigua, 2012; Treasure Island Cruises, 2014; Wadadli Cats, 2015). The Cruise Lines International Association defined the cruiser target market as adults 25 years or older, with household earnings of US\$40,000 plus; this segment represented 43% of the total United States population (Florida-Caribbean Cruise Association, 2011).

- Strong and positive internet presence; excellent reviews on websites such as Trip Advisor (2015) stimulated additional business. According to the Cruise Lines International Association, “destination websites” (39%) and “cruise websites” (28%) were the dominant influences in terms of selection for both vacations and cruises by passengers (Florida-Caribbean Cruise Association, 2011).
- Adoption and adaption of industry “best practices” for interactions with southern stingrays as well as health and safety standards. Mike Nelson, a dive instructor that has developed a Stingray Experience Program recognised by the National Association of Underwater Instructors (Nelson, 1995), has assisted Stingray City in this regards.
- Operations were perceived as eco-friendly by most tourists; Stingray City Antigua does not hold stingrays captive or de-barb them (i.e., remove their stingers) for safety reasons. Supplemental feeding was used to attract and maintain wild stingrays in the area as well as condition them to approach humans handing out food.
- Synergies with other tour operators in the following areas have fostered additional business:
 - marketing – by cross-promotion with other tours operators, the company increased its visibility without increasing its marketing cost.
 - service offered – by “bundling” current products with services offered by other tours, the company attracted more consumers and at the same time offered consumers a more diverse array of services as a single unit and at a more affordable price.

In summary, Stingray City’s business model appears to utilise a marketing strategy that adequately addresses all the elements of what Robert F. Lauterborn (1990) cited as the “Four Cs”:

- (1) “consumer wants and needs” as opposed to “product” (development of product was consumer-centric);
- (2) “cost” to satisfy the consumer rather than “price”;
- (3) “convenience to buy” as opposed to “place” (the increase in the use of online shopping has practically eliminated the need for a physical facility or store); and
- (4) “communication” with potential customers rather than “promotion” (websites such as Trip Advisor allowed for two-way interaction or communication between buyer and seller and promotion was “buyer-driven” as opposed to “seller-driven”).

In addition to the aforementioned, Stingray City’s competitive strategy was based on being unique. According to Magretta (2002) “organizations achieve superior performance when they are unique, when they do something no other business does in ways that no other business can duplicate”. Finally, Stingray City Antigua seems to have passed the “numbers test” based on the fact that they have generated enough profits to consider expansion to another Caribbean island. According to Brooks (2013), with about 20,000 visitors per year at US\$50 per head, suggesting annual gross revenue of US\$1.0 million, Stingray City’s gross revenue stream exceeded the ex-vessel value of capture production for sharks, rays and skates (US\$145,122) for 2014 (Antigua and Barbuda Fisheries Division, 2015).

Limitations and Challenges

Critical issues affecting the operations of Stingray City Antigua included:

- Absence of a legislative framework governing ecotourism interactions (including safety, use rights and animal welfare); the operations of Stingray City was almost crippled in 2002 due to the death of 17 stingrays purportedly by poisoning.
- Inadequate enforcement of marine protected areas regulations; Stingray City’s offshore operations takes place at Barge Reef close to the eastern boundary of the North East Marine Management Area, which was established in 2005 under the *Fisheries Act No.14 of 1983*. While the protected area has been established, the zones designated in the marine management plan (Jackson, 2008) and the specific regulations for the areas have not been *gazetted*.

- Concerns over the safety of stingray tours; in 2006, following the death of Australian naturalist Steve Irwin, by a stingray barb, the owner of Stingray City reported a drop in business that year due to the story being sensationalised by the media (Brooks, 2013). Engber (2006) quoted figures from various media sources, ranging from 17 to about 30 for the number of recorded stingray-related fatalities globally.
- Concerns that supplemental feeding of stingrays to retain them in the area affect animal behaviour and welfare; Semeniuk and Rothley (2008) found that in the Cayman Islands, in comparison to stingrays from non-tourist sites, tourist-fed stingrays were more likely to have lower body condition, be injured by boats and predators, be susceptible to ecto-dermal parasites, and be engaged in intense competition (resulting higher incidences of bite marks). While sites such as Stingray City Sandbar in the Grand Cayman had up to 2,500 tourists interacting with stingrays at any one time (Semeniuk & Rothley, 2008), Stingray City Antigua offered a more private experience that probably has less of an impact on animal behaviour and welfare.
- Business was at the whim of the cruise-ship industry due to its dependency; Antigua and Barbuda was dropped from the ship *Carnival Victory* itinerary in 2010, after six American tourists from the ship were arrested after a dispute with a taxi driver; executives of *Carnival* stated that the decision was unrelated to the incident (“Another cruise ship to replace *Carnival*”, 2011). Nevertheless, this change in itinerary affected the number of clients and ultimately profits for that year.
- High cost of public liability insurance; most insurance companies perceived this type of operation as high risk and charge high premiums.
- Accessing financing resources was difficult; similar to the insurance companies lending institutions perceived this type of venture as high risk.

Recommendations

In order to address the various limitations and challenges, the following recommendations should be implemented:

- Development of a national policy in collaboration with stakeholders with respect to marine ecotourism interactions as well as legislative framework to govern such interactions (including safety, user rights and animal welfare). Brooks (2013) suggested that shark and ray ecotourism should be promoted, given its potential to generate millions of dollars in a sustainable and non-consumptive way, however a suitable legislative framework is required. In 2007, Cline (2008) found that divers experienced an estimated 73,000 shark interactions in The Bahamas, generating roughly US\$78 million in revenue. A study by Gallagher and Hammerschlag (2011) corroborated the high economic valuation of shark interactions in the Bahamas.
- Improve enforcement of existing legislation regarding the marine protected area as well as review (and update where necessary) existing zones designated in the marine management plan for the North East Marine Management Area; these zones would be required to be *gazetted* along with the specific regulations for the various areas. Zoning is essential towards minimising user-conflicts (e.g., between consumptive versus non-consumptive use).
- Given that Stingray City is heavily reliant on the cruise-ship passengers, greater effort should be made to attract more locals and hotel guests thereby improving business resilience. Marketing to regional travellers should also be considered.
- While it is difficult to change the perception of risk associated with the operations, business risk can be mitigated through a safety management programme. This should include policies (e.g., guide to client ratio), hiring standards, training requirement, qualifying clients (e.g., matching the customers abilities and interest to the activities), safety practices (e.g., rescue drills, first aid) and signed waivers advising customers of the risk (Patterson, 2007). In addition, the business should be structured so that personal liability is minimised, for example contract out certain services that

may be high risk (e.g., catering). Note where contractors are used, the risk they are assuming needs to be clarified and proof of insurance is required (Patterson, 2007).

- Creation of a public credit registry and the establishment of a private credit bureau (i.e., credit-information sharing system) should enhance commercial financing (Inter-American Development Bank, 2013).

Financing Mechanisms and Support

The following is a summary of institutions that can support fisheries and tourism linkages:

- The National Development Foundation (NDF) was established in 1985 to promote and develop micro and small businesses. The NDF is a private sector non-profit organisation governed by a Board of Trustees comprising of Antiguan and Barbudans with extensive experience in finance and business. The NDF offers a variety of service including small business loans, technical assistance, training, business management and market promotion.
- The Antigua and Barbuda Development Bank (ABDB) was established in 1971 as a statutory development finance institution and commenced operations in 1974 to provide among other things, medium and long-term development financing to the productive sectors (including micro and small enterprises). Under the Direct Assistance Grant Scheme facilitated by the Caribbean Export Agency with the support of the bank, registered businesses in Antigua and Barbuda can apply for grant funding for up to and in excess of US\$37,000 based on verifiable needs to be used for exporting of products and services across the Caribbean region and / or internationally (Antigua and Barbuda Development Bank, 2014 January); the Direct Assistance Grant Scheme is a reimbursement grant funding facility provided by the Regional Private Sector Development Programme (RPSDP) under the European Union (EU) 10th European Development Fund (EDF). In terms of regular business loans the ABDB does not have a ceiling on loans; US\$111,000 is used as a rough cut-off point.
- The Antigua and Barbuda Investment Authority (ABIA) is a government statutory body formed under the *Investment Authority Act of 2006* for the promotion of both local and foreign investment. The Authority offers support services to local and foreign investors in the areas of enterprise development, investment facilitation, promotion and business development. The Authority assists local entrepreneurship by encouraging the creation and expansion of domestic businesses and providing practical training and business advisory services through programmes such as Mind Your Business, which provides entrepreneurs with basic business development skill (Antigua and Barbuda Investment Authority, 2015a). The ABIA & Diaspora Investment Partnership Programme is geared towards bolstering foreign direct investment inflows into the nation through dedicated and targeted outreach to the diaspora (Antigua and Barbuda Investment Authority, 2015b).
- The Caribbean Export Development Agency was established in 1996 as the regional trade and investment promotion agency of the 15 Member States of the Caribbean Forum – CARIFORUM (Caribbean Export Development Agency, 2015a); in July 2005 Caribbean Export assumed an investment promotion mandate after the 14th CARIFORUM Council of Ministers meeting and have also established collaborative links with the French Caribbean Outermost Regions, the English and Dutch Overseas Countries and Territories and with Cuba. In terms of accessing financing, Break Point (a programme aim to empower Caribbean businesses through alternative funding sources such as private investors in the form of venture capitalists) and Direct Assistance Grant Scheme (mentioned earlier) are the main flagship programmes. Other options for financing and support services indicated by Caribbean Export (2015b) include the European Investment Bank, Centre for Development of Enterprise and the European Union-African Caribbean and Pacific Micro-finance Programme.

In addition to the aforementioned, the *Small Business Development Act 2007* provides incentives in the form of concessions, technical assistance and credit guarantee to aid in the development of small businesses in Antigua and Barbuda (Antigua and Barbuda Investment Authority, 2013). Some of the incentives and concessions include:

- exemption from or reduction of payment of duty on the importation or purchase of raw materials, fittings, appliances, machinery and equipment for use in the construction and operation of the business, etc.;
- reduction of property tax of up to 75% in respect of land and buildings used in the operation of the business;
- exemption from or reduction of payment of income tax on the income of the business for a period not exceeding five years;
- exemption from or reduction of stamp duty on documents required for loans for the business or security for those loans; and
- exemption from or reduction of payment of withholding tax for a period of up to three years from the grant of the concession.

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Chapter 3: Case Study 2 - Barbados

Linking Fisheries to Tourism-Related Markets: Barbados

Iris Monnereau

Introduction

Caribbean islands depend highly on tourism for their economy and the sector is a huge contributor to the economies of all Caribbean countries. It provides a steady revenue stream, and supports local farming, fishing, and retail industries. The island population in the Caribbean is more dependent on income from tourism than in any other part of the world relative to its size. In 2014 travel and tourism directly supported more than 13.0% of total employment, with the sector contributing US\$ 16.1 billion to the Gross Domestic Product (GDP). In Barbados the tourism sector is even more essential as, while the direct contribution of the sector to the GDP is 11%, the total contribution of travel and tourism to GDP was 36 % of GDP in 2014.¹ The sector directly supported 14,000 jobs. It plays a key role in the economy and has a positive "spin-off" impact on virtually all other business sectors. This includes jobs in hotels and restaurants, travel agents, airlines and other passenger transportation services but also includes, for example, the activities of leisure industries directly supported by tourists (e.g. catamaran cruises). Barbados has thus moved from a previous primarily agricultural economy to a service-based economy that supports tourism.



Twenty-five million tourists choose to holiday in the Caribbean each year with its climate and the coastal and marine environment being one of the main attractions. Dependence on tourism therefore also implies dependence on the capacity of the marine ecosystems to continue providing the services, goods and conditions which make the region such a popular vacation destination.

Figure 1: Flying fish depicted on one dollar coin

Source: <https://www.etsy.com/listing/69986960/barbados-flying-fish-heptagon-dollar>

The fisheries sector in Barbados is important as it supplies a range of goods and services, including food security, recreation opportunities and ecosystem services (Moore et al. 2014). It provides livelihood and employment, tax revenues, as well as foreign exchange through exports as well as foreign exchange savings from reduced food imports (Mahon et al., 2007). The fisheries sector is important for the tourism industry both directly as well as indirectly and for consumption as well as recreational purposes. Flyingfish, dolphinfish, kingfish and tuna are, for example, constant favorites with visitors. Barbados is known as "the land of the flying fish", and the fish is one of the national symbols of the country. The one dollar coin, for example, bears an image of a flying fish (see figure 1) and the Barbados' national dish is coucou and flying fish.

¹ WTTC Barbados 2015

However, some 54 percent of the commercially harvested fisheries stocks in the Caribbean Region are overexploited or depleted and an estimated 41 percent of the stocks are fully exploited at present². The inshore fishery in Barbados is considered to be fully or overexploited (McConney, 2011; Vallès and Oxenford, 2012). The deep-slope and bank reef fishery may be fully exploited in some areas, but not in others while there is lack of information on the coastal pelagic fishery (McConney, 2011).

The sector provides direct employment to approximately 2,200 persons, while supplying livelihood and employment to approximately 6,000 in total people who catch, sell and process fish (McConney, 2011). This number, however, excludes those involved in cooking, serving fish, whether in exclusive restaurants, at *Fish Frys* or the numerous rum shops across the island.³ However, as for the eastern Caribbean in general, the true value of the fishing industry is seldom accurately estimated due to deficiencies in available information on catches and prices (Mahon et al., 2007). The true contribution of fisheries to the Barbadian economy is therefore not exactly known but is expected to be much higher than the figures mentioned above.

Fisheries and tourism are thus two important drivers of the country's economy. The linkages between the two sectors can be categorized into two general categories: *fish utilization* activities and *recreational* activities. The links between the two productive sectors is not always recognized while creating enhanced linkages and synergies is important to the growing tourism industry on the island.⁴ However, the links between the fisheries and tourism sector can also be negative with e.g. conflicts with recreational divers and water sports operators and coastal development projects marginalizing fishers use of the coastal zone for landings and boatyard space (McConney, 2011). This report examines the main linkages between the two sectors in the country in order to identify successful cases of linkages between fish producers and processors with buyers in the tourist-related markets which can be up-scaled or replicated, the opportunities and challenges that exist, and provides ideas for new opportunities to create economic activities and jobs, reduce food import bills and foreign exchange outflows, in order to benefit coastal communities. The report will identify the knowledge gaps and support needed to strengthen links between the various actors in the value chain – small-scale farmers, processors, finance institutions and tourism and hospitality sector officials.

Methodology

The author first analyzed the various linkages between the fisheries and the tourism sector that exist in Barbados after which relevant informants were approached for interviews. This study is therefore based on 15 qualitative interviews (of which one was conducted by phone, the other 14 in person) with those involved in the various sectors as well as an analysis of the secondary literature.

Successful linkages fisheries and tourism in Barbados

The tourism industry and fisheries sector in Barbados are linked in various ways and in this report they have been categorized in two general categories: *Fish utilization activities* and *Recreational activities* (see figure 2) and their direct and indirect uses. The categories and their components are further discussed below.

²FAO (2014). The Sustainable Intensification of Caribbean Fisheries and Aquaculture. Factsheet 3

³ It also excludes those associated with the fishing industry through supporting services such as boat building, and the sale and maintenance of boats, boat engines, fishing tackle and electronic equipment (Mahon et al., 2007)

⁴ WTTC Barbados 2015

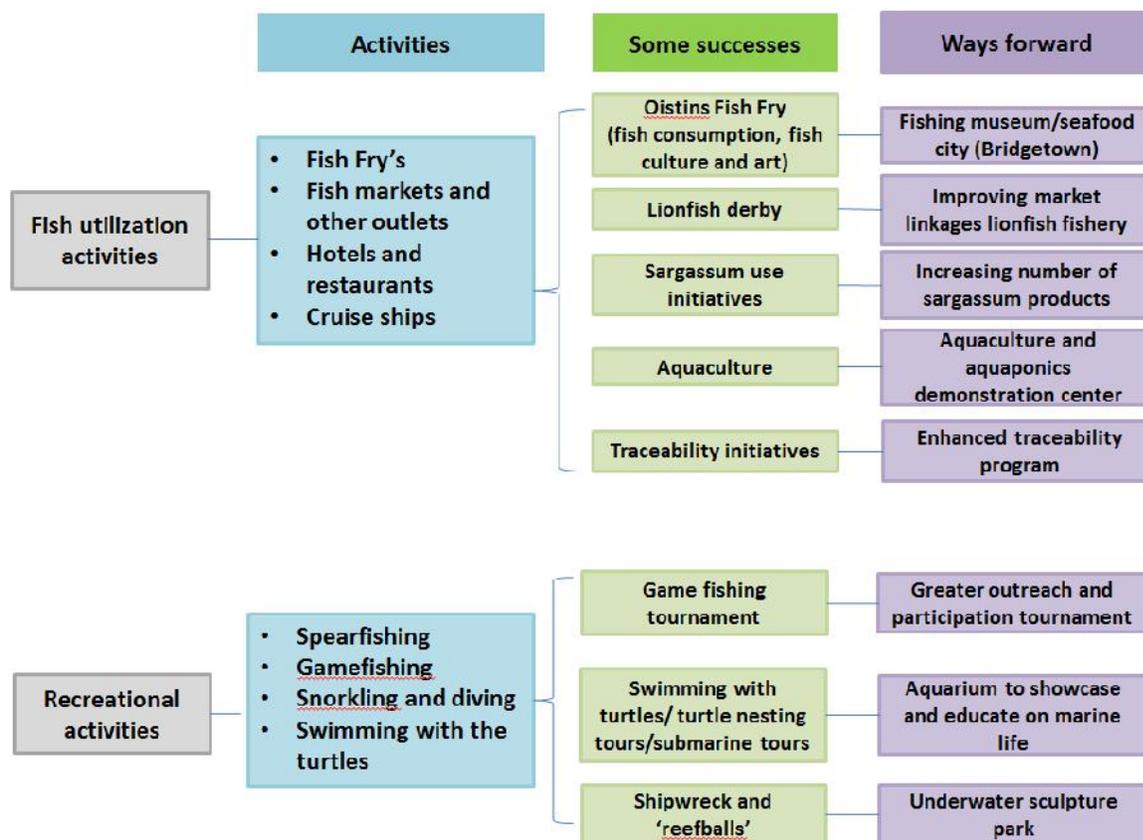


Figure 2: Major linkages between the fisheries and tourism sector in Barbados

Successes in fish utilization in Barbados

Oistin's Fish Fry

Fish Frys have been popular in Barbados since the 1980s. Over the last 20 years the weekend *Fish Frys*, such as those in Oistins on the south coast, Half Moon Fort (Moon Town) on the West Coast, or Martin's Bay on the East coast have gained popularity and emerged as major features in the country's tourism product. These activities attract a large number of visitors who have the opportunity to interact with the many locals that patronize them (Mahon et al. 2007). These Fish Frys are not only popular in Barbados but also for example in St. Lucia with popular Fish Frys in Gros Islet and in Anse-la-Raye and in Antigua Fish Frys are currently under development. There are also annual festivals such as the Oistin's Fish Festival or in Belize the Lobster Festival in Placencia.

Fish Fry's in Oistins in Half Moon Fort enhances economic benefits and adds some diversity to the islands' tourism product (Moore et al. 2014). In Oistins the main activity is the Bay Garden *Fish Fry's* on a Friday night attracting numerous visitors (the most popular day being Friday but other days are popular as well), offering a 'truly' Barbadian cultural dining experience with a street party setting for visitors and locals with karaoke and other festive activities as well as stalls with crafts and arts (see Figure 3-5). The consumption of a meal often includes fish and many local vendors sell various kinds of prepared fish and lobster from the grill and other forms of seafood-based cuisine supporting livelihoods of fisherfolk.

In 2009 fish landings in Barbados were approximately 3,467mt. The local demand for fish in Barbados is very high and the local fish production is insufficient. Fish imports are therefore required and in 2009



Figure 3 and 4: Oistin's Fish Fry on a Friday Night
Source: Aniya Legnaro

imports were 5,362mt which is in fact 155% of the domestic caught fish. High fish imports is common in the Caribbean region and in 2009 it was estimated that the CARICOM Member States imported approximately 70,037 mt of fish (48% of the production from marine capture fisheries plus aquaculture production of the region) (Masters, 2012).

According to various interviewees the majority (70%) of the fish sold at the Oistin's fish fry is therefore not local fish but actually frozen imported fish. This is a rough estimate and the exact figures could fluctuate depending on the species, season and day of the week. Further research would be needed to examine the exact percentage but all interviewees stated approximately 70%. As the majority of fish consumed at the Oistin's Fish Fry is imported further improvement for livelihoods and food security of local vendors lies perhaps more in improving the crafts and entertainment in Oistins rather than increasing



the fish consumption as this would only increase fish imports. Enhancing crafts, entertainment and perhaps offering tours can increase the number of visitors to the Oistin's *Fish Fry*.

There are a variety of arts and crafts stalls. At present, one vendor sells bowls made of ground up fish scales, producing a unique tourist product (figure 5). However, despite the claims by the vendors that these

bowls are made locally, they appear to be mass produced in a factory (most likely Asia) and imported from elsewhere. The popularity of these bowls among tourists, however, suggests that there is a desire for locally made crafts made of fish waste products and new routes should be investigated (e.g. fish leather products). The Oistin's *Fish Fry*, as well as the other *Fish Fry*'s, have been successful in attracting people



Figure 5: Bowls made of ground up fish scales
Source: Aniya Legnaro

and showcasing the local fishery of Barbados to tourist while providing benefits to the fishing community.

Fishermen’s week

There are also annual festivals linking fisheries and tourism. Fishermen’s week is a week full of activities for fisherfolk and those associated with the industry, as well as for outsiders. The week’s celebrations include a memorial church service to remember all those who lost their lives at sea as well as presentations for fishermen on a variety of topics and various entertainment activities. In 2014 there were presentations on: Law of the Sea; Market Information System for the Fishing Industry; and G.P.S

Tracker for Maritime Tracker industry. In 2014 there were also presentations and discussions: fish handling and quality control; risk management in the fisheries sector and the Ecosystem-Based Approach

(see figure 6). In 2015 Fishermen’s week was significantly downscaled due to a crisis in the fishery [resulting from persistent presence of Sargassum]. As a result fisherfolk lacked the financial resources required.



Figure 6: Poster of fishermen’s week and boning competition
Source: Fisheries Division

In addition, the Oistin’s Fish festival also attracts many visitors. The celebrations showcase a variety of local and regional delicacies, art & craft, live music and cultural entertainment such as the steel-pan and Tuk-band (a Barbadian musical ensemble) but also karaoke. Some of the main attractions are the fish boning competition, the climb-the-grease-pole competition as well as the crab racing and boat racing competition. These activities could be broadened to attract and educate tourists. The Tuk band, stilt walking and limbo dancing during the Oistin’s Fish Festival have been identified as needing further cultural development (Leslie, 2010)

Lionfish derby

Lionfish are an invasive species in the region and now being spotted in the waters around the entire island of Barbados. Lionfish negatively affect native fish stocks and decreasing their abundance is therefore crucial. The first lionfish sighting in Barbados was in 2011. This has resulted in the implementation of the Lionfish Response Plan which was drafted by the Natural Heritage Department in collaboration with the Fisheries Division,



the Coastal Zone Management Unit (CZMU) and the University of the West Indies (UWI). The response plan has several elements including research, eradication strategy and creating public awareness. *Public awareness* has been created by means of newspaper articles, workshops (giving information, training in capture and safe handling, food preparation for chefs), and production of brochures, a Facebook page and a lion fish hotline. As part of the *Eradication Strategy* various activities were undertaken and lionfish derbies and cook-ups have been undertaken to encourage market and public awareness (see Figure 7 and 8).

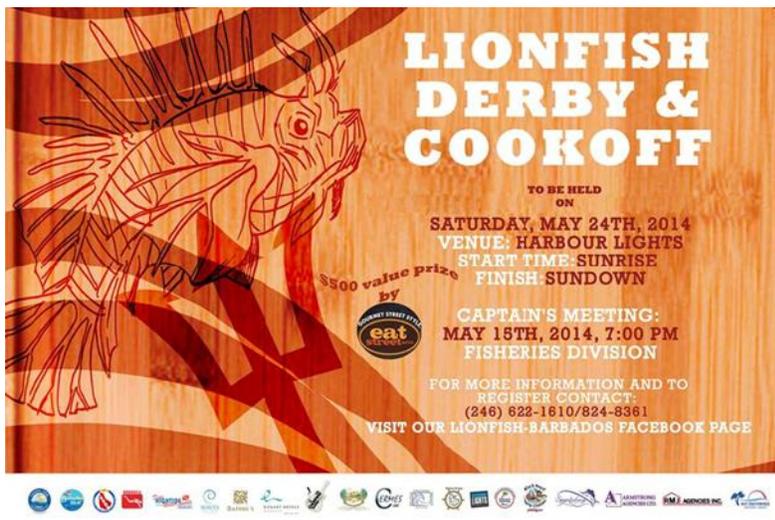


Figure 8: Flyer of lion fish derby in Barbados in 2014 (7a) and 2015(7b)
Source: CZMU

In 2014 a successful lionfish derby was carried out by the CZMU. The lion fish derby is a large-scale cull where divers and fishermen would compete to catch as many of the predatory fish as possible during the contest. In addition, culinary chefs from well-known restaurants prepare the lionfish afterwards to introduce the lionfish as food. It has proved successful as people realized the taste of lionfish is excellent. In fact, one of the interviewees indicated that divers who catch lionfish will not sell the product but prefer to eat it due to its superb taste. Fisheries Division has also been providing training to chefs to promote cooking and consumption of lionfish.

Derby's are also a way to improve the linkages between the fishers and the hospitality industry as chefs learn to prepare and work with lion fish. For 2015 the Lion Fish derby was organized by the private sector rather than the public sector, with the brand REEF in collaboration with PADI organizing the Derby on the 5 - 6 December 2015. This derby included some of Barbados most respected hoteliers, chefs, environmental, and scuba diving experts. It aims not only to help to preserve the reefs, which the lionfish infestation is threatening, but is also geared towards helping to create a new sustainable aspect of fisheries in this country. Lionfish could become a structural component of the menu of restaurants tourists enjoy. However there is still a continuous discrepancy between market and supply. The fluctuation of supply in the market is a major constraint to put lionfish on the menu while simultaneously the uncertainty in demand is a constraint to catch lionfish. It is important to continue efforts to control the lionfish in the

region, including Barbados. This involves continued efforts in training of fisherfolk in fish handling of lionfish as this provides a significant obstacle to fishers (Fisheries Division has supported this with an initiative at the AgroFest 2015 but also with training given to chefs in recent years) but significantly more training needs to be carried. It is also important to improve the public awareness by holding more workshops with local chefs on safe preparation of lion fish as many chefs are still unfamiliar with the myriad ways lionfish could be prepared and encourage more lionfish derby's to improve public awareness and thus build the bridge between supply and demand. It would also be fruitful to promote lionfish hunting tours for tourists interested in (spear) fishing.

Aquaculture developments

Aquaculture (freshwater, brackish water and marine) is globally the fastest growing food-producing sector, and the latest figures for worldwide aquaculture show that it contributes 42 percent of total fish production for human consumption (FAO, 2014). Aquaculture has become increasingly important in meeting the deficit created by declining capture fisheries and it could meet the increasing demand for fish in domestic and international markets. Aquaculture could assist countries in the Eastern Caribbean in terms of supplying food security and employment while decreasing the need for foreign exchange by



Figure 9: Kristina Adams, the owner of Adams Aquafarm, with a crayfish

Source: Author

decreasing fish imports. However, aquaculture is still underdeveloped. The aquaculture sector in the Caribbean in general is not well developed, with significant development limited to the larger Caribbean countries. In value Trinidad and Tobago, Belize, and Jamaica are the largest producers in the region (Masters, 2012).

In the Caribbean region the import of fish and fisheries products shows a steep rise, with an increase of 35 percent in just over a decade. Fish imports are currently about 10 times higher than aquaculture production. The continuing increase in population in the region together with the impact of a more demanding tourism industry and the ongoing promotion of a healthier lifestyles and diets, spurs demand for healthy, safe and high quality food including fish and fisheries and aquaculture products. Considering that Barbados imports much more fish than it produces, there is certainly scope for the aquaculture sector in terms of import substitution.

Barbados is considered a good candidate for aquaculture farms due to the climate which allows year round production, the proximity to both local and foreign markets and the fact that fish demand greatly surpasses market supply. If developed properly, aquaculture can become a major producer of fresh fish on the island, creating food security, employment, foreign exchange, and a lower fish import bill. However, aquaculture is also capital intensive, requires a high level of technical know-how and can be water and energy intensive. Scarcity of suitable land can also pose challenges for aquaculture development in Barbados.

Tilapia farming is considered a worthy option as it is a fast maturing fish, relatively easy to manage, is popular with consumers and is nutritious. Adams Aqua farm, owned by Kristina Adams (Figure 9), is a commercial aquaculture farm producing Red Tilapia and Crayfish for the food industry in Barbados. The farm was set up in 2005 and initially imported the Red Tilapia brood stock in 2006. Since then she has been able to multiply this stock and has not had the need to import further. She has seen a steep increase in production over the last two years as a result of increased external investments after she won the national 'Bank on me' TV show. She produces Red Tilapia, which is a hybrid species of three different types of tilapia, for the local hotel and restaurant industry. It looks similar to snapper and is therefore

often sold as ‘cherry snapper’ or ‘freshwater snapper’ on restaurant menus. Adams Aqua farm does not sell directly to the local hotel and restaurant industry but sells through a processor. The farm produces approximately 1MT of tilapia monthly (Figure 10a), of which 70% is sold as filet whereas 30% is sold as whole fish, but trying to build up to 3 MT. She is currently expanding into producing Red Claw Crayfish, an Australian species and produces approximately 0.5 MT of crayfish a month (Figure 9b).



Fig 10a and b: Cray fish tanks and Tilapia tanks

Source: Author

Adams Aqua farm has engaged in some tours for students and tourists as well as summer camps for young adults to learn more about aquaculture. A large number of tourists visit Barbados every year. A number of these tourists are interested and would want to learn where the seafood they consume comes from. This interest, linked with the current surge to buy local and buy fresh (see for example the recent “slow food” flyer in figure 11b) has created a positive climate for any ventures that connect tourists with aquafarms. Developing interactive tours for tourists (and schools) to visit the aquafarm whereby visitors are educated on all aspects of aquaculture rearing could be a unique and interesting attraction. The visitors could see and or provide help in feeding the fish and fish could be prepared on the spot by local chefs for visitors to taste. The Adams Aqua farm would therefore need improved facilities to accommodate this (viewing tanks with window panes for example see figure 11a), information material, washroom facilities. Another addition would be to have visitors engage in ‘fish your own fish’ from designated tilapia tanks after which the caught fish are prepared on the spot by the local chefs. This will provide a unique and inexpensive opportunity for visitors to catch their own fish. This would also create enthusiasm among schools and students visiting the farm and engage them more actively which is important in Barbados as only a small percentage of the youth is currently interested in working in the agriculture sector. However, this process needs to be carefully designed and monitored (e.g. only in one tank) as pathogens could be accidentally (but easily) introduced by visitors (Bondad-Reantaso and Arthur, 2008)



Figure 11a: Fish tank with window pane

Source: <http://forevervictorygardens.com/category/the-secret-garden/>

11b: a recent message by Slowfood Barbados.

Source: www.slowfoodbarbados.org

In general the aquaculture sector is constrained by lack of proper policy and legal frameworks that give certainty to investors in the sector, expensive feeds, difficulty in obtaining loans, limited hatchery capacity, insufficient trained people, lack of extension services and lack of a value chain approach. There is thus a need for a more holistic approach to develop the aquaculture sector in Barbados.

The Ministry of Agriculture has also expressed an interest to develop an aquaponics demonstration centre. A few small aquaponics farms exist in Barbados but not yet at a commercial level. Aquaponics, a form of sustainable aquaculture combining aquaculture and hydroponics is still in its infancy yet could provide great development potential. Aquaponics is capable of producing fish, fruits and vegetables in a recirculation system that conserves freshwater resources. This demonstration centre would provide training for small-scale aquaponics farmers, educate secondary and tertiary school students and could provide tours for educational purposes for tourists and locals.

Traceability and value adding

For the tourism sector, safe food consumption is essential. Strict fish safety handling procedures need to be according to the regional and international guidelines and should therefore be mandatory throughout the fish chain to prevent contamination and illnesses. A holiday is easily ruined as a result of food poisoning and seafood is more susceptible than other animal products. Improving traceability of fish products in Barbados through the fish chain enhances the trust of consumers (both direct consumers as well as hotels and restaurant).

The fish chain actors depend on the type of fishery. There are various fish fleets in Barbados: longliners and the offshore fleet which target flyingfish (*Hirundichthys affinis*) and large pelagics such as dolphinfish (*Coryphaena hippurus*), tunas (Scombridae), kingfish (*Scomberomorus cavalla* and *Acanthocybium solandri*), and swordfish (*Xiphias gladius*). The inshore fishery is also important with sea eggs and reef fishes (e.g. hinds (Serranidae); Parrotfishes (Scaridae); grunts (Haemulidae); surgeonfishes (Acanthuridae); Triggerfishes (Balistidae) as well as lobster (*Panulirus argus*), conch (*Strombus gigas*) and sea eggs (*Tripneustes ventricosus*). The coastal pelagic fishery is also important for catching jacks

(Carangidae); herrings (Clupeidae); silversides (Atherinidae); anchovies (Engraulidae); ballyhoo (*Hemiramphus* spp.) and small tunas (McConney, 2011). Artisanal catches were found to be the most dominant with 63% of the catch, with subsistence and industrial fisheries contributing 20% and 17% of the catch, respectively (Mohammed et al. 2015). A processing industry has emerged to clean, cut and package these products for local and export markets (Mahon et al. 2007).



Figure 12: High quality tuna (grade 1) destined for a well-known sushi restaurant which tourist frequent handled improperly on metal trolleys which could cause cross-contamination at one of the popular fish markets

Source: author

Landed fish follow a variety of routes. Firstly a part of the fish is prepared for sale (e.g. by boners, butchers, meat saw operator, packer (plant), scalers and skinners) after which direct sellers will further distribute the fish (e.g. hawkers, sales person, vendors, transshippers, wholesaler / exporter). Some fish is also directly bought by processors (e.g. whole tuna) without being prepared. The fish are in principle sold to four categories: 1) directly to consumers; 2) processors; 3) vendors; and 4) to the *Fish Fry*. Processors and vendors will consequently sell the fish onwards to the export market; restaurants and supermarkets. The percentage of the fish that is sold to the

various categories depends on the type of fish. Flying fish is sold for approximately 45% to processors, 25% to vendors, 21% directly to consumers and 9% to the fish fry. Tuna, on the other hand, is sold for 70% to processors, 17% to vendors, 7% directly to consumers and 6% is sold to the *Fish Fry* (Mahon et al. 2007).

The fish are thus handled in various ways by the variety of market outlets which can impact food safety and quality of fish handling. It is important to address shortcomings between small-scale fishers and the hospitality trade and improve quality and reliability throughout the supply chain. To service the tourist market local producers need to find profitable and competitive ways to meet tourism industry demands for volume, quality, regularity traceability, and safety requirements.

International regulations on seafood quality and handling have become more important in Barbados since 1997 with the requirement that all facilities that handle fish for export be inspected and passed by registered inspectors. The Barbados' Strategic Plan 2005-2025 refers to safeguarding Food and Nutrition Security by rationalizing and regulating the fishing fleet and market infrastructure to ensure Sanitary and Phyto-Sanitary (SPS) compliance and adherence to Hazard Analysis Critical Control Point (HACCP) principles as well as to enhance the agricultural health and food safety program. As a result of a request by the Barbados Government to export fish and fishery products to the European Union (EU), the Food and Veterinary Office of the European Commission conducted a mission to Barbados in 2009. They evaluated whether the system in place in Barbados for fishery products was equivalent to those required by the EU and would thus allow fish and fishery products to be exported to the EU.

The report (FAO, 2012) concluded that the system in place did not guarantee that fish and fishery products are produced with a standard that is equivalent to those required by the EU. Underlying reasons listed were; the lack of the requisite legislation, the need for the implementation and maintenance of HACCP based programs from fishing vessels, through landing sites, to markets and processing establishments, the requirement for the establishment of monitoring programs for chemical and

microbiological contaminants, the provision of adequate laboratory facilities and an adequate enforcement system including the need for training of all staff performing official controls.

These failures in quality and food safety of fish handling at various critical points in the fish chain affects the fish consumed by both tourists and locals in Barbados. The type of improper fish handling, as depicted with the high quality tuna in Figure 12, can cause food poisoning and creates a high risk to consumers and shows a poor level of fish handling and processing. Improving the standards of level of fish handling and processing in all parts of the fish chain is therefore critical in further developing the fishery and improving the linkages between fish producers and processors with buyers in the tourist-related markets. Improper handling creates an apprehension among processors and hotels and restaurants to source local seafood products. Processors indicate that hotels and restaurants often prefer imported fish products as they perceive this to have followed a higher standard of fish handling and processing. Improving the quality in fish handling and processing could provide higher benefits for fishers and all those involved in the fish chain.

Common problems of sourcing fish and fishery products locally are well-known- inadequate quality, reliability, or volume of produce, exacerbated by poor transport and lack of communication and information between supplier and buyer (Karunasagar, Ryder and Roessink, 2012). Since the mission by the EU and publication of the report by the FAO in 2012 the fishing sector in Barbados has made several improvements both at the small-scale as well as national level to improve quality and food safety of fisheries. However, as the pictures in Figure 12 indicate, more improvements need to be made and there is a need to improve the traceability system of fish products and advance the fish handling procedures.

Currently there is a regional project being implemented in Barbados (and other Caribbean countries), titled “Support to the Caribbean Forum of ACP States in the implementation of commitments undertaken under the Economic Partnership Agreement (EPA): Sanitary and Phytosanitary measures”.⁵The project is implemented by Inter-American Institute for in Agriculture (IICA), and the Caribbean Regional Fisheries Mechanism (CRFM) is responsible for the fisheries component of the project. This project aims, *inter alia*, to improve the quality of fish products in Barbados. The project is divided into three sub-components: the establishment of a sound and comprehensive national and regional legislative framework; the development and organization of the national and regional institutional frameworks and coordinating mechanisms; and capacity building, and in particular, the capacity needs of environmental monitoring programs for achieving good SPS standards for the fisheries and aquaculture situation in CARIFORUM States.

Barbados has also developed a Sanitization Standard Operating Procedures (SSOP) and Standard Operating Procedures (SOP) Manual for the sixteen landing sites. A laboratory is currently in place for testing and improving food safety. Various types of training are currently being carried out by Barbados National Union of Fisherfolk Organisations (BARNUFO) and one of them covers “Implementing Standard Operating Procedures and Fish Handling (SOPs)” (see Figure 13). This course teaches the importance of SOPs in fish handling. It takes a practical approach and demonstrates the correct way to clean and manage the working environment. This was only for one group of fisherfolk, however, and there is a lot of scope for more training of operators throughout the whole food value chain from vessels to processing and distribution, in good manufacturing and hygiene practices and in undertaking and implementing HACCP systems to meet the requirements of international standards and regulations.

As a result of the recent training of fish vendors they have received “Fish Vendor Checklists” for daily checks on various aspects for the processing area, the chemicals used, clothing, etc. This type of training

⁵This project is funded under the 10th European Development Fund (EDF) programme. The project is implemented by IICA, and the Caribbean Regional Fisheries Mechanism (CRFM) is responsible for the fisheries component of the project.

and use of daily checklists is crucial in internalizing improved handling and quality assurance procedures. However, so far only a small number of fishers and fish handlers have received training.



Figure 13: SOP training of BARNUFO
Source: BARNUFO

In order to improve quality and food safety it is also important to improve the traceability of fish throughout the fish chain. Traceability refers to the ability to trace the history (e.g. date, landing by fisher, name vendors) of fish products. In the case of the fisheries sector, supply relates to *supplier traceability* and *process traceability*. Supplier, referencing to fisher and vendors (as well the skinner / scaler etc.), which ensures that the source of all raw materials/ ingredients can be identified from the records and documentation and *process traceability*, which ensures the ability to identify all ingredients and process records by vendors (chemicals used at the market place) as well

as at the professional processors level. At the processors level traceability appears to be of high standard and records kept are very detailed. At the local level (at fish markets) further improvements need to be made.

Recently, however, a few vendors have been designing their own type of traceability system based on a personal label or a rather rudimentary system of colored stickers which enables the vendor to systematize and eventually trace back the fish if necessary. The sticker cites the date and the color will implicate from which boat the fish came from and who cleaned the fish (vendors make use of different fish cleaners). The entrepreneur is the head of BARNUFO, Vernell Nicholls and she is now training other fish vendors to carry out a similar type of labeling making use other types of stickers (stars etc.) to mark the variance between the different vendors. One individual, a boat owner, has designed his own personal labels for each type of fish he catches (tuna, dolphin, marlin and swordfish). He is the only person with personalized labels (outside of the processing plants) and is also the only fisher selling at the Barbados Agricultural Development and Marketing Corporation Southern Farmers' Market. This market currently runs on the last Friday and Saturday of each month. Primarily, it is to give local farmers and other types of entrepreneurs the opportunity to market their diverse range of products or services. It shows the fish vendors have embraced the increasing need for traceability of the product; however, it is a rudimentary system that needs further expansion. Further training and fine-tuning of the traceability system is therefore necessary. The photos below exemplify the change in work clothing/protective gear worn at the Fish Market in Bridgetown as well as the introduction of the fish vendors to the traceability system with stickers (see Figure 14 and 15).



Figure 14: Vernell Nicholls of BARNUFO explaining vendors on the new labelling system
 Source: Author



Figure 15: In the upper row the bags are labelled with colored stickers by fish vendor Vernell Nicholls, the bottom is packaged by boat-owner Henderson Inness (picture right).
 Source: Iris Monnereau

Fish processing in Barbados has made significant progress over the years. A large percentage of the processing is primary, with the fish being cleaned, filleted and packaged. One processor, Morgan Fisheries, has engaged in value adding of fish products with considerable success as the company has gone a step further to produce secondary products such as fish burgers and fingers, breaded and smoked fish and they have just introduced a fish breakfast sausage and thus engage in value adding in the fishery (see Figure 16). To produce the Fish Wieners for example they use both local fish as well as imported white fish. These products are destined for the local supermarkets although some are also sold to hotels. This type of value adding is certainly an area which needs encouragement as well as less burdensome incentive arrangements if it is to develop further.

Another processing plant is carrying out research and development in terms of turning fish waste into liquid fertilizer which will be sold to farmers in the nearby area. Fish fertilizer is a very good product for promoting plant growth. It's high in nitrogen which can be used for growing plants and can be produced naturally.



Figure 16: Morgan Fisheries and some of their value-added products

Critical issues in traceability and value-adding to be improved are (including some recommendations made in Moore et al. 2014) support to implementation of the SOP Manual in the sixteen landing sites and increased training of fisherfolk (incl. fishers, vendors, cleaners etc.) in all aspects of quality and food safety (fisherfolk should follow mandatory training linked to their fisheries permit). Improving the legislative framework build around the concept of SPS is necessary as legislation on quality and food safety is fragmented and outdated and requires a revision and updating. It is important to implement legislation that meets international standards. Even though Barbados might not be targeting certain export markets, the legislation should still be in place.

Cruise ship markets and the impact of food safety measures needs to be further analyzed to improve linkages between local producers and cruise ships. It should be kept in mind that lead buyers in the cruise industry are unable and unwilling to co-operate with large numbers of fluctuating fish suppliers, and thus require a single interface to facilitate engagement with and mobilization of small-scale fishers. Cruise ships require constant volume and demand of produce. It is crucial to pay attention to the quality and safety of fish being supplied to tourists in Barbados since consumption by tourists is counted as income generating activity in the export market.

Sargassum products

Massive quantities of pelagic Sargassum occurred throughout the Caribbean in 2011, impacting aquatic resources, fisheries, shorelines, waterways, and tourism. Similar events have occurred since then, with a particularly heavy influx of Sargassum observed during 2015 (Doyle and Franks, 2015). Pelagic Sargassum is a brown alga, or seaweed that floats free in the ocean and never attaches to the ocean floor. There are two species of Sargassum involved in the Sargassum influx: *Sargassum natans* and *Sargassum fluitans* (Doyle and Franks, 2015).

Sargassum beds are an important nursery habitat that provides shelter and food for endangered species such as sea turtles and for commercially important species of fish such as tunas. It can therefore act as a Fishing Aggregation Device and attract fish. At the same time it causes damage to the fisheries sector as fishers are not able to go out; interferes with their motors; renders landing sites useless and can change the composition of species in the catches.

The influx of Sargassum also severely affected the tourism industry in Barbados. Authorities have released emergency funding to clean up piles of decaying seaweed so huge and pungent that tourists have cancelled summer beach holidays. The large mats of plant matter attract biting sand fleas and smell like rotten eggs. One large beach resort in Barbados went as far as investing USD\$ 100,000 in a ploy to keep

Sargassum off their beach. They designed and constructed a boom of approximately 335 meters long that floats in the water to prevent Sargassum from reaching the shore.

The underlying causes for the increased presence of Sargassum are still unclear. The seaweed boom that started in 2011 could be the result of warming ocean temperatures and changes in the ocean currents due to climate change. However, others believe it is primarily due to increased land-based nutrients and pollutants washing into the water, including nitrogen-heavy fertilizers and sewage waste that fuel the blooms.

The species of pelagic Sargassum involved in the influx also provide some potential however. The Sargassum is different from sea moss (used for juice) and Sargassum can be used as mulch or compost – by allowing the salt to wash out in the rain and mixing with manure and soil. Collected Sargassum can also be usefully redistributed in areas affected by beach erosion. In Barbados there have been attempts by the Barbadian company BIOGEN to build a Caribbean Seaweed Industry. Currently Biogen harvests the seaweed to produce a particle board, designed and developed from seaweed wood, which can be use in houses or boats (see Figure 17).



Figure 17: Sargassum board and Sargassum soap

Source: Author

BIOGEN also attempts to produce fertilizer out of the seaweed and one of the company's goals is to make use of Sargassum for food. The Sargassum appears in two forms, the yellow seaweed, which is fresh and consumable and could help fight obesity because it brings down your cholesterol, is rich in fibre, is anti-fungal, and supposed to be anticancerous; and the brown seaweed, which is good for agricultural and landscaping purposes, but should not be consumed. BIOGEN have used the yellow seaweed primarily for salads, soup, as a breakfast item, to add to gravy, fish dishes and such like. The texture is like coconut, some persons have made it as shake, with banana and milk. The tourists in Barbados could potentially become a market for these types of products and as a result support livelihoods and benefits to the local population (including fishers) when they collect Sargassum. However, there is no guaranteed supply so building up an industry could prove problematic.

Recreational activities

Gamefishing

Visitors enjoy recreational fishing activities such as gamefishing and spear fishing. These types of fishing provide recreation for visitors and locals as well as fish for consumption in Barbados. The recreational fishery has grown because of its association with tourism. There are three types of fishing which is of interest to tourists: game fishing on charter boats; international game fishing competitions and spear fishing.

There a large number of charter boats with a capacity to fish 25 - 50 km offshore targeting barracudas, tunas, Wahoo, dolphinfish and billfish. Catches of these and smaller recreational boats are not recorded. The charter boats make day trips with tourists. The influx of Sargassum has been posing problems for the charters, as it was hard for them to get out; they would have to go longer distances and equipment would get tangled up.



Figure 18: Four tuna caught in 2015 at the international tournament
Source: Irelan Herrera

Sport fishing for international tournaments in Barbados has a long history, but Barbados Game Fishing Association was formally established in 1961 and moved the sport to organized competitions (Peirce, 2009). The culmination of

all efforts has been Barbados International Fishing Tournament, which was started in 1990. They have now reached the point where the tournament has been accredited as an International Game Fish Association Offshore Championship qualifying event and which allows Barbados to send teams to the annual world championships in Mexico and Costa Rica. Fishing at the tournament in 2015 was considered by the interviewees to be very good, which was believed to be perhaps due to the influx of Sargassum, as for the first time they had 11 yellow-fin tunas (see figure 18). They catch blue marlin, white marlin, sailfish, spearfish and yellowfin tuna. Below 500 lbs the fish are released, above 500 lbs. they kept and are recorded.

The most popular game fishing tournament in the region is in Grenada where the fishing is considered extremely good attracting a large number of foreign boats. A challenge for the Barbados game fishing tournament is the distance to the other eastern Caribbean islands, the lack of fish abundance and the lack of financial means for global and regional advertisement. Improved outreach and better advertisement would ensure more private boats would come to Barbados for the tournament as currently only approximately five 'foreign' boats currently come for the tournament. One or two teams fly down for the event and rent charter boats to participate in the tournament, however, the equipment of these charters is not of the high quality many competitors are accustomed to and can thus not be a source of growth.



Figure 19: Swordfish caught at the 2015 tournament
 Source: Irelan Herrera

Turtle tours and swimming with turtles

The Barbados Sea Turtle Project (BSTP) is based in Barbados at the University of the West Indies. The BSTP has been involved in conservation of the endangered marine turtle species that forage around and nest on Barbados for the past 25 years through research, education and public outreach as well as monitoring of nesting females, juveniles and hatchlings. Turtle nesting occurs on most of the beaches around the island, many of which are heavily developed with tourism

infrastructure providing both challenges and opportunities for sea turtle conservation. Sea turtles are important for the biodiversity of Barbados but also have become an integral part of the attraction of a holiday in Barbados. During a one-hour dive a SCUBA diver can be assured to see at least one hawksbill turtle, and a visitor on a catamaran cruise will likely see several green turtles at the several ‘swim with the turtles’ sites. If a visitor comes during the nesting season he or she has a high likelihood of seeing at least one nesting hawksbill turtle during a 2-week stay at any of the hotels on the south coast. The BSTP have produced guidelines and developed printed materials to inform visitors on how to minimize any potential negative impacts of their visits on the turtles at the “Swim with the Turtles” sites. In 2007, the BSTP’s approach to inclusion of visitors in sustainable sea turtle activities resulted in it being listed in Islands magazine’s Blue List as one of the top 100 sustainable tourism activities on islands anywhere in the world.⁶

Recreational diving

Coral reef ecosystems are vital to the economies of Caribbean countries. Reefs are also an important economic resource as well as homes for commercially and recreationally important species of fish and a recreational locale for diving and tourism activities and healthy reefs are thus crucial. For food, for natural coastal protection and as a basis for tourism, people in the Caribbean are dependent on the services that reefs provide. Storms and hurricanes can damage and remove corals from a reef through direct wave action, or cause indirect damage through abrasion, blocking light and smothering by depositing sediment and rubble. According to the World Resource Institute the Eastern Caribbean’s coral reefs are at extremely high risk from overfishing and pollution. Overfishing caused steep reductions in the populations of herbivores, especially large parrotfishes, which are the most effective grazers on Caribbean reefs. Diving tourism is paramount in Barbados and healthy reefs and an abundance of marine species is crucial for both the fisheries sector as well as recreational activities catering tourists.

⁶ Information taken from the website of the BTSP http://www.barbadosseaturtles.org/pages/about_us/index.html



Figure 20: Reef restoration in Bonaire

Source: Raymon van Anrooy

Reef restoration has been considered an option. An example of reef restoration has been carried out in Bonaire (see Figure 20). The Bonaire Coral Restoration Foundation (CRF Bonaire) is a nonprofit conservation organization dedicated to restore the shallow water populations of Elkhorn and Staghorn corals along the coast of Bonaire and Klein Bonaire.⁷ By setting offshore coral nurseries and transplanting mature Staghorn and Elkhorn coral onto degraded areas, the CRF Project aims to restore a portion of the coastal coral reef of Bonaire. To date, more than 6000 coral fragments are growing in the nurseries in Bonaire and almost 4000 have been already transplanted on the reef by Coral Restoration divers. The restoration creates awareness among the volunteers (e.g. tourists) and educates them on the importance

of coral reef health. To become a volunteer and get involved, divers have to complete the training course and become a certified *PADI Coral Restoration Diver*. Volunteer divers assist the CRF Bonaire staff in the coral nurseries, helping with maintenance activities and transplanting corals to the designated restoration sites. This could thus be an attraction for PADI divers to come to Barbados. A reef restoration project will be carried out in Barbados by the NGO Coral which is funded by the Inter-American Development Bank. Nevertheless, reef restoration projects do not diminish the negative external impacts that already affect coral reef health such as sewage pollution, agricultural run-off, pollution, and coral bleaching as a result of increased sea surface temperatures.

Barbados has a large number of shipwrecks, approximately 200, of which the SS Stavronikita and the wrecks in the Carlisle Bay Marine Park are the most important for SCUBA divers. The SS Stavronikita is the most famous wreck on the island. This purposely-sunk Greek freighter, now part of the Folkestone Underwater Park, hosts a rainbow of huge tube and rope sponges and lies at 36 metres of water.⁸ The Carlisle Bay Marine Park, is not an official marine park but is commonly regarded so. This shallow, calm bay is home to a cluster of wrecks including the Berwyn (a World War I French tug boat that went down in 1919), the Eilon (sunk in 1996), Ce-Trek (a cement boat sunk in 1986), the Bajan Queen (party boat sunk in 2002) and the Cornwallis (a freighter sunk during World War II and relocated to the marine park).⁹ These shipwrecks, which acts FADs are thus very important to attract diving tourism and for marine ecosystem health. In order to improve marine health the BMT has been placing reef balls, another form of FADs, in the sea off the South Coast of Barbados in an effort to support coral reef rejuvenation and as well as provide habitats for fishes and other marine animals.

The establishment of a reef balls garden in Oistins Bay is a means of creating artificial habitat for fish, which will help to build back the fish population in the Bay. Reefballs are man-made, individually created, specially created concrete modules designed to restore ailing coral reefs, attract marine life and create new fishing and scuba diving sites. The reefballs can be used in any combination of number and sizes and are environmentally friendly with a lifespan of approximately 500 years. The BMT placed 30

⁷<http://crfbonaire.org/>

⁸<https://www.padi.com/scuba-diving/scuba-diving-travel/vacation-spotlights/barbados/>

⁹ Ibid.

reef balls into the water along the southern coast to create an artificial coral reef to mimic the natural environment, encourage the growth of new corals, and attract fish to the area. While the reef balls are successful in this way, they tend to be fished by fisher folk, thus reducing their impact and they are not frequented by recreational divers. The BMT has now secured funding from the United Nations Development Program to develop an Undersea Heritage Museum with underwater sculptures for the 50th Independence Anniversary of Barbados (November 2016). An underwater sculpture park has already been successfully in Grenada, where local fishermen provide water taxi services out to the sculpture sites to tourists, and also benefit from terrestrial sculpture generated business, and thus have a sense of ownership/desire to protect them for personal long term gain. The proposed sculpture park in Barbados is supposed to assist in the regeneration of coral reefs; provide a habitat for fish, and provide alternative livelihood strategies for local fisherfolk; while providing unique tourist snorkeling and scuba diving opportunities. The budget available for the sculptures is, however, very limited (USD\$ 40,000) and only a restricted number of sculptures can be designed, build and deployed for this amount. The theme of these sculptures will be ‘the era of slavery in Barbados’. It would therefore be interesting to find additional funding to increase the number of sculptures while also developing sculptures that address the era between the slavery period and now expressing cultural features of Barbados (e.g. a donkey cart, a parish church, ‘out of town’ bus stop sign, and Neptune with the trident).

Financial mechanisms

There are a wide range of possibilities for financing improved linkages between the tourism and fisheries sector. Developments in this area will most likely largely be based on public-private partnerships but also include civil society groups. Existing partnerships for this development have to overcome challenges of shaping a common vision, synchronization of priorities and expectations, enabling collaboration and coordination mechanisms, and forging better understanding and consensus around emerging challenges and opportunities. Private sector investments – in aquaculture, fisheries and tourism- involving both domestic and foreign capital, are an important source of funding. Donor funding can also provide myriad openings and can offer opportunities for improving the environmental sustainability of marine and coastal management, meeting social and economic development needs of the fisheries sector while also improving the tourism sector. Trade-offs between the different objectives of projects might occur nevertheless. Where external financing is required for public investments, NGOs and large environmental funds (e.g. the GEF, TNC) can support national investments in healthy oceans and ecosystems. The list below provides a selection of sources for donor funding for projects in Barbados linking the fisheries and tourism sectors:

GEF Small Grants: Biodiversity

The GEF Small Grants Programme (GEF SGP) is a Corporate GEF Programme implemented by UNDP to provide financial and technical support to communities and civil society organizations (CSOs) to meet the overall objective of “Global environmental benefits secured through community-based initiatives and actions”. Biodiversity is one of the five themes of the GEF Small Grants Programme.

The Barbados Marine Trust has received a small grant from UNDP to support the development of an Undersea Heritage Museum with sculptures. This sculpture park is intended to assist in the regeneration of coral reefs; provide a habitat for various species; protect the shoreline; provide alternative livelihood strategies for local fisher folk; and provide unique tourist snorkeling and scuba diving opportunities.

United Nations Western Central Atlantic Fishery Commission (WECAFC): Aquaculture

The Governments of Antigua and Barbuda, Barbados, Bahamas and St. Kitts and Nevis assign high priority to the development of the aquaculture sector and requested FAO technical assistance to develop their aquaculture sector in early 2015. They stressed that in the development of the sector a value chain approach should be applied, from pond to plate. The project aims to contribute to more efficient and inclusive food and agricultural systems in the selected Caribbean countries, through sustainable development and management of the aquaculture sector and development of selected value chains. The support provided is expected to lead to increased farm production efficiencies, economic benefits, alternative employment opportunities and incomes in the Eastern Caribbean island states and will contribute to improved food security and food import reduction; all key development objectives of the participating governments. The primary target beneficiaries of the project are the small- to medium-scale enterprises, or farms, involved in aquaculture in the four countries. The project proposal is currently under review and the outcome is still unknown.

Barbados Small Business Association

Previously the Barbados Small Business Association has received financing in the amount equivalent to US\$150,000 from the Multilateral Investment Fund, and it intends to apply part of the proceeds to payment for goods, works, related services and consulting services to be procured under the project Development of Tourism Micro-Projects in Barbados. The project will be jointly financed with the Ministry of Tourism of Barbados. The main objectives of this project are: (1) improve the quality of products offered to tourist micro-small and medium-sized businesses in three clusters (Agro-processing, woodworks and small hotels), and (2) improve the packaging, marketing and distribution of indigenous products and services offered to tourists by micro and small businesses in the three selected clusters. Involving the fisheries sector in this type of projects is crucial for example for Sargassum products as well as arts.

Inter-American Development Bank: Integrating Small Farmers into the Cruise Ship Value Chain in Barbados

This project addresses the insufficient technical capacities and limited access to markets small-scale farmers in Barbados face as well as the lack of knowledge that anchor (or buyer) companies have in dealing with low income commercial partners. Increasing skills, engaging farmer associations and formalizing linkages within the cruise tourism/grocery sector value chain, will improve farmer competitiveness. This project does not include the fisheries sector but a similar type of project could facilitate the inclusion and participation of a wider number of fishers in higher value markets.

The Caribbean Export Development Agency

The Caribbean Export Development Agency was established in 1996 as the regional trade and investment promotion agency of the 15 Member States of the Caribbean Forum – CARIFORUM.

The *Small Business Development Act 1999* provides incentives in the form of concessions, technical assistance and credit guarantee to aid in the development of small businesses in Barbados. This relates, for example, to exemption from or reduction of payment of duty on the importation or purchase of raw materials for small businesses. This can be important in the case of developing small scale businesses in Barbados linking the fisheries and tourism sector.

The *Barbados Tourism Investment Inc.* (BTI) is the development agency of the Government of Barbados with special responsibility for promoting and facilitating investment in the tourism and hospitality sector in Barbados.

Conclusions

This report has shown variety of successful linkages between the fisheries and tourism sector in Barbados. Some of them provide great potential to be of interest to other countries in the region (e.g. Antigua has received financial support to set up a *Fish Fry*). Some of the activities however need additional support. Some potential opportunities to explore are:

1. Oistins attracts numerous visitors to Oistins' *Fish Fry* every week and offers a truly Barbadian cultural dining experience in which fish plays a key role with a street party setting for visitors and locals with karaoke and other festive activities as well as stalls with crafts and arts. The *Fish Fry* is a great success from a business and livelihoods perspective. The majority of fish consumed is imported; however, so further improvement for livelihoods and food security lies in improving the crafts and entertainment. It could also be a possibility to: develop a fishing museum, an upgrade of the library, provide guided tours of the market and surrounding areas; while the Barbados Marine Trust (BMT) proposed sea turtle viewing activity and guided tours of the Oistin's Fish Market area;
2. Development of "Seafood City" by the Bridgetown fish market where many tourists pass by to get to and from the cruise ships. This would involve an improved Bridgetown market with already prepared fish consumption products (high end and lower end restaurants), a fishing museum (if not in Oistins) and guided tours of the market with arts and fish soup for sale;
3. Fishermen's week is a week full of activities for fisherfolk and those associated with the industry as well as for outsiders. Some of the main attractions are the fish boning competition, the climb-the-grease-pole competition as well as the crab racing and boat racing competition. These activities could be broadened to attract and educate tourists. In addition, the Tuk band, stilt walking and limbo dancing during the Oistin's Fish Festival have been identified as needing further cultural development;
4. Various activities have been undertaken to eradicate lionfish presence in Barbados resulting in, *inter alia*, lionfish derbies and cook-ups were undertaken to encourage market and public awareness. Initially this was undertaken by the public sector but for 2015 the Lion Fish Derby has been taken over by the private sector with the brand REEF in collaboration with PADI as the organizers in 2015. There is need for continued efforts in public awareness building (workshops with local chefs on safe preparation of lion fish as many chefs are still unfamiliar with the myriad ways lionfish could be prepared and encourage more lionfish derby's) as well as training of fisherfolk in fish handling of lionfish as this provides a significant obstacle to fishers;
5. Considering that Barbados imports more fish than it produces and because of its location there is scope for the aquaculture sector in terms of import substitution. Currently there is only one well-functioning aquaculture farm in Barbados. Improving aquaculture production is important;
6. Development of an aquaponics demonstration center providing training for small-scale aquaponics farmers, educate secondary and tertiary school students while also providing tours for educational purposes for tourists and locals providing an unique and interesting attraction for visitors;
7. It is important to address the current mismatch of supply and demand between small-scale fishers and the hospitality trade and improving quality and reliability throughout the supply chain. To service the tourist market local producers need to find profitable and competitive ways to meet tourism industry demands for volume, quality, regularity traceability, and safety requirements;
8. Traceability and appropriate quality and food safety handling of fish is crucial for the fisheries sector. Some fish vendors have been entrepreneurs, embracing traceability schemes of fish

- products by their own simple system. Although in recent years improvements have been made, more remains to be done in order to export to certain international markets as well as to ensure safe fish consumption in Barbados. Amongst others there needs to be an increase in training of fisherfolk (including fishers, vendors, cleaners etc.) in all aspects of quality and food safety; supporting for a simple yet effective traceability system for fish vendors; a legislative framework build around the concept of SPS. This would build enhance the relationships between the fisheries sector and hotels and restaurants;
9. Cruise ship markets and the impact of food safety measures needs to be further analyzed to improve linkages between local producers and cruise ships. It should be kept in mind that lead buyers in the cruise industry are unable and unwilling to co-operate with large numbers of fluctuating fish suppliers, and thus require a single interface to facilitate engagement with and mobilization of small-scale fishers. In addition, quality and food safety needs to be of a very high standard for the cruise ships to consider buying local processed fish;
 10. Carry out a feasibility study on creation of an eco-label and specific regulations for Barbados fish products (branding and adding value for greening fisheries);
 11. Decreasing IUU fishing in Barbados will ultimately result in a more sustainable fishery, higher benefits for fisherfolk as it contributes to higher rewards throughout the fish chain and increased income for the government as a result of taxes;
 12. The influx of Sargassum in recent years has affected the fishing sector greatly. There could be potential in designing Sargassum food or beauty products for the hospitality industry but also in terms of fertilizer to grow vegetables for the hospitality industry;
 13. Visitors enjoy recreational activities such as gamefishing, spear fishing, swimming with the turtles during catamaran cruises and diving among the shipwrecks. The international game fishing tournament has been a success but needs wider advertisement and public outreach to increase foreign boats participating in the game fishing tournament;
 14. The anticipated Underwater Heritage Sculpture Park proposed by the BMT could provide incentives for local fishers as well as the tourism sector. The budget available for the sculptures is, however, very limited (USD\$ 40,000) and only a restricted number of sculptures can be designed, build and deployed for this amount. The theme of these sculptures will be 'the era of slavery in Barbados'. I think it could therefore be interesting to find additional funding to increase the number of sculptures while also developing sculptures that address the era between the slavery period and now expressing cultural features of Barbados (e.g. a donkey cart, a parish church, 'out of town' bus stop sign, and Poseidon with the trident) with which recreational divers can pose for pictures.

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Chapter 4: Case Study 3 - Belize

Linking Fisheries and Tourism Markets: Belize

Vincent Gillett

Introduction

Background

Marine fish exports, including aquaculture, have historically contributed significantly to the economic and social development of Belize. Income from exports of marine products grew from BZ\$18 million in 1990 to BZ\$26 million in 2014 (Min of Agri., 2003; Stat .Inst. BZ. 2014). The industry is ranked 5th in export earnings for the national economy. The latest available data list the industry's contribution to GDP as 2.2 percent (Gongora, 2012).

While the figures for fishery export are clear, those for domestic consumption are less so. In 1990, 30% of the Fisheries sector's output was consumed by the Tourism Sector (US lib. of cong. doc.). FAO (2005) estimated that 10% of the production was marketed to domestic consumers and the Tourism Sector. A Belize Fisheries Sector Report on the 2014-2015 Lobster Season stated that lobster consumption within the Tourism Sector was unknown (Gongora, 2015). The report noted, however, that most of the lobster fished in the vicinities of Placencia, Ambergris Caye and Caye Caulker was consumed by tourist.

Belize also has a significant tourism industry. Estimates are that tourism accounts for about 16% of the country's GDP and places the tourism sector at the forefront of the country's economic activity (Belize Tourism Policy, 2005).

Apart from the nature and adventure based tourism, Belize has also experienced considerable growth in Cruise Tourism. Since 2003, cruise tourism has brought more than 500,000 day visitors per year to Belize. Growth in income is forecasted to exceed \$39 million in 2015 representing a 21% increase over 2004 cruise ship arrivals and expenditures (Launch pad Consulting & D. Russel, 2005). Total tourist expenditures in 2006, reached nearly BZ\$400 million dollars, which equates to 16.8% of GDP (BTB, 2007). Tourism is the largest contributor to GDP and provides most of Belize's foreign exchange income. The contributions of Fisheries and Tourism to the economy of Belize have been significant. However, little attempt has been made to explore the synergies existing between the two sectors. Growth and development has been pursued separately and policies and institutions have not recognized nor advanced opportunities for cooperation.

Linking fisheries with tourism has become an important goal. It has become a major objective of the Caribbean Community Common Fisheries Policy and has been identified as a strategic goal of the 2013-2021 Strategic Plan for the Caribbean Regional Fisheries Mechanism (CRFM, 2013).

Purpose

The purpose of this study is to identify and document any business relationships that exist between fish producers and processors on the one hand and tourism industry enterprise on the other. It seeks to determine, in the absence of any relationship, if and how this can be achieved. The study will also identify key constraints that need to be addressed in order to advance linkages between the two sectors.

Methodology

The methodology adopted included a review of relevant literature, analysis of fisheries and tourism data and assessment of market information including product/production, product supply and accessibility, consumption, demand, employment, cost and income.

Whilst a review and analysis of the traditional fisheries and tourism data was done, it was determined that two other elements needed to be included in the study. These were sport/recreational fishing and climate change / climate variability.

Recreational-sport fishing is a rapidly growing segment of the Fisheries and Tourism Sectors as is evidenced by its economic value and the broad spectrum of stakeholders involved in the industry.

Climate Change and Climate Variability will influence policy, productivity, fish migration, tourism profile, market opportunities and the long term viability and sustainability of both sectors. These dynamics would be critical to the market integration exercise.

The study also constructed several project feasibility matrices. Here issues from each sector were identified, labeled and prioritized as potentially feasible project ideas for consideration and possible funding in the future - depending on the eventual course of this exercise.

Anticipated outcomes

It is anticipated that the study would have identified and documented at least one instance in which trade linkages were established or, where attempts were made to establish same or, how linkages could be achieved. And, where linkages can potentially exist, recommendations would be made to advance or enhance these through the identification of potentially enabling projects.

Linkages between Tourism and Fisheries

The linkages between the Fisheries Sector and Tourism

This covers two (2) areas, namely:

- Food production
- Recreational activities

Food production activity dovetails with the tendency of tourists visiting Belize to consume seafood. The recreational activities of note are recreational fishing and sports fishing. Both activities provoke broad biodiversity consideration in that both the availability of the fish stocks and the integrity of the ecosystems which supports them become relevant.

The food production activities

This involves the participation of the:

- Capture Fishery Sub-Sector
- Aquaculture Sub-Sector

The Capture Fishery Industry refers to wild caught species from both the marine environment and continental water bodies or inland freshwater systems. Most fishery products that would be consumed by tourists come from the Marine Fisheries Subsector (See Table 3, Fig. 1 and PL1). The main freshwater

species that would be on the market is wild-caught Tilapia (See PL13). A wide variety of imported seafood commodities is also on the market. These include: Tuna cuts (See PL8), salmon portions (See PL9), 'Bassa' or imported Vietnamese catfish fillets (See PL7), scallops (See PL12), crab sticks (See PL11), mussels, squids and clam (See PL14).



PL1: Assortment of Red Snapper and Deep Sea Black Snapper destined for Belize City



PL2: Panoramic view of seafood display in supermarket freezer in Belize City

Commodities that would be available from aquaculture production are Penaeid shrimps and Tilapia (See PLs 5 & 13). Both the Capture Fishery Industry and Aquaculture are export-oriented.

Recreational Activities

Sports Fishing

Sport fishing was the first activity to attract the "specialty" tourist to Belize (Huesner, 1996). This proceeded from the 1950's when keen local fishers would do a "day trip" fishing for King-fish (*Scomberomorus cavall*) and / or Tarpon (*Megalops atlanticus*). After five decades of developing the fishery, Belize is now one of the few countries in the world where fishing enthusiast can perform the "Grand Slam". That is; characterized by sequentially catching a Permit (*Tachinotus falcatus*), a Tarpon (*Megalops atlanticus*) and a Bonefish (*Albula spp.*) in one day. Three of the World's Top Ten Permit Fishing destinations are located in Belize (Huesnerpers. comm).

While these three fish species are much sought after, they are but three of 22 fish species officially designated as "sport fish" by the Government of Belize through Statutory Instrument 14 of 2009.

Stakeholders involved

Stakeholder engagement in the issue of the interrelationship between Tourism and Fisheries development in the exchange of goods and services between the two sectors is critical. Therefore, it is important to identify who these stakeholders are and the role they play in the provision of goods and services.

Recreational-Sport Fishing Stakeholders

Identifying stake holder may be somewhat complicated. They are however, largely determined by the activity or role they play in the sector. In Belize for example, fly fishing is known as "sports fishing", reef fishing, "tourism fishing" and "drop fishing" or "recreational fishing" (Perez-Cobb *et.al*, 2014).

Service providers in the industry are grouped into five types namely; fishing lodge, tour guide, tournament organizer, shop (equipment and accessories) and hotel and resort.

The major stakeholders are the fishing guides, tour guides, boat owners and captains, and fishing lodges and hotels. Lodges act as conduits linking fishing clients with the guides. Hotels traditionally promote a variety of tours including "sports fishing" tours.

It is worthy to note that the leaders of influence are the fish and tour guides who work closely with their membership (Fish and Tour Guides Association) and members of the International Game Fish Association (IGFA) in establishing codes of conduct and ethic within the sub-sector.

Other major stakeholders include the Belize Fisheries Department (BFD) and the Coastal Zone Management Authority and Institute (CZMAI). Both of these entities are responsible for formal management of recreational and sport fishing as defined in the Fisheries Act (Chapter 210 of the Laws of Belize; Revised edition 2000 -2003) and the Coastal Zone Management Act (Chapter 129 of the Laws of Belize; Revised Edition 2000-2003).

Fisheries Stakeholders

The primary stakeholders for the Fisheries Sector are the producers and the organizations associated with the goods and services they provide to the sector.

The primary stakeholders in the Capture Fishery Sub-Sector are the Cooperative Fishermen as well as the independent fishers (See Fig. 1). Primary stakeholders also include the Fishing Cooperatives as institutions, - namely:

- Northern Fishermen Cooperative
- National Fishermen Cooperative Society
- Placencia Fishermen Producers Cooperative Society
- Caribena Fishermen Cooperative
- Rio Grande Fishermen Cooperative

A private, non-fishing cooperative seafood trader has entered the market over the last few years – this is Rainforest Seafood (See PL 5).

The secondary stakeholder for the Capture Fishery Subsector is the retailer of seafood. As shown in Fig. 1 below, these include:

- Supermarkets
- Cooperative processing houses and retail outlets
- Open markets
- Fish landing sites
- Independent fish traders



PL3: Assortment of jacks, groupers and Barracuda at fish landing site in Placencia Village southern Belize



PL4: Barracuda being scaled and gutted for hotel client in Placencia Village in southern Belize



PL5: Locally produced and package shrimp in freezer at center and left and right of frame



PL6: Packaged lobster tails in freezer produced by local Fishing Cooperative

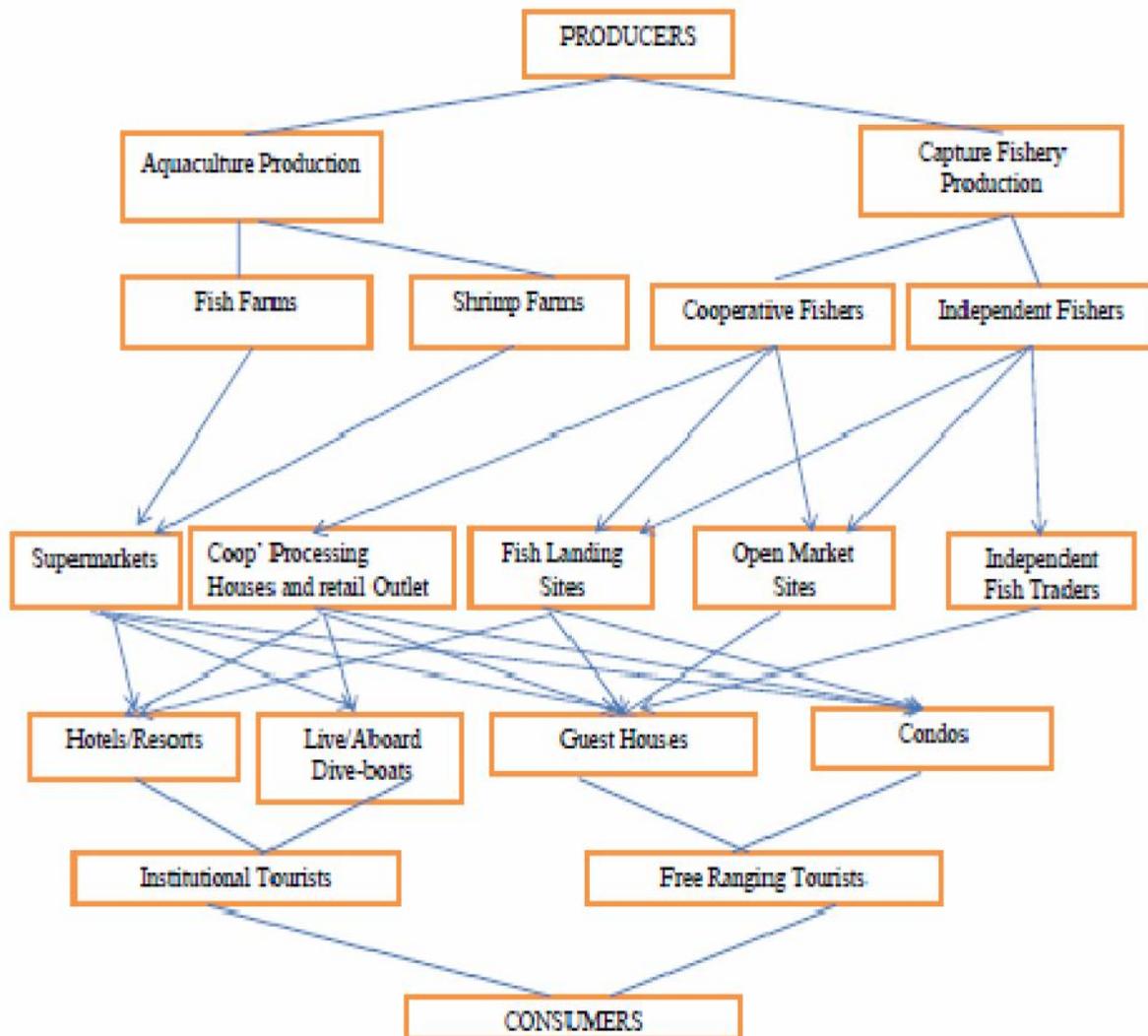


Fig. 1: Fishery Product Value Chain - Focus on Tourism Consumption.

The primary stakeholders from the aquaculture sector are the shrimp farms and fish farms (See Fig. 1). The secondary stakeholder for the Aquaculture Subsector is the retailer and distributor. These are mainly the supermarkets (See Fig. 1).

The tertiary stakeholders are the regulatory arms of the industry. In this case the Belize Fisheries Department and the Belize Agriculture Health Authority (BAHA).



PL7: Imported and packaged 'Bassa' fillets in freezer – Note: 'Bassa' is colloquial name for Pangasid Catfish from Vietnam



PL8: Imported Tuna cuts packaged and on display in freezer



PL9: Imported salmon cuts in upper portion of frame and imported scallops in lower portion On display in Belize City supermarket freezer



PL10: Imported seafood at distal end of freezer in Belize City supermarket



PL11: Imported Crab Sticks on display in freezer of Belize City supermarket



PL12: Imported scallops on display in freezer of Belize City supermarket



PL13: Locally harvested and packaged Tilapia in center of frame flanked by imported ‘Bassa’ fillets at left and right of frame



PL14: Imported green mussels, squid and clams on display in Belize City supermarket freezer

Importance of Tourism and Fisheries in the National Economy

Tourism

GDP contribution

Tourism is the single most important industry in Belize. It contributes significantly to the country's tax revenues and foreign exchange earnings. In 2006 tourism accounted for 16% of GDP. In 2007 GDP was 17% and in 2011 GDP contribution was at 30% (Robertson 2007; NCRIP 2011). A marginal decline of 0.2% was experienced in 2015 as fewer overnight tourists and cruise ship passengers visited Belize in comparison to 2014.

Revenues derived

As shown in Table 1 below, over BZ\$200 million of reported annual tourist expenditures was recorded in Belize for the 1999 to 2006 period

	1999	2000	2001	2002	2003	2004	2005	2006
Tourism Expenditures (BZ \$millions)	222.9	240.4	241.0	265.6	311.4	345.3	349.4	398.8
Tourism Expenditures (% GDP)	15.2	14.5	13.9	14.3	15.9	16.7	15.8	16.8

Table 1: Economic Impact of tourism in Belize: 1999-2006 (Adapted from BTB, 2006)

In 2011 the travel and tourism industry directly contributed BZD 350.6 million (USD 176 million) to Belize's GDP (12.0% of GDP). This primarily reflects the economic activity directly generated by industries supported by tourists, such as hotels, restaurants, leisure industries, travel agents, airlines and other transportation services. The total contribution to GDP in 2011 (including wider effects from investment, the supply chain, and induced income impacts) was BZD 971.9 million (USD 486 million) representing 33.2% of GDP (<https://en.wikipedia.org>)

Employment

Data collected show that employment in tourism rose from one out of every 11 persons in 1998 to almost one out of every seven by 2006 (A. Q. Novelo *et.al.*, 2007). This is summarized in Fig. 2 Below. Travel and tourism directly generated 14,500 jobs in 2011 (10.9% of total employment) and, including indirect and induced effects, supported 40,000 jobs (<http://en.wikipedia.org>). The BTB, in 2007, noted that hotel employment had more than doubled between 1993 and 2005.

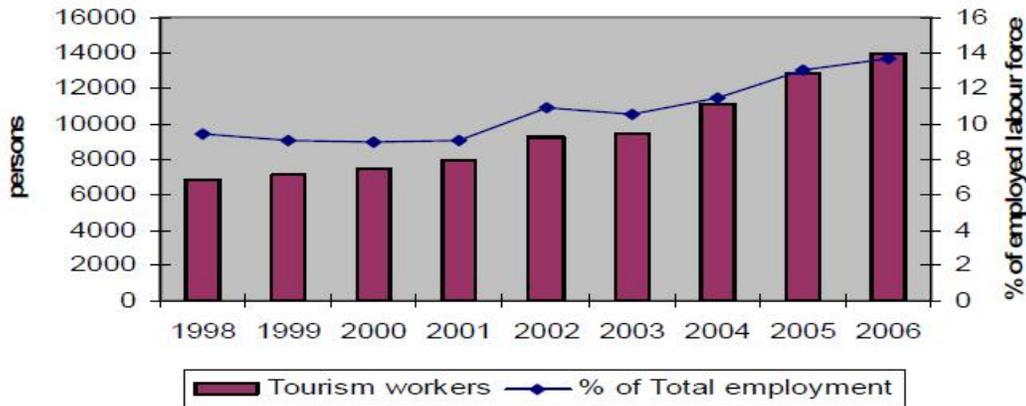


Fig 2: Employment in the Tourism Sector; 1998 -2006

Growth Trends

Tourist arrivals have been growing steadily; growth being heavily influenced by the Cruise Ship industry. Between 1998 and 2006 passenger arrivals rose from 161,183 to 655,931. Average annual growth in overnight visitors was nearly 4.5% from 1999 to 2006 (See Table 2). Overall, from 2002 to 2008, total international visitor arrivals to Belize increased by 18.6%. From 2004 to 2008, however, total arrivals decreased by an average of 6% per year (Tourism Master Plan, 2011).

In October, 2014 Belize reached its first one million visitor mark. This critical juncture has shown a 9.2% increase in overnight visitors, when compared to 2013 overnight total arrivals (BTB, 2015).

Tourist Arrivals	1998	1999	2000	2001	2002	2003	2004	2005	2006
Stay-over ¹	154,928	159,744	172,451	176,033	177,120	209,179	220,359	227,036	237,839
Cruise Ship	14,183	34,130	58,131	48,116	319,690	575,196	851,436	800,333	655,931
Total Arrivals	169,111	193,874	230,582	224,149	496,810	784,375	1,071,795	1,027,369	893,770
Cruise ship % of Arrivals	8.4	17.6	25.2	21.5	64.3	73.3	79.4	77.9	73.4
Cruise Ship Port Calls	25	52	70	48	200	315	406	370	295

Table 2: Stay-over Tourist and Cruise Ship Disembarkations to Belize, 1998 - 2006

Fisheries

Capture Fisheries

The most reliable statistics that are kept for the Capture Fishery Industry are export volume and value. Export earnings between 2003 and 2014 have ranged from BZ\$17.4 Million to BZ\$24.8 Million respectively (See Table 3). As shown in Table 3, these values exclude the contribution of white farmed shrimp. The export volume over this timeframe (excluding white farmed shrimp) ranged from 1.0 Million pounds of fishery products, to 1.6 million pounds.

The value of these statistics hinges on two main issues:

Firstly, they give a good representation of the range of fishery products available to the tourism market. Secondly, for the high value lobster and conch species, there is a greater relationship between the total amount of biomass landed and processed and the quantum of exports relative to finfish. Conch exports in 2014 for example, were 758 thousand pounds while that for finfish were 276 thousand pounds; a fact not reflected in the export statistics, since most of the fin-fishes produced are destined for the domestic market (See Table 3).

Secondly, for the high value lobster and conch species, there is a greater relationship between the total amount of biomass landed and processed and the quantum of exports relative to finfish. Conch exports in 2014 for example, were 758 thousand pounds while that for finfish were 276 thousand pounds; a fact not reflected in the export statistic since most of the fin-fishes produced are destined for the domestic market (See Table 3).

The Fisheries Sector contributed 2.2% to GDP in 2008 (Wade 2010). This value encompasses both the Capture Fishery Sub-Sector and Aquaculture.

The Capture Fishery Sector provides direct employment to over 2,459 fishers and 137 processing plant workers (Villanueva 2015).

Marine Domestic Exports, 2003 - 2014

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<i>BZE \$ Thousand</i>												
Whole Fish												
Quantity (Thousand)	26.39	9.90	7.50	412.20	453.04	2,852.36	1,857.82	989.67	805.51	488.87	651.88	276.71
Value	41.08	12.33	5.38	300.40	734.27	4,353.98	2,103.77	2,565.11	2,725.38	1,489.26	2,764.53	558.19
Fish Fillet												
Quantity (Thousand)	0.06	257.55	296.96	148.07	88.57	55.30	60.29	2.25	-	-	0.63	-
Value	0.40	1,201.73	1,197.09	932.66	400.61	363.30	240.14	3.22	-	-	7.51	-
Lobster Tail												
Quantity (Thousand)	325.46	265.10	183.28	165.72	170.52	206.53	505.00	499.03	632.42	519.19	493.01	452.66
Value	8,692.44	7,377.51	5,301.76	5,601.40	6,058.22	6,967.33	12,693.11	12,525.20	17,586.76	14,993.42	14,070.60	13,993.78
Lobster Meat												
Quantity (Thousand)	210.84	272.85	336.12	232.47	287.75	242.58	-	44.00	32.65	205.67	349	122.55
Value	4,905.51	7,764.85	9,526.99	8,325.52	9,386.64	7,821.31	-	195.50	181.88	568.91	504.7	1,614.64
Shrimps (White Farmed)												
Quantity (Thousand)	16,051.76	17,180.05	19,021.24	15,922.32	6,332.12	7,452.65	10,261.05	11,181.59	10,071.65	10,250.77	14,597.76	14,305.69
Value	32,762.31	85,402.15	74,525.68	62,519.72	20,647.50	21,010.11	28,628.34	31,115.59	20,994.22	28,409.52	84,069.90	36,179.05
Conch												
Quantity (Thousand)	449.71	596.09	546.65	731.95	526.21	623.15	713.85	575.55	801.30	1,119.05	586.84	758.47
Value	3,740.71	5,810.20	7,500.84	8,359.08	5,389.11	6,408.12	7,860.99	6,324.66	8,727.46	11,987.55	11,290.55	8,534.18
Crab												
Quantity (Thousand)	1.46	2.75	4.40	-	2.53	-	-	-	-	1.40	37.54	26.55
Value	25.77	37.85	55.20	-	19.51	-	-	-	-	3.76	90.27	86.77
Ornamental Fish												
Quantity (Thousand)	56.03	117.60	240.59	126.97	88.22	79.95	62.25	33.51	56.67	99.85	256.89	447.67
Value	87.43	180.37	216.16	102.79	232.44	268.91	239.99	165.67	232.83	565.61	620.72	471.61
TOTAL												
LBS	17,065.67	18,584.32	20,400.14	17,612.73	7,861.52	11,432.57	13,398.01	13,292.09	12,347.53	12,584.95	16,771.15	15,943.43
VALUE	110,168.23	107,606.69	98,120.92	86,038.78	42,636.25	46,944.15	51,526.35	52,733.89	50,215.70	57,452.42	112,343.83	110,971.81

Source: Statistical Institute of Belize

Table 3: Fisheries Export Data

Aquaculture

Aquaculture for food production purposes have varied from one (1) to three (3) species between 2003 and 2014. The most significant species in terms of production, volume, and availability is the Pacific White Shrimp (*Penaeus vannamei*). The other two species cultured in Belize are the Tilapia (*Oreochromis niloticus*) and the Cobia (*Rachycentrum canadum*). The latter species went out of production in 2007 due to high feed costs and poor feed quality and consequently low growth performance and decreased yields.

The Tilapia (*Oreochromis niloticus*) like the White Shrimp (*Penaeus vannamei*) is still in culture. Over the last year however, production is still insignificant to the extent that no export production has been documented for 2014 (See Table 4). The White Shrimp has been the longest species in culture in Belize and accounted for over ninety percent (90%) of the production.

Export revenues from aquaculture varied from BZ\$ 92.7 Million in 2003 to BZ\$ 86.2 Million in 2014 (See Table 4). Kehr et al reported that the White Farmed Shrimp (*Penaeus vannamei*) accounted for over 80% of total Fishery Product Export revenues in 2007. In 2014 this amounted to 77. 8% (See Table 4).

Year	Aquaculture Production Volume and Value (Farmed Shrimps)	
	Volume(X 103 lbs)	Value (BZ\$ X 103)
2005	20,400 lbs	\$ 98,121
2006	17,612 lbs	\$ 86,039
2007	7,861 lbs	\$ 42,636
2008	11,433 lbs	\$ 46,944
2009	13,398 lbs	\$ 51,526
2010	13,392 lbs	\$ 52,739
2011	12,348 lbs	\$ 50,216
2012	12,585 lbs	\$ 57,452
2013	16,771 lbs	\$ 112,344
2014	15,944 lbs	\$ 110,972

Table 4: Aquaculture exports (After Statistical Institute of Belize)

Sport / Recreational Fishing

Economic Value of Industry

Felder and Hayes (2008) estimated that fishing for Bonefish (*Albula vulpes*), Permit (*Trachinotus falcatus*) and Tarpon (*Megalops atlanticus*) in Belize generated gross revenue of USD 28 million in 2007, of which USD 15 million was earned in annual salaries and wages.

Employment

The fishery provides support for 13 fishing lodges which supports the employment of some 1,864 persons, at least 100 of whom are independent fishing guides (Felder & Hayes, 2008).

Trends going forward

Projections are that the industry will continue to grow. While Bone fish (*Albula vulpes*), Tarpon (*Megalops atlanticus*) and Permit (*Trachinotus falcatus*) are the overwhelming target of sport fishermen other reef fish namely, the lane snapper (*Lutjanus synargris*), the Mutton snapper (*Lutjanus analis*) and the Yellowtail snapper (*Ocyurus chrysurus*), form part of the targeted species.

Growth is reflected in an overall increase in sport fishing license fees collected by the Coastal Zone Management Authority (See Table 5) since implementing its sport fisheries administration and licensing program.

Year	Number of licenses	Annual Income (BZ\$)
2012	2,280	92,820
2013	1,299	61,400
2014	2,687	112,230

Table 5: Annual Sport fishing license issued and Income.

In addition, the Belize Tourist Board is heavily promoting sport fishing for fishing lodges nationally and internationally through its marketing department. Importantly, Felder and Haynes (2008) predicts that by the end of this decade annual sport fishing revenue may reach or exceed USD 300 million if the quality of the fishing is maintained and the practice of catch-and-release is continued.

Relationship between fish production, processing, packaging, warehousing / storage, distribution and marketing

Aquaculture

The two (2) species being cultured for food production at a commercial scale are the Pacific White Shrimp (*Penaeus vannamei*) and the Tilapia (*Oreochromis niloticus*). Currently thirteen (13) farms are in operation in Belize only one of which - a fish farm - operates on an industrial scale (See Table 6).

A number of the shrimp farms in Belize are vertically integrated with a hatchery or seed stock production facilities, a processing plant and the production ponds or on-growing systems. The hatcheries are designed to supply the seed stocks that would be stocked into the production ponds: The processing plants process the harvested produce from the ponds.

Farm	Operational Status (As of Dec.31, 2014)	ASC Certification (As of Dec. 31, 2015)
Aqua-Mar Shrimp Farm	√	√
Aqua-Sur	√	
Bel-Euro Aquaculture Ltd	√	√
Belize Aquaculture Ltd	√	√
Cardelli Farms Ltd	√	√
Destiny Aquaculture Ltd	√	
Four Hands Aquaculture Ltd	√	
Haney Farm	√	
Paradise Shrimp Farm Ltd	√	√
Royal Mayan Shrimp Farm Ltd	√	√
Tex-Mar Shrimp Farm Ltd (North)	√	√
Tex-Mar Shrimp Farm Ltd (South)	√	√
Tropical Aquaculture Investment Ltd (TAIL)	√	

Table 6: Status of Shrimp Farm Certification

After processing, packaging and warehousing shrimps are marketed as ‘Fresh Frozen’ products.

The vast majority of shrimps are marketed overseas – mainly to the United States and to a lesser extent the Caribbean and Europe. A small and indeterminate proportion of the shrimps produced remain in Belize. This is marketed to consumers in general, including the tourism market (See Fig. 1).

Over the last three to four years much of the farmed shrimp production from Belize was marketed to Mexico in an unprocessed form. Once harvested from the ponds, shrimps are iced and transported by Mexican Container Trucks across the northern border to lower Yucatan, including the City of Merida for processing and marketing (Pers. Comm. R. Quintana).

All of the shrimp processing plants in Belize have been HACCP Certified by the Belize Agriculture Health Authority (BAHA).

Farmed Tilapia is marketed as fresh-frozen fillets. Most of this is exported to the United States with a limited amount being left on the local market.

Most of the farmed shrimps and Tilapia produced are marketed through the supermarket (See Fig. 1). Apart from fresh-frozen tails, at least one shrimp farm has gone into further processing to produce a range of value-added forms – these included:

- Headless – shell on
- Peeled Pull Vein
- Ez-Peeled
- Peeled

The processed and packaged farmed shrimp and Tilapia are available in Belize City, Belmopan, the District Towns and much of the larger villages and cayes within the country.

There are no special or strategic marketing arrangements between the farms and the supermarkets for shrimps and Tilapia. There are also instances where middle-men retailers operate between the farms and supermarkets: These middle-men also supply directly restaurants.

Capture Fishery Industry

Fishery products on the domestic market from Capture Fishery sources derive from two (2) main streams, viz:

- Formal organized sources
- Informal sources

The formal source is the fishing cooperatives which process, package, store and market their products under strict industry standards mandated and enforced by BAHA under the BAHA Act Chapter 211 of the Laws of Belize.

Fishery produce are supplied to the Fishing Cooperatives Processing Houses by fishers who are members of the cooperative. There are two main Fishing Cooperative Processing Houses in Belize: the National Producers Cooperative Society Limited and Northern Fishermen Cooperative. These processing centers are located in Belize City with receiving stations in the south of the country. Commodities processed, handled and marketed by these cooperatives include:

- Lobster or Spiny Lobster (*Panulirus argus*)
- Conch or Queen Conch (*Strombus gigas*)
- Stone Crab (*Minnipe mercenaria*)
- Shrimps or Marine Shrimps including the Pink Shrimp (*Penaeus duorarum*), the Caribbean White Shrimp (*Penaeus schmitti*) and the Brown Shrimp (*Penaeus aztecus*)
- Finfishes (a number of grouper (Serranidae) and snapper (Lutjanidae) species, jacks (Carangidae), mackerels (Scombridae), and barracudas (Sphyraenidae)

The production volume and export value of these species are detailed in Table 3. These products are marketed as fresh frozen commodities. The processing houses have a ‘Retail Outlet’ to deal with local purchases including those establishments servicing the tourism sector. The vast majority of the Capture Fishery production is destined for the export market.

Produce from the informal stream are distinguished by the lack of any meaningful processing intervention. These markets are supplied by both Cooperative and Independent Fishers (See Fig. 1).

Production from the informal stream is generally sold at ‘Open Market Sites’ and ‘Fish Landing Sites’ in Belize City and other coastal municipalities, as well as in the Capital City of Belmopan (See Fig.1). Produce also reaches the public through ‘Independent Fish Traders’ (See Fig. 1). Fish Traders are

instrumental in moving fishery produce from the coast to inland market locations such as the Twin Towns of San Ignacio and Santa Elena, as well as Belmopan City and Orange Walk Town.

Recreational / Sports Fishing

Background

All kinds of fishing including spin, fly, cast, trolling - can be experienced all year long along the coast of Belize; from the Port Honduras in the south to Rocky Point on Ambergris Caye in the North. Any of the many rivers which empty into the Caribbean along Belize's coasts can guarantee a daily catch. The estuaries, inlets and mouths to the many rivers are known for their tarpon (*Megalops atlanticus*), snook (*Centropomus* spp.) and jacks (*Caranx* spp.). The lagoons and grass flats are known for the bonefish (*Albula vulpes*) permit (*Trachinotus falcatus*) and barracuda (*Sphyraena*). The coral reefs support groupers (*Serranidae*), snappers (*Lutjanidae*), jacks (*Carangidae*) and barracuda (*Sphyraenadea*) while the deeper waters of the drop off are home to sailfish (*Istiophorus alicans*), marlin (*Makaira nigricans*), bonito and pompano (*Alectis ciliaris*). Most types of fish can be caught year-round; from a dock, in tidal flats or in blue water hundreds of feet deep.

Geographic scope

Sport / recreational fishing for Bone fish (*Albula vulpes*), Tarpon (*Megalops atlanticus*) and Permit (*Trachinotus falcatus*) is done along the entire coast of Belize, from Ambergris Caye in the north to Punta Gorda in the south. Bone fish (*Albula vulpes*) and Permit (*Trachinotus falcatus*) are primarily caught in the shallow back reef flats whereas Tarpon (*Megalops atlanticus*) are caught in creeks, channels and rivers.

Species

While anglers primarily target the Bonefish (*Albula vulpes*), Tarpon (*Megalops atlanticus*) and Permit (*Trachinotus falcatus*), the Belize Fisheries Department (BFD) has identified and designated in S. I. 114 of 2009, 22 species of fish as "sport fish". However, the number of recreational fish species targeted and caught exceeds this number (See Table 4) as documented by Perez-Cobb *et.al*, (2014).

Habitat and Distribution

Bonefish

The habitats for Bonefish (*Albula vulpes*) are the sand flats along the coast and cays. In Northern Belize they are found around the coastal sand flats on the eastern side of Ambergris Caye and the Cayo Francis and San Pedro Lagoons, and along the coastal mainland - from Midwinter's Lagoon to the Belize River. In Southern Belize and the outer Atolls, they occur on the sand flats around the south small cayes and the windward side of Black Bird Caye. They appear to be more abundant in Northern Belize than in the south.

Spawning aggregations of Bonefish occur in deep water within a few miles of the Belize Barrier Reef. Spawning peaks during the full and new moons in March and April of each year.

Permits

The Permit (*Trachinotus falcatus*) inhabits sandy beach flats and open sand flats throughout the Belize Barrier Reef region; particularly in the central reaches of the Barrier Reef Lagoon and the Turneffe Islands.

Spawning aggregations occur every month from February through October during full moons in deep water promontories within the Bacalar Chico Marine Reserve area, the southern end of the Turneffe and Light House Reef Atolls, and Gladden Spit.

Tarpon

Tarpons (*Megalops atlanticus*) occupy wetland habitats including most mangroves around cayes, along coastal lagoons and mangrove fringe along river mouths. They are particularly prevalent along river mouths in Southern Belize; from the Sarstoon to the Sibun River.

After years of residence in wetlands, juvenile Tarpons (*Megalops atlanticus*) migrate from wetlands to coastal flats and estuarine habitats. In Northern Belize, this includes the Shoals of Lowery Bight, the Bulkhead Shoals of Ambergris Caye and most of the river and creek mouths.

Tarpons (*Megalops atlanticus*) also spend some time in fresh water; including rivers and inland fresh water lagoons. They then move from the fresh water lagoons to the open waters of the Belize Barrier Reef Lagoon where they take up residence around some cayes or in the tidal cuts, back reef flats and the many channels and canyons of the reef of Turneffe, Lighthouse and Glovers Reef Atolls.

Tarpons (*Megalops atlanticus*) spawn during annual aggregations, thought to occur near the new and full moons of late spring and summer. This is thought to occur some 75 miles east of the mainland of Belize.

Species	Fly Fishing	Reef Fishing	Local Recreational Fishing	Blue-water Fishing
<i>Albula vulpes</i>	X			
<i>Balistes vetula</i>		X		
<i>Caranx hippos</i>	X			
<i>Trachinotus falcatus</i>	X			
<i>Centropomus undecimalis</i>	X		X	
<i>Coryphaenahippurus</i>				X
<i>Istiophorus platypterus</i>				X
<i>Makaira nigricans</i>				X
<i>Tetraodon lineatus</i>				X
<i>Lutjanus analis</i>		X		
<i>L. apodus</i>		X		
<i>L. cyanopterus</i>	X	X		
<i>L. jocu</i>		X		
<i>L. synagris</i>		X		
<i>Ocyurus chrysurus</i>		X		
<i>Megalops atlanticus</i>	X			
<i>Acanthocybium solandri</i>				X
<i>Katsuwonus pelamis</i>				X
<i>Scomberomerus cavalla</i>				X
<i>S. maculatus</i>		X		X
<i>Thunnus atlanticus</i>				X
<i>T. obesus</i>				X

<i>Epinephelus itajara</i>				X
<i>E. fulvus</i>		X		
<i>Mycteroperca bonaci</i>		X		
<i>Sphyraena barracuda</i>	X	X		

Table 7: Target Fish Species Captured in Recreational Fisheries

Fishing practices

Fishing practices are cleverly described by A. Perez (2012) in his work on characterization of the recreational -sport fishing in Belize.

The sport fishery is categorized based on five distinct parameters including; 1)geographic area; 2) fishing objective; 3) fishing method and gear; 4) geomorphology of the fishing ground; and 5) motivation (competition). Based on these parameters, the Recreational-sport fishing is seen to be comprised of four fishing types; Sport *Fishing*, Reef *Fishing*, “*Recreational Fishing*” and Deep Water *Fishing*. In the first three instances fishing is normally conducted in shallow water whereas, in the last instance it is conducted in deep blue water.

The **Recreational fisher**, primarily for snook (*Centropomus spp.*) may, depending on location, target their fish from a motorized vessel or from a dock or pier. The gear of choice is "Spinning" with weight and live bait or "Casting" with artificial bait.

The traditional **sport-fisher**, fishes mostly for Bonefish (*Albula vulpes*), Permit (*Trachinotus falcatus*) and Tarpon (*Megalops atlanticus*). Depending on location and distance, Bone fish (*Albula vulpes*) and Permit *Trachinotus falcatus* are caught with rod and fly bait (fly fishing) Tarpons (*Megalops atlanticus*) are more commonly caught by deploying fly fishing gear or trolling in the rivers.

Reef fishers targeting Yellowtail Snappers (*Ocyurus chrysurus*), Barracuda (*Sphyraena barracuda*), Lane Snapper (*Lutjanus synagris*) Cuberas Snapper (*Lutjanus cyanopterus*), etc., fishing along the reef or within the reef pelagic zone, or among coral patches or in artificial habitats spin, troll, or drop fish using weight and live bait.

Deep Water fishing is when big game offshore fishers -including competitive international fishers- fishing in motorized vessels hunt (using trolling gear) big game fish such as Marlins (Istiophoridae), Dolphin fish (*Coryphaena spp.*), skip jack tuna (*Katsuwonus pelamis*) and tuna (*Thunus spp.*).

Supply and Demand scenario for the Fisheries Sector

The supply and demand scenario for seafood products specific to the tourism sector remains unknown. It may be surmised from the dimensions of the tourism sector that the volume and value of fishery products consumed is significant. Although it is believed that most of the fishery products consumed by the sector are from domestic production, there are some fishery products that are imported. This includes salmon cuts (*Salma spp.*), Bassa or Pangasid Catfish fillets, scallops (*Pecten spp.*) and Green Mussels (*Perna spp.*).

The consumption of fishery products can be divided into two sub-sets, viz: those consumed by tourists in formal establishments, such as major hotels, resorts and live-aboard dive boats - and those consumed by tourists who do much of their own food preparation. Most products consumed by tourists in formal establishments are purchased from supermarkets and Fishing Cooperative Retail Outlets (See Fig. 1). Those tourists who do their own food preparations purchase their fishery products from the full range of

retail outlets, viz: supermarkets, coop processing houses / retail outlets, open market locations, fish landing sites and independent fish traders (See Fig. 1).

Governance Framework

Fisheries Department

The Fisheries Act – Chapter 210 of the Laws of Belize provides the legal foundation for the management of the sector. The Act empowers the Minister responsible for Fisheries to appoint any Public Officer as a Fisheries Officers for the purposes of implementing the Act (See Fisheries Sec. 4, Sub-Sect 1). The Minister is also empowered to make Regulations for implementing the operational details, or activities, of the Act (See Sec. 12) including functions such as education, enforcement, scientific research and monitoring and prosecution for fisheries offenses.

Institutional Arrangements

The Fisheries Department falls within the Ministry of Fisheries Forestry and Sustainable Development (MFFSD). Therefore, issues related to the enunciation of policy, planning and legislation are enunciated and endorsed by the Central Administration of the Ministry.

The implementation of decisions taken by the Central Administration of the Ministry takes place at the Departmental level under the supervision and direction of the Fisheries Administrator. The Fisheries Administrator is answerable to the Chief Executive Officer of the Ministry who is in turn responsible to the Minister.

Coastal Zone Management Authority (CZMA)

Organizational relationship within MFFSD

The Coastal Zone Management Authority and Institute is but one of two institutions from the public sector that has legal responsibility for regulating and administering the recreational-sport fishery. Both institutes are under the Ministry of Forestry, Fisheries and Sustainable Development (MFFSD). The MFFSD is comprised of seven departments and units including; 1) the Department of Fisheries; 2) the Department of Forestry; 3) the Department of the Environment; 4) the Sustainable Development Unit; 5) the Climate Change Office; 6) the Coastal Zone Management Authority and Institute; and 7) The Protected Areas Conservation Fund (PACT).

Structure and function of CZMA

Structurally, the CZMA operates at two levels: ‘Institutional’ and ‘Organizational’. Fig. 3 below show the separation between the ‘Institution’ and the ‘Organization’ showing a clear vertical hierarchical arrangement, and reporting relationships and flow of information, between the two except in the case of the Advisory Council that reports to the Board of Directors through its Chairperson. Operationally, the CZMA or ‘Authority’ is directly charged with policy formulation, issues relating to the legal framework, and overall operations, administration, and accountability. It thus operates closely with and within the institutional framework. That is, in association with the Board of Directors, the Advisory Council and, in accordance with the provisions of the CZMA Act (Adopted from CZMAI Draft Strategic Plan: 2015-2030).

The implementation, monitoring and reporting functions of decisions taken by the Board take place at the Authority / Institution level under the supervision and direction of the Chief Executive Officer (CEO) of the CZMAI. The CEO is thus directly answerable to the Board of the Authority.

Legislation

The legislation of record is the Coastal Zone Management Act which was enacted in 1998. The purpose of the Act is to provide for improvement in the management of Belize's coastal zone. It did this by establishing the "Authority" and the "Institute" and, a Board of Directors to control and manage the affairs of the Authority and Institute.

Relevant to this study is the creation of the only piece of regulation that emanated from the CZM Act; Statutory Instrument No 115 of 2009 which established sport fishing regulations which gave the CZMA the authority to issue licenses and collect fees from persons engaged in sport fishing activities and set conditions governing sport fishing.

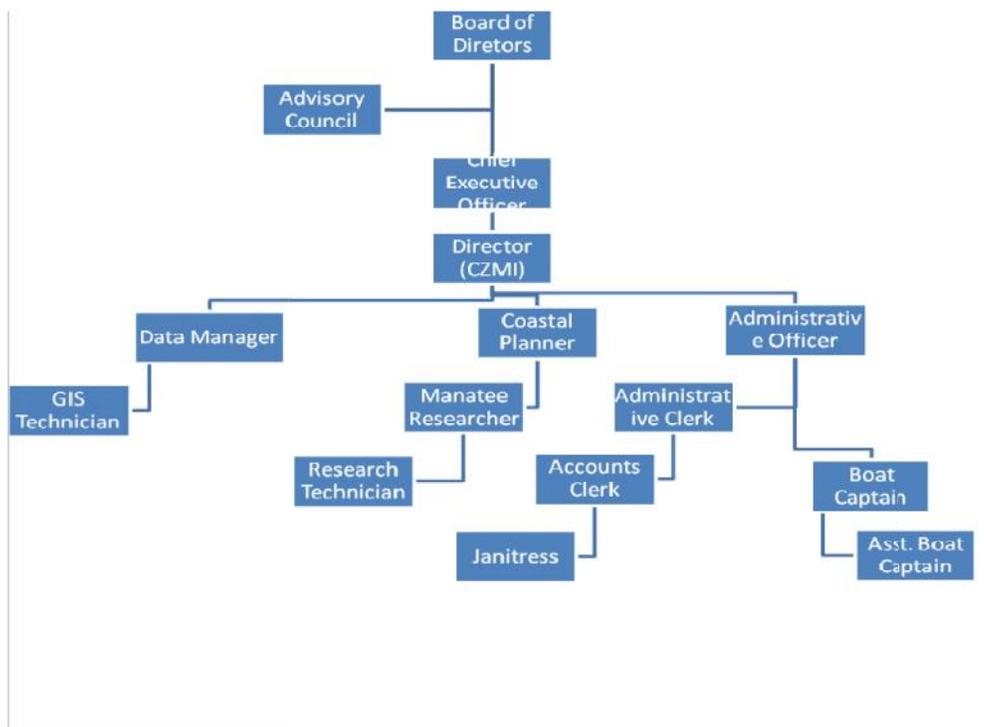


Fig 3: CZMAI Organizational Structure

Plans and Policies

The plans and policies of the CZMAI are focused on developing a lead organization that is engaged in promoting, directing, supporting and executing programs and actions that result in the sustainable use and planned development of Belize's coastal resources: a view that is cogently expressed in the Institution's Mission Statement. In this regard, the central pillar on which policies are built is the Authority's National Integrated Coastal Zone Management Plan. This document was completed in 2013 and is expected to be accepted by the Legislature sometime in December, 2015.

In furthering the Plan and other policies, the CZMAI is preparing to develop and implement a "*Sport Fishery Management Plan and Accompanying Regulatory Framework*". This is but one of a series of six (6) Strategic Objectives and twenty (20) Specific Objectives identified in the CZMAI 2015-2030 Strategic Plan document (CZMAI, Draft Strategic Plan:2015-2030).

Tourism

Tourism Governance Structure

Belize's tourism governance framework is ordered amongst a set of stakeholders from the public, private and civil sector, which are active in undertaking several tourism development initiatives (see Table 8). Fundamental to this, is the Ministry of Tourism which is the policy making body that is also responsible for legislation, coordination, implementation and enforcement of policies (Belize Tourism Policy 2005).

Public	Private	Civil (Social & NGO)
Ministry of Tourism and Civil Aviation	Belize Tourism Industry Association	Belize Audubon Society
Ministry of Natural Resources and the Environment	Belize Chamber of Commerce and Industry	Southern Environmental Association
Ministry of Forestry, Fisheries and Sustainable Development	Belize Hotel Association	Programme for Belize Green Reef
Ministry of Works	Belize Cruise Industry Association	Healthy Reefs
Belize Tourism Board	Belize National Tour Operator Association	APAMO
National Institute of Culture and History	Belize Tour Guide Association	National Garifuna Council
Coastal Zone Management Authority		
Forest Department		
Protected Areas Conservation Trust		
Belize Trade and Investment Development Service		

Table 8: Belize Key Tourism Stakeholders by Sector
(Adapted from National sustainable-Belize tourism master plan 2030)

Structure and function of Belize Tourism Board

The Belize Tourism Board (BTB) is a body appointed by the Minister of Tourism that is responsible for planning, developing and marketing the tourism industry of Belize. As described in the National Sustainable Tourism Master Plan (GOB, 2011), the Board creates programmes to increase tourist traffic to Belize and encourages the development and promotion of capacity building programmes for those employed in the industry. The Board also works closely with its sister agencies which include the Ministry of Tourism & Culture, National Institute of Culture & History (NICH) and Border Management Agency.

The Board of Directors of the BTB is comprised of ten members, nine of whom belong to the private sector including the Belize Tourism Industry Associating (BTIA) and the Belize Hotel Association (BHA). The Minister of Tourism is the Chairman of the Board.

Plans and Policies

The plans and policies of Belize's Tourism are formulated to improve the quality of life of the local population, satisfy the need of the tourist and fostering a positive environment for the industry. Strong local participation is promoted ensuring that planning and management are based on partnership and collaboration agreements.

The policies and strategies are summarized and classified in the following documents:

- A Tourism Strategy Plan for Belize (1998)
- Belize Tourism Policy (2005)
- Belize Cruise Tourism Policy
- Belize Tourism Board Action Plan (2009/2010)

Legislation

The governing legislations supporting the tourism industry are summarized below.

- **Belize Tourism Board Act (2000)**
This Act created the Board and outlines its composition, powers and responsibilities.
- **Belize Times Share Act (2007)**
This Act describes the laws that monitor the time shares used for tourism accommodations
- **Belize Hotels and Tourist Accommodation Act (2000)**
The registration process for accommodations, standard applicable, and the legal stipulations for adhering to the guidelines are describe here
- **Belize Hotels and Tourist Accommodation Act Subsidiary Laws(2003 revised)**
These provide a supplement to the primary act, specifying the requirements for various types of tourist accommodations

Challenges to Development

Capture Fisheries and Aquaculture

Although both Capture Fishery and Aquaculture industries form a significant part of the national economy, there are a range of challenges that needs to be surmounted for continued growth and development to be realized. These challenges are as follows:

4.1.1 There is a paucity of data (range of species and product form, quantum and value) on the consumption of fishery products by the tourism subsector (See Table 3).

4.1.2 There is the need for the sustained monitoring and assessment of the quality of seafood purchased at establishments catering to tourism sector (See Fig. 1). This is especially relevant to ‘Open markets’ and ‘Landing Sites’(See Fig. 1) and to fishery products from Capture Fishery sources (See Fig. 1).

4.1.3 The absence of any feasibility assessment for certification and eco-labeling of seafood and in general fishery products that would be destined for the tourism market. The ‘Certification’ and ‘Labelling’ of seafood has implications for pricing. Some effort has been expended by the Aquaculture Certification Council (ACC) and the World Wildlife Fund (WWF) in regards to some of the shrimp farms in Belize.

Box 1

Fishers in Tourism

Marine Protected Areas (MPAs) are strongly believed to be a legal and effective fisheries management tool. Benefits of its application are especially evident in "No-take" zone.

Some fishers are however conflicted by them, through loss of fishing ground suffered in their creation and their perceived greater benefits to the tourism industry.

However, some fishers have also shifted their livelihood strategies, with the encouragement and support of the Fisheries Department, to tourism in light of reduced opportunities in Fisheries.

Options are however diverse; the more affluent fisher may opt to use his boat for recreational fishing, whereas the less affluent subsistence fisher may find employment as a tour guide or fishing-tour guide.

4.1.4 The need to capitalize on all potential sources of seafood demand including exploring the potentials of sourcing seafood from Belizean producers by the Cruise Tourism Sector.

4.1.5 There are a range of opportunities that would increase revenues for the Belizean seafood industry; particularly for value-added production and processing.

One shrimp farm in Belize produces a wide range of value-added product forms that include:

- Heads on – shell on
- Headless – shell on
- Peeled Pull Vein
- Ez-Peeled
- Peeled

This farm is located in the south of the country but the overwhelming majority of the production is destined for the export market. There is no definitive marketing strategy by the farm to attract greater participation of the Belizean market, particularly in regards to the tourism economies.

4.1.6 Any attempt to introduce and strengthen ‘Certification’ and ‘Labeling’ initiatives should be accompanied by adjustments in legislation. The Fisheries Act and Regulations would therefore need to be amended to accommodate any proposed ‘Certification’ and ‘Eco-labeling’ response contemplated.

4.1.7 The impacts of Climate Change and Climate Variability (CCCV) will prove to be increasingly pervasive and macroscopic. These impacts are expected to accrue on two fronts: Firstly the infrastructure supporting the production systems and secondly the stocks themselves.

In regards to the Capture Fishery Industry – both the fishing tackle immediately associated with the capture and landing of fish will be impacted, as will the standing support infrastructure. The latter entails largely fishing camps, piers, potable water repository and store houses. The fishing tackle ranges from boats, to traps to anchored seines, and buoyed horizontal and vertical long-lines. The standing fishing infrastructure in Belize also includes the super-efficient ‘Beach Trap’.

These impacts are created largely by hurricanes, tropical storms and strong winds independent of these systems. In the case of the latter, there has been much displacement and loss of lobster traps associated with the Cold Fronts or ‘Northerlies’ which impacts Belize generally from October to March. The south-easterlies are also characterized by relatively strong winds that blow for a couple days uninterruptedly and even a week and beyond in extreme cases. The effect of these south-easterlies on fishing activity has been documented (Mahon, 2002) as displacing and transporting traps to areas where they become lost to fishers. Apart from the loss of fishery production to fishers, these traps continue to fish in a phenomenon known as ‘Ghost Fishing’, which has negative implications for stock depletion and in general biodiversity.

Apart from the immediate fish stocks themselves, the habitats and ecosystems supporting commercial species and populations are also impacted. These include the big three tropical ecosystems: mangroves, seagrass beds and coral reefs. The mangrove ecosystems are most severely affected with heavy sedimentation of their root systems, defoliation and consequent die-off (Mahon 2002).

The impacts of CCCV on coral reefs are more cumulative and long-term. These include bleaching events and diseases associated with elevated water temperatures (Mahon 2002). Much of the habitat and species associated will however, adapt over time to the gradual changes in environmental conditions associated with CCCV (Mahon 2002). This however does not obviate the scope for impacts to some finfish and macro-invertebrate species that are of commercial importance to fisheries and tourism development.

The impacts of CCCV to fish life include influence on spawning events, migration patterns, maturation and survivorship.

The impacts of CCCV are similar on aquaculture. Both the support infrastructure and species have been and will continue to be impacted. The standing infrastructure includes hatcheries, larvae-culture and on-growing containment facilities such as tanks, raceways and ponds.

The impacts on captive stocks are expected to be as pervasive and significant as they are on wild stocks. These impacts are not all negative: For example the increase in water temperature predicted for CCCV has positive implications for both farmed fin-fishes and invertebrate stocks.

Given the foregoing it would thus be imperative to assess and monitor the effect of CCCV on the life history, distribution, behavior and abundance of commercially important snapper and grouper species (See Table 10 below).

4.1.8 It has been suggested that the poorer classes of society are more vulnerable, in relation to their livelihood and the place where they live, to the effects of Climate Change and Climate Variability (CCCV).

The poor often live in areas, usually low-lying areas that are prone to flooding, and / or exposed to the ravages to winds and waves, where they are disproportionately exposed to the effects CCCV.

Much of the poor are involved in economic activities, such as agriculture, forestry and fishing, for their livelihood. These activities are to be increasingly impacted by CCCV as time progresses. A 2012 CRFM sponsored study on the incidence of poverty among fishers in the Caribbean has showed that poverty is widespread among fishers in Belize.

Thus from a vulnerability perspective there would be need for some intervention to alert fishers to the existence of CCCV and build capacity among fishers and to invest them with the knowledge to adapt and cope with the impacts of Climate Change and Climate Variability.

4.1.9 Over the last two (2) decades a number of unsuccessful attempts have been made to generate a comprehensive national policy to guide the development of a national fishery. Such a document should in principle address the connections and synergies between the fishing industry and tourism in regards to the question of seafood availability. This document could contribute to the national policy initiative to provide a rational framework for the development of the industry.

Sports Fishing

Branding and Certification

With the importance given to the economic value of the industry and the strong conservation ethics employed by sport fishers and managers, consideration should be given to expanding its scope and value through an application for "Branding" Belize as a prime sport fishing destination. This would be especially relevant to the capture of Bonefish, Permit and Tarpon as relatively strong management is instituted through the FD, and the CZMA. Importantly, stakeholders at every level have bought into applying best fishing practices, principally Catch and Release (C&R). Strong Collaboration with the Ministry of Tourism, BTB, FD, CZMAI, Belize Sport Fishing Association (BSFA) and the International Game Fish Association (IGFA) would greatly enhance a successful outcome of this venture. Certification of sport fishing lodges and tour operators who vigorously practice C&R is an option that should be considered.

Enforcement

Sports Fishing Sub-Sector

The Fisheries Department (FD), under the Fisheries Act and through S.I 114 of 2009, has the responsibility for the allocation and protection of the targeted species and enforcement of the regulations. The Coastal Zone Management Authority, through S.I.115 of 2009, is responsible for issuing licenses and collection of fees. Service providers are also required to comply with several other formal rules including guides requiring a national tour-guide license or a national fly-fishing license, or a tour -operator license issued by the BTB. Boat Captains license and boat registration license, administered and issued by the Belize Port Authority are also required. Additionally, there are codes of conduct and ethics, which are information and guidelines given by the service providers and practiced by the recreational sport fishers. In spite of this, enforcement is notoriously difficult. And, while service providers report that there was surveillance by FD and Belize Defense Force / Coast Guards, one study has at least shown that there is no statistically significant difference between those who claimed they had some interaction with enforcement agencies and those who don't (Perez, Cobb *et al.*, 2014). There is clearly a need to expand on surveillance patrols and compliance within the industry.

Impacts of Climate Change

Belize is highly vulnerable to the effects of climate change. Projected impacts for Belize include a 7 - 8% decrease in the length of the rainy season, a 6-8% increase in the length of the dry season and a 20% in the intensity of rainfall. Other expected impacts include increased erosion and inundation of coastal areas, increased sea temperature and sea level rise, flooding and an increase in the intensity of and occurrence of hurricanes (NCRIP, 2013). It is further anticipated that there will be significant beach and land loss particularly in the northern part of the country, including Ambergris Caye and Caye Caulker (CARIBSAVE2012).

Impacts of Climate Change on recreational-sport Fisheries sub-sector

Most habitats, including coral reefs, sea grass beds, mangroves and littoral forest are vulnerable to climate change events including sea-level-rise (SLR) and increases in water temperature. SLR will impact fish production if coastal wetlands and other habitats that serve as nurseries are lost. Shallow water areas, including the "Sand Flats' along the coast and around the cayes, would vanish or be diminished. SLR would also exacerbate the process of coastal erosion and salinization of aquifers, increase flooding risk and the impact of severe storms along the coast.

Climate change impacts on infrastructure and sport fishing activities

Significantly, service providers within the sector live largely within coastal communities; 50% of the Belizean population resides near the coast. They therefore depend heavily on the road network to bring in supplies and "clients" to them. Severe flooding in 2008 and Hurricane Richard in 2010 had, among other things, isolated many coastal communities, destroyed roads and generally gave rise to an economic slowdown, negatively impacting growth and development in the country.

Climate Change impacts on fish behavior (spawning, migration)

Warm waters are a primary cause of coral bleaching. The loss of coral impacts fish diversity and fish population size. Warm water and changing ocean circulation alters the time of spawning which could also lead to higher fish mortalities. Evidence also suggests that fish species are migrating pole-ward as sea temperatures rises (Nurse, 2011).

Impacts of Climate Change on the Tourism Sector

Tourism is one of the most important industries in Belize contributing significantly to tax revenues, foreign exchange earnings and, the overall economic growth of the country. The Belize National Tourism Master Plan-2030 records that in 2008 tourist arrivals, including overnight and cruise ship visitors, was about 845,000 persons, contributing Bz\$563 million to the Belize economy (GOB, 2011). In 2014, at least one million tourists entered the country (BTB, 2014). Most of Belize's tourism is marine based; 70% of hotels are located in the coastal zone. Reef based activities attract more than 80 % of tourist who want to visit the cayes and reefs for snorkeling, diving or fishing. Evidently any decline in marine tourism will have a direct impact on the economy of the country.

The vulnerability of coral reefs is among the most significant threat to the tourism sector. This vulnerability is directly related to rising sea levels, increasing temperatures (and coral bleaching), and the increasing frequency and intensity of tropical storms (R. B. Richardson 2007). Several other impacts have been linked with the forces of climate change, including loss of coastal land, coral reef mortality (or coral bleaching), ocean acidification, changes in the productivity of agriculture and forestry, risks to human health, and risks to physical infrastructure.

An assessment of the economic impact of climate change on Belize's tourism sector has been done and estimated at BZ\$48.3 million, which included the effects of reduced tourism demand and the loss of facilities (from sea level rise), beaches (from coastal erosion) and reef-based ecotourism (GOB, 2013 in: *National Climate Resilience Investment Plan [NCRIP]*)

Given tourism's emphasis on marine related products and activities, environmental change, for example along cayes, reefs, or in river valleys affecting fishing and boating activities could be highly damaging to local communities. This outcome has been fully documented by Allen Perry (2004) in his paper "Sports, Tourism and Climate Variability". Belize and other Caribbean Island States for example are experiencing an epidemic wherein large accumulations of *Sargassum* have invaded ocean areas, many beaches and coastal lands. A condition attributed to climate change induced shifting ocean currents and rising sea temperatures.

Shown in Table 9 below is a summary of the major implications for tourism destinations. It is highly likely that some of these direct effects of climate change, and their subsequent indirect effects, would have an impact on Belize.

Impact	Implications for Tourism
Warmer temperatures	Altered seasonality, heat stress for tourists, cooling costs, changes in: plant-wildlife-insect populations and distribution range, infectious disease ranges
Increasing frequency and intensity of extreme storms	Risk for tourism facilities, increased insurance costs/loss of insurability, business interruption costs
Reduced precipitation and increased evaporation in some regions	Water shortages, competition over water between tourism and other sectors, desertification, increased wildfires threatening infrastructure and affecting demand
Increased frequency of heavy	Flooding damage to historic architectural and cultural assets, damage to

precipitation in some regions	tourism infrastructure, altered seasonality (beaches, biodiversity, river flow, spawning aggregations)
Sea level rise	Coastal erosion, loss of beach area, higher costs to protect and maintain property, waterfronts and sea defenses
Sea surface temperature rise	Increased coral bleaching and marine resource and aesthetic degradation in dive, snorkel and fishing destinations
Changes in terrestrial and marine biodiversity	Loss of natural attractions and species from destinations, higher risk of diseases.
Soil changes (such as moisture levels, erosion and acidity)	Loss of assets and other natural resources, with impacts on destination attractions

Table 9: Main Impacts of Climate Change and their Implications for Tourism

(Adapted from Sandra Sookram (2009): The impact of climate change on tourism in selected Caribbean countries)

Potential Project Areas

There are a range of possibilities arising from the TOR for this undertaking. These span issues immediately related to food production and indirectly to management and conservation of bio-diversity. The issues as outlined earlier, relate to capture fishery, aquaculture production plus sport and recreational fishing.

Capture Fishery

This relates to capturing wild-caught fish for immediate human consumption. There are a range of potential project areas which includes the following:

5.1.1 The scope for improving data collection, analysis and reporting with respect to consumption, use and value of fishery products. This should bridge the challenge identified in Section 4.0 above regarding the paucity and absence of data and information. It would additionally, better position management to make informed decisions relating to the connections between capture fishery production on the supply side and tourism on the demand side (See Table 10 No. x).

Project Ideas	Feasibility Criteria					Cumulative Score
	Cost	Time-frame	Complxty	Stkhldr Support	Policy Priority	
(i) Assess and monitor volume, value and range of seafood consumed by tourists	2	2	1	3	3	11
(ii) Assessment of volume and value of imported vs. domestically produced fishery products	2	2	2	2	2	10
(iii) Quality assessments of seafood at establishments catering to tourism sector	1	1	1	3	3	9
(iv) Feasibility assessment for certification and eco-labelling of seafood for tourism market	1	2	1	2	2	8
(v) Assessment of scope for sourcing seafood in Belize for Cruise Tourism Sub-Sector	3	3	3	2	2	13
(vi) Feasibility assessment of scope for value-added production for tourism market	2	2	2	1	2	9
(vii) Legislative amendment of Fisheries Act and Regulations to accommodate Certification and Eco-labelling provisions	2	1	2	2	2	9

(viii) Monitor effect of climate change on life history, distribution, behavior, abundance of snapper and grouper species	1	1	1	1	2	6
(ix) Assess impacts of hurricanes and extreme weather events on income and livelihood of fishers	2	1	1	2	1	7
(x) Build capacity among fishers to cope with the impacts of Climate Change and Climate Variability	2	2	2	2	2	10

Table 10: Feasibility assessment of potential project ideas – Capture Fishery food consumption
Key: 1 = Least favorable; 2 = Moderately favorable; 3 = Most favorable. **n.b.** Complxty = Complexity; Stkhldr = Stakeholder

BOX 2

OCEANA's "Fish Right Eat Right" Initiative

Interestingly, on January 26, 2016 OCEAN Belize launched an initiative to promote the consumption of seafood that is caught using sustainable harvesting practices. Targeted are the restaurants, hotels and local consumers.

Additionally, given that Belize is a tourism destination, the programme especially targeted tourist who are being encouraged to eat healthy seafood that has been prepared by local businesses.

Oceana's Communication Director declared that the programme will, in the future, result in the branding of restaurants, hotels and resorts that provide their customers with what has been sustainably caught.

This thrust for improved data should also include statistical material on the quantity of seafood imported for the tourism market (See Table 10 No. ii).

5.1.2 The need for sustained monitoring and assessments of the quality of seafood purchased at establishments catering to the tourism sector (See Table 10 No. iii and Fig. 1).

5.1.3 A feasibility assessment for certification and eco-labeling of fishery product for the tourism market (See Table 10 No. iii). The Capture Fishery Industry in Belize is largely managed within the context of 'Sustainable Stewardship'. The added values that may accrue to fishery produce from 'Certification' and 'Environmental Labelling' schemes have not been explored in Belize.

5.1.4 The need to explore the potential of sourcing seafood from Belizean producers by the Cruise Tourism Sector (See Table 10 No. v): The Fishing Cooperatives are ideally positioned to take advantage of such a market, if there is buy-in from the Cruise Tourism side.

5.1.5 The need for value-added product forms in regards to pre-cooked and package-friendly presentations (See Table 10, No. vi). Much of Belizean seafood is retailed fresh, or fresh-frozen (See PL 1, 3, 4, 5, 6 & 13). The intervention of 'Easy to Prepare' value-added preparations needs to be fully investigated (See Fig. 1).

5.1.6 Legislative amendment in regards to the Fisheries Act and Regulations to accommodate Certification and Eco-labeling provisions (See Table 10, No. vii). Any measure directed at development and implementation of 'Certification' and 'Eco-

Labelling’ would need to be supported by appropriate legislation.

5.1.7 Monitor the effect of climate change on the life history, distribution, behavior, abundance of snapper (Lutjanidae) and grouper (Serranidae) species (See Table 10, No. viii): These are prime finfish species that are in high demand by the tourist market.

5.1.8 Assess the impacts of hurricanes and extreme weather events on the income and livelihood of fishers (See Table 9, No. ix). Predictions are that as hurricanes and tropical cyclonic systems become more frequent and severe, fishers and fishery production are expected to be impacted. This relates to both the loss of fishing opportunity in terms of days or weeks worked, as well as to the loss of fishing tackle, boats and infrastructure such as fishing camp and piers.

5.1.9 Build capacity among fishers to cope with the impacts of Climate Change and Climate Variability (See Table 10, No. x). Fishers are within that strata of society that may be significantly impacted by Climate Change and Climate Variability (CCCV).

Sports Fishing

Strengthen coordination between Fisheries Department and CZMA to improve enforcement in regards to sports fishing

Of the several actions that can be taken, the most outstanding is co-ordination of Fisheries Department's and Coastal Zone Authority's surveillance and enforcement programmes. The coordination of compliance efforts would result in reduced surveillance cost and, better compliance.

Project Ideas	Feasibility Criteria					Cumulative Score
	Cost	Time-frame	Complxty	Stkhldr Support	Policy Priority	
Strengthen coordination between Fisheries Department and CZMA to improve enforcement in regards to sports fishing	3	3	3	1	1	11
Scope for marketing campaign based on highlighting sustainable Fisheries management framework	1	1	2	1	3	8
Assess and monitor effects of Climate Change on four main species viz: Tarpon, Bonefish, Permit and Common Snook	1	1	1	1	2	6
Monitor the effects of Hurricanes and other extreme weather events on income, livelihood of tour guides and fishing lodges	1	2	1	1	2	7

Table 11: Feasibility assessment of potential project ideas – Sport Fishing

Key: 1 = Least favorable; 2 = moderately favorable; 3 = Most favorable. **n.b.** Complxty = Complexity; Stkhldr = Stakeholder

Scope for marketing campaign highlighting the sustainable Fisheries management framework

Generally the fisheries sector operates within a succinct sustainable management framework. The Coastal Zone Authority's management is also conservation based. These are important policy statements which

can be used to support a marketing campaign directed at enhancing and expanding the social and economic benefits of the recreational-sport fishery.

Assess and monitor the effects of Climate Change and Climate Variability on four main Sports Fishing Species viz., Tarpon, Bonefish, Permit and Common Snook

Given that sport fishers, particularly "anglers" target the Tarpon (*Megalops atlanticus*), Bonefish (*Albula vulpes*) and Permit (*Trachinotus falcatus*) and to a lesser though increasing extent the Snook (*Centropomus* spp.) and, given that these fish species frequent, at various stages of their development critical habitats that are considerably vulnerable to climate change and climate variability and, given the economic value of the fishery and the number of Belizeans who are dependent upon it for their livelihood, priority efforts should be directed at assessing and monitoring the effect of climate change and climate variability on these four species such that relevant adaptation or mitigation measures could be considered. Furthermore, an assessment of the economic vulnerability of the fishery should be undertaken to consider the exposure of the tourism system to the hazards of climate change as well as the adaptive capacity of communities to overcome them.

Assess and monitor the effects of Hurricanes and other extreme weather events associated with Climate Change and Climate Variability

These are long term and probably continuous programs. Ideally however, they may be undertaken under the country's National Tourism Vulnerability and Capacity Assessment Programme or Coastal Zone's National Integrated Coastal Management Plan.

Aquaculture

There are a number of project ideas that are pertinent to the Aquaculture Sub-Sector in the context of the TOR currently being attended. These are as follows:

5.3.1 Development of National Policy and legislation to guide the course of development of the industry (See Table 12, No. i). There is no overarching policy guiding the development of aquaculture in Belize. Furthermore, no legislation guides the development of the industry. An aquaculture policy should now identify the opportunities presented by the significant tourists inflows to Belize.

Project Ideas	Feasibility Criteria					Cumulative Score
	Cost	Time-frame	Complexity	Stkhdr Support	Policy Priority	
(i) Development of National Policy and legislation to guide course of development of the industry	1	1	2	1	3	8
(ii) Evaluating scope for eco-labelling of aquaculture produce	2	2	2	1	2	9
(iii) Feasibility study on expanding aquaculture certification from a few production locations to all the shrimp farms and fish farms	3	3	3	1	2	12
(iv) Strengthening data collection systems specific to aquaculture production information	2	2	2	2	3	11
(v) Aquaculture suitability survey to identify sites for small scale aquaculture	1	1	1	2	1	6

production for the local market						
(vi) Disaster Preparedness Plan for the sector as a proactive measure to cope with the impacts of Climate Change	2	2	3	1	2	10
(vii) Industry research on local feed ingredients to lower feed costs for small scale fish farmers	1	1	1	3	3	9

Table 12: Feasibility assessment of potential project ideas – Aquaculture production consumption

5.3.2 Evaluating the scope for Green Labelling of aquaculture produce (See Table 12, No. ii). Generally, the production systems employed tend towards the ‘greener’ end of the production spectrum. This is so for both penaeid shrimp culture as well as Tilapia husbandry.

5.3.3 Feasibility study on expanding aquaculture certification from a few production locations to all shrimp farms and fish farms (See Table 12, No. iii). This would entail the expansion of the Aquaculture Certification Council (ACC) and the World Wildlife Fund (WWF) Eco-Certification programme from the current eight shrimp farms to the remaining five operations (See Table 13).

Farm	Operational Status (As of 31 December 2014)	ASC Certification (As of 31 December 2015)
Aqua-Mar Shrimp Farm	√	√
Aqua-Sur	√	
Bel-Euro Aquaculture Ltd	√	√
Belize Aquaculture Ltd	√	√
Cardelli Farms Ltd	√	√
Destiny Aquaculture Ltd	√	
Four Hands Aquaculture Ltd	√	
Haney Farm	√	
Paradise Shrimp Farm Ltd	√	√
Royal Mayan Shrimp Farm Ltd	√	√
Tex-Mar Shrimp Farm Ltd (North)	√	√
Tex-Mar Shrimp Farm Ltd (South)	√	√
Tropical Aquaculture Investment Ltd (TAIL)	√	

Table 13: Status of Shrimp Farm Certification

5.3.4 Strengthening data collection systems specific to aquaculture production information (See Table 12, No. IV). Data is invaluable in providing the information necessary to inform and guide policy formulation and legislation in identifying a path linking the fisheries and tourism sub-sector.

5.3.5 Aquaculture suitability survey to identify sites for small scale aquaculture production for the local market (See Table 12, No. v). This would impact positively on the volume and range of species being farmed and, the working class Belizean in terms of employment and income generation.

5.3.6 Disaster Preparedness Plan for the sector as a proactive measure to improve resilience in regards to the impacts of Climate Change (See Table 12, No. vi). This would relate to the standing infrastructure which supports the aquaculture production process and, the potential loss of farmed stocks in low-lying flood prone areas.

5.3.7 Industry research on local feed ingredients to lower feed costs for small scale fish farmers [See Table 12, No. (vii)]: This is an imperative if small-scale producers are to become relevant servicing the Tourism Market for aquaculture produce.

Tourism

Coordinate promotional efforts with the BTB and Ministry of Tourism to ‘Buy in Belize’, including Belizean seafood that are eco-labelled

The Fisheries sector could buy into the vast experiences of the BTB to collaborate on and develop a project to “Brand” Belize as a recreational-sport fishing destination. A sub-component of such a proposal would include a "Buy in Belize" element that would promote and encourage tourists to purchase "eco-labeled" Belizean seafood.

Project Ideas	Feasibility Criteria					Cumulative Score
	Cost	Time-frame	Complxty	Stkhldr Support	Policy Priority	
Develop and implement coordinated promotional efforts between the BTB and Fisheries Dept. to ‘Buy in Belize’ for fishery products	1	2	2	2	2	9
Develop Certification Programme for Catch-and-Release species, viz: Tarpon, Bonefish and Permit	2	1	2	1	2	8
Develop project for data sharing between BTB and Fisheries Dept. in regards to the quantum and range of seafood consumed by tourists	3	3	3	1	2	12
Build capacity among tour guides, tour operators and hoteliers in regards to the linkages between Fisheries and Tourism	2	2	2	2	2	10
Develop and implement public awareness programme in regards to linkages between conservation of biodiversity and tourism	2	2	2	1	2	9

Table 14: Feasibility assessment of potential project ideas – Tourism

Key: 1 = Least favorable; 2 = Moderately favorable; 3 = Most favorable. **n.b.** Complxty = Complexity; Stkhldr = Stakeholder.

Develop Certification Programme for Catch-and-Release species focused on Tour Guides

Service providers in the sport-recreational fishery have bought into the conservation principles driving the catch and release practice legislated. The economics of this practice is also largely understood. These principles can be further enhanced through the development of a certification programme for the fishing lodge operator, tour operator and tour guide who is exceptional in promoting and enforcing the catch-and-release-fishing practice.

Develop project to assess the viability of supplying the Cruise Tourism Sub-Sector with locally produced food

Cruise ship companies are anxious to enter into partnership with local suppliers providing that they are able to meet market demands and produce products of high quality. The fisheries sector working with the Ministry of Tourism, the BTB and the Fishing Cooperatives should develop a project to assess the viability of supplying the cruise ship companies with locally produced seafood.

Develop project for data sharing between BTB and Fisheries Dept. in regards to the quantum and range of seafood consumed by tourists

There is currently no data which unequivocally sites the amount of sea-food consumed by tourists. A project must be formulated, between the BTB and the FD, relating to tourist visitors and the quantum, price and range of seafood consumed.

Project Selection for Case Study

Develop project selection framework to identify more viable projects

The range of project possibilities needs to be prioritized within the context of the TOR. The general approach taken is to generate a simple Project Feasibility Matrix in the various topical areas described in Secs. 5.1, 5.2, 5.3, & 5.4 above. These matrices are outlined as Tables 10, 11, 12 & 14. From these matrices the two more viable projects identified under each of the topical areas are as follows:

- Capture Fishery Subsector – Food Consumption
 - Assessment of scope for sourcing seafood in Belize for Cruise Tourism Sub-Sector
 - Assess and monitor volume, value and range of seafood consumed by tourists
- Aquaculture Sub-Sector – Food Consumption
 - Feasibility study on expanding aquaculture certification to all the shrimp farms and fish farms
 - Disaster Preparedness Plan for the sector as a proactive measure to cope with the impacts of Climate Change
- Sports Fishing Subsector
 - Strengthen coordination between Fisheries Department and CZMA to improve enforcement in regards to sports fishing
 - Scope for marketing campaign based on highlighting sustainable Fisheries management framework
- Tourism Sector
 - Develop project for data sharing between BTB and Fisheries Dept. in regards to the quantum and range of seafood consumed by tourists
 - Build capacity among tour guides, tour operators and hoteliers in regards to the linkages between Fisheries and Tourism

Specific Case Study Project

As seen from Sec. 6.1 above, there are eight potential projects that would be most feasible under the four subject areas. The project that has been selected, within the context of the TOR, is: ***‘Assess and monitor volume, value and range of seafood consumed by tourists’***. This project is a component of the Capture Fishery Subsector and has been chosen because it is felt that it would get greater political buy-in at the Ministry Level. Also, it is felt that the project would be more congruent with the needs and policy orientation of both the Capture Fishery and the Tourism Sectors.

Project Design

Given the general lack of data and information across the board for the various project ideas (See tables 10, 11, 12, & 14), it is important to design a project that would yield the information required and should explicitly be reflected in the project identified. The project identified as: ‘Assess and monitor volume, value and range of seafood consumed by tourists’ should do so. Traditional components such as purpose, operational objectives, methodology, time-frame, results and resources to execute this project would be

further elaborated in term of project design, which, it is supposed, has been captured in the proposed project log frame presented in Table 15 below.

Project Title: Qualify and Quantify Tourism Seafood Consumption **Target Area:** National Scope

Duration: April 2016 – September 2016

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Assumptions
Goal: ‘Assess and monitor volume, value and range of seafood consumed by tourists’	Volume and value of fishery products consumed by tourists known	Final Project Report	MFFSD and Min. Tourism committed to effecting public policy on issue
Purpose: Evaluate amount of fishery product consumed by tourists to effect synergies between Fisheries Sector and Tourism	Improved cooperation and coordination between Fisheries and Tourism Sectors	Monthly reports verifying MOUs on data sharing between the sectors	Improving synergies between the sectors are a priority for senior management
Outputs: (i) Evaluate total amt. fishery product consumed by tourist on annual basis (ii) Determine amt. imported fishery product consumed vs. that produced in Belize (iii) Assess types of fishery products (iv) Determine importance and range of retail outlets (v) Determine Marketing strategy	(i) Poundage fishery products consumed by tourists (ii) Value and quantum seafood imported (iii) Identification range fishery products (iv) Identification diversity retail outlets (v) Qualified marketing strategies	(i) GST Returns Hotels & Resorts (ii) Customs Entry Log (iii) Project specific survey report (iv) Project specific survey report (v) Project specific survey report	- Cooperation and support by stakeholders to accommodate very surveys, esp. hotels and resorts, Customs and GST Offices and supermarkets - Stakeholder can be assured that sharing of sensitive and confidential data and info will not pose any problems
Activities: (i) Survey of tourism establishments and retail outlets to determine tourism consumption (ii) Canvas Customs Dept. and Importers to determine range and volume of imports (iii) Survey of fishers, Fishing Coops and Fish Farms to determine volume and value of domestic seafood production and consumption (iv) Sample survey of establishments and individuals marketing seafood to accurately qualify range of marketing strategies	(Budget BZ\$) Travel and Subsistence \$ 6,500 Office Expenses \$ 2,100 Report Production \$ 1,200 Consultant Rate \$45,000 Contingency \$ 980 Budget Total \$55,780 -		Project would be supported in part by Foreign Donor as part of MFFSD Cap IIIB Budget submission Precondition: Political buy-in and support by HODs, CEOs and Ministers of MFFSD and Min. of Tourism

Table 15: Proposed Project Log Frame

Conclusion and Recommendation

Both the tourism and the Fisheries sectors expect that they will experience further growth following decade of success. Neither sector has however, expressed any desire to join forces, to create an alignment that would market fishery products for the tourism market. There is no strategic marketing arrangement to produce fishery products directly for tourist consumption. Nor is there any definitive marketing strategy to attract greater participation of the Belizean fishery product producers to tourism economies. Evidently, there is a paucity of knowledge about the existing opportunities and how best to take advantage of them. Indeed, it is necessary to reiterate that marine products and resources are big foreign exchange earners and that they are primary drivers of the economy. But, the challenge face by policy makers and the general public in Belize is how best marine resources can sustainably continue to fuel the well being of the booming tourism industry and the economic well being of the country. Clearly, linking fisheries management and marine resource management to tourism has been reasonably successful. Further inter-sectoral alignment need to be developed or, where they exist, strengthened. For example, annual community or national activities such as the "lobster fest", the September "Carnival" Parade, the Punta Rock Band Fest, and even our traditional annual "Holy Saturday Cross Country" bicycle race should become embedded in the fabric of multi-sectoral tourism linked activities. These are mass events that attract thousands - including tourist - of consumers of sea-food product. Their potential to contribute to economic growth is not fully recognized. But again, there is no specific research or empirical data which would support this contention. The recommendation emanating from this exercise is therefore on point, in recognizing that critical data is necessary to augment strong counsel.

This exercise concludes with the recommendation that a project entitled *‘Assess and monitor volume, value and range of seafood consumed by tourists’* be developed and implemented. Such a project will produce data highlighting the value of directly addressing fish consumption demands of the tourist. It is very likely that a project of this nature would persuade leaders within the fisheries and tourism sectors to form partnerships (linkages) to capitalize on any opportunity that would further advance their sector's continued success.

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Chapter 5: Case Study 4 - Grenada

Linking Fisheries to Tourism-Related Markets: Grenada

James Finlay

Characteristics of the Grenada Fisheries Sector

Introduction

Regional Trade and agribusiness development in the context of linkages between fishers and tourism in the Caribbean would have to treat fisheries goods and services as more than mere supply of fish products traded within the tourism industry. It must also treat fisheries as a supplier of marine ecosystems products and services such as coastal sightseeing, sports fishing and snorkel and SCUBA dive services. And furthermore, this study should recognize that even as Grenada has been an importer of a variety of fish products over the years it is now a significant net exporter of processed fresh fish, in terms of both quantity and value. Notably there is a vibrant extra-regional export trade in fresh tuna and tuna-like species. The following are the more important characteristics driving trade relations between fishers and tourism in Grenada.

A highly multispecies fisheries

1. This is a highly multispecies fisheries is dominated by oceanic pelagic species. Production (fresh weight) given as follows:

Category	Year 2009		Year 2010		Year 2011	
	Kg.	EC\$ Val.	Kg.	EC\$ Val.	Kg.	EC\$ Val.
Oceanic Pelagics	1.5m	19.7m	1.7m	22.5m	1.7m	23.8m
Coastal Pelagics	0.6m	3.6m	0.2m	2.1m	0.2m	2.1m
Demersals	0.5m	6.4m	0.5m	6.6m	0.3m	5.4m
Shell Fish	0.03m	0.6m	0.02m	0.5m	0.04m	0.6m
Total	2.6m	30.5m	2.5m	31.7m	2.3m	31.9m

Total Fish Production 2012-2014

Category	Year 2012		Year 2013		Year 2014	
	Kg.	EC\$ Val.	Kg.	EC\$ Val.	Kg.	EC\$ Val.
Oceanic Pelagics	1.7m	27.1m	2.1m	30.4m	2.2m	29.8m
Coastal Pelagics	0.2m	1.7m	0.1m	1.4m	0.2m	1.8m
Demersals	0.4m	5.6m	0.4m	5.6m	0.4m	5.8m
Shell Fish	0.06m	1.4m	0.06m	1.2m	0.06m	1.3m
Total	2.3m	35.6m	2.7m	38.6m	2.9m	38.7m

Source: Fisheries Division, Grenada; m: million

2. The two most preferred pelagic species are:
 - Yellow-fin Tuna predominantly oriented to supply an export fresh-fish market.
 - Mahi – Mahi a first choice for supply to the local tourism market.
 - Some demersal (rock fish) species such as Snapper and Grouper types that are attractive to the tourist market.
 - Shellfish species such as Lobsters and Conch exclusively attracting the tourist market.

3. Lobsters and Conch production is predominantly provided to the tourism market and as main supply, not only for local tourism food services providers (hotels and restaurants) nevertheless a regional market. These two species notably brand the local tourism cuisine. The other species such as Snappers, Grouper types, Sword Fish, King Fish, Barracuda, Crabs, Imported Shrimps, Squid, Oysters, Imported Salmon, etc., play a part.

A Distinct Species Preference Exist

The rankings of species most in demand and supply for the tourism market as determined from the responses of various subsectors of suppliers and purchasers are given as:

Demand/ Supply Subsectors	SPECIES RANKING										Respondents engaged for information
	1	2	3	4	5	6	7	8	9	10	
<i>Hotels</i>	M-Mahi S-Fish	Lobsters	R- Snapper	Conch	Oysters	Squid	Crab	Imported Salmon	I Shrimps	Grouper	4
<i>Restaurants</i>	M-Mahi	S-Fish	YF Tuna	Snapper	K-Fish	Barracuda Salmon	Lobster	Conch			4
<i>Fish Vendors at Markets</i>	M-Mahi	Snapper	Grouper Types	YF Tuna	K-Fish						15
<i>Scuba Diver- Suppliers</i>	Conch	Lobster	Red Fish	Sea moss							5
<i>Commercial Fish Processors</i>	YF Tuna	M-Mahi S-Fish	Marlin	Conch	Lobster	Snapper	K-Fish				3
<i>Fish Importers</i>	Herrings	Alewives	Saithe	Pollack	Haddock	Hake	Salmon	Cod	Trout		2
<i>Processed Fish Shippers</i>	M-Mahi	Conch	Lobsters	Snappers							2

Fish Imports Important to Market Supply

4. Imported fish supplies are predominated by the species: Herrings, Alewives, Saithe, Pollock, Haddock and Hake, sourced from Canada, Norway and the USA. These imports provide security of supply to the tourist services food providers and also to the general public. Limited quantities of Salmon, Cod, Snappers, Lobsters, Shrimps and Oysters are also imported to substitute for a number of seasonal or other shortages in local-fish supply. The most notable *imports* their sources, quantities in dressed-weight and value (ECD) are given as follows:

Main Source of Imports	Year 2009		Year 2010		Year 2011	
	ECS Val.	Kg.	ECS Val.	Kg.	ECS Val.	Kg.
Canada	1,498,143	157,930	1,501,548	171,007	1,216,662	89,748
Norway	2,800,018	205,211	2,862,922	159,122	2,684,754	160,618
USA	62,564	6,334	50,856	3,206	23,396	1,649
<i>Te</i> from main sources (% of <i>te</i> .)	-	369,475 (94%)	-	333,325 (73%)	-	252,015 (92%)
Overall Total Imports	4,647,270	392,020 (100%)	5,176,355	456,302 (100%)	4,176,758	273,144 (100%)

Fish Imports; Sources, Quantities and Value (Grenada)

Main Source of Imports	Year 2012		Year 2013		Year 2014	
	EC\$ Val.	Kg.	EC\$ Val.	Kg.	EC\$ Val.	Kg.
Canada (1)	1,888,736 1.9m	186,209 0.2m	2,274,405 2.3m	235,898 0.2m	4,389,803 4.4m	36,504 0.4m
Norway (3)	143,768 0.14m	4,793 0.005m	432,393 0.4m	25,881 0.03m	994,998 1.0m	78,374 0.08m
USA (2)	1,224,312 1.2m	113,446 0.1m	934,341 0.9m	115,78 0.1m	1,180,341 1.2m	101,844 0.1m
<i>% Contribution by Main Sources</i>	59%		83%		89%	
Overall Total Imports	5,558,569 5.6m	588,866 0.6m	4,384,481 4.4m	458,581 0.5m	7,359,463 7.4m	635,787 0.6m

Temporary Shortages in Supply Compensated for

5. Tourism oriented species face short-term shortages for several reasons, among them being:
- Choice species that are subject to close season and include: Lobsters, Sea Eggs.
 - Choice species that are subject to natural seasonal abundance and include King Fishes.
 - Choice species are “switched from” by fishers who find that fishing oceanic pelagics yield better value per days fishing effort when compared with fishing species such as Snappers and Grouper types that are weather and current constrained.

Because of the exposure of tourism (food supply) service-providers to short-term shortages, such services providers purchase secure supplies of imported fish preparations that are known to their tourist clients.

Fresh Fish Export Market as Most Significant Earner of Net Foreign Exchange

6. The export of domestic fresh, chilled, frozen and processed fish preparations is a significant part of the local fish industry and a key foreign exchange earner. Canada and USA are the main destinations for export; with other destinations such as Barbados, St. Martin and others. The notable destinations, quantities in fresh weight and value (ECD) are given as follows:

Source	Year 2009		Year 2010		Year 2011	
	EC\$ Val.	Kg.	EC\$ Val.	Kg.	EC\$ Val.	Kg.
Canada	5,568,847	286,518	6,686,930	321,056	5,644,457	233,962
USA	5,311,234	236,120	8,225,533	357,916	7,792,602	289,253
Others						
Overall Total Exports	10,915,173	524,206	14,989,165	682,521	14,364,731	586,503

Fish Exports: Destination, Quantities and Value (Grenada)

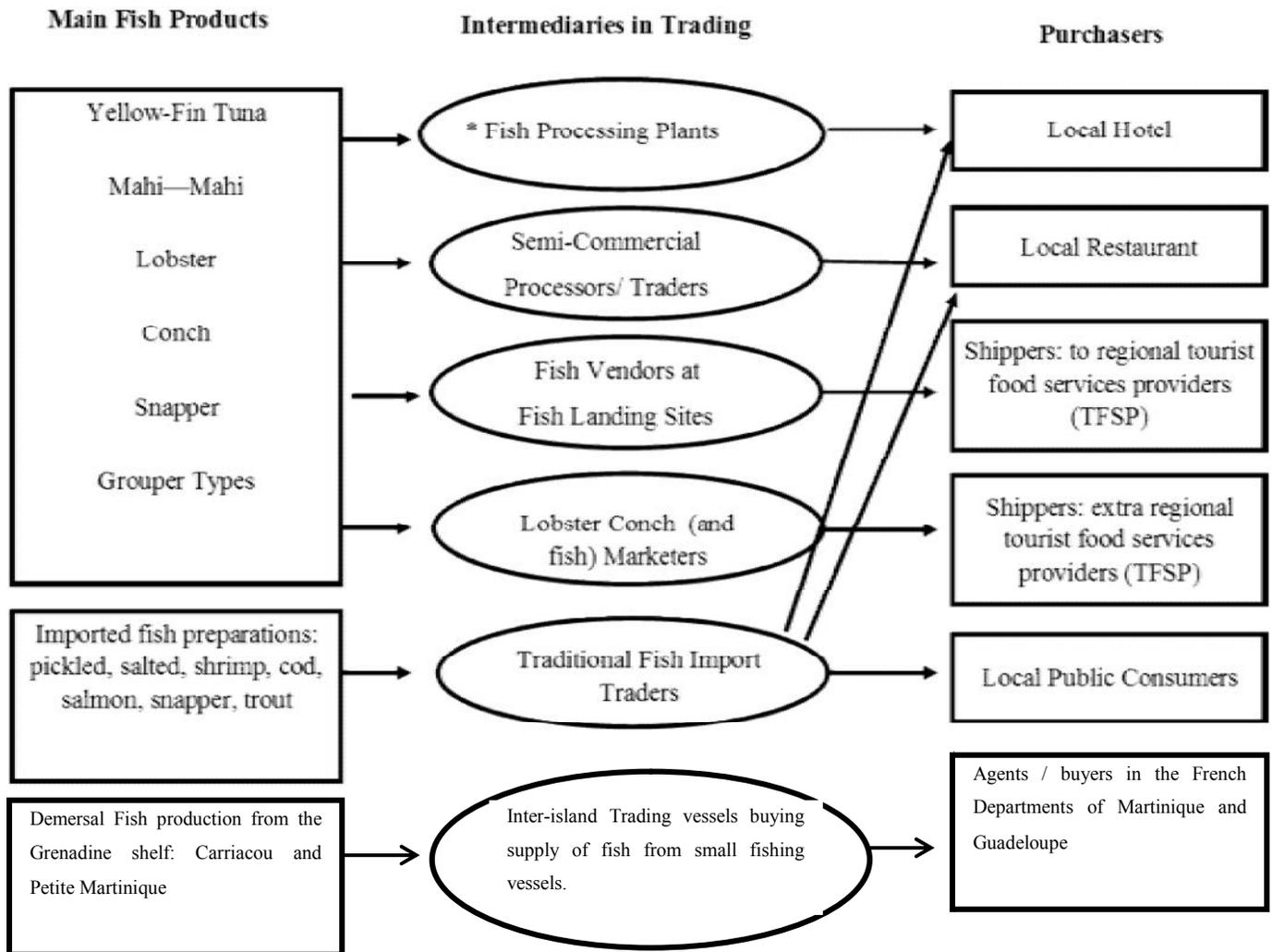
Exports to all destinations	Year 2012		Year 2013		Year 2014	
	EC\$ Val.	Kg.	EC\$ Val.	Kg.	EC\$ Val.	Kg.
Total	17,039,583 (17.0m)	626,552 (0.6m)	23,430,454 (23.4m)	861,432 (0.7m)	25,191,852 (25.2m)	943,072 (0.9m)

Export quantities are mainly Yellow Fin Tuna
See Figure 1 for an overview of the local fish trade.

Tourism Services Providers as Important Factor in Tourism-Fisheries Trading

The marine fisheries ecosystems assets provide goods and services being traded by tourism services providers.

Figure 1. Grenada Fish Trading Overview



Key: * Main export traders in fish (as principal business)

ST – Significant Trading, MT – Minor Trading, VST – Very Significant Trading

Summary of Key Findings of the Study

1. *Pelagic* species dominate fish catches in a wide-range *multispecies* fishery that provides options for a variety of *economic opportunities* within the fishery:
 - *Upscale Fishing Vessels* purchase of weekly supplies of: fuel, ice, food, fishing equipment, fishermen services, vessel maintenance services etc.
 - *Fish Processing Plant* weekly purchases of the fresh fish multi-day purchase price for fish landed, sales of processed fish to local restaurants, hotels and consumers; and with export sale as main activity.

- *Small Fishing Vessels* purchases of daily supplies of fuel, ice, food, fishing equipment, repair and maintenance services etc.
 - *Fish Vendors* at fish centers providing opportunities for purchases of fresh fish from fishers (small scale and upscale).
 - *Subsistence Fishers* providing opportunity for formal and informal trade in fish in exchange for other goods and services at the village level.
 - *Small Scale Commercial* fishers and vendors trading fresh fish with small scale fish exporters, restaurants etc.
 - *Fisheries-based Marine Services-Providers* trading their services with tourists.
 - *Coastal (Sightseeing) Tour Operators*: coupling snorkeling with sightseeing.
2. Although fish importation is a very significant contributor to the security of food supply for both local consumers and for tourists, yet a vibrant *export market exceeds imports* in both quantity and value.
 3. *Free trade* in fish products (imports and exports) is a key policy of Government: local fish prices have been completely deregulated for more than 20 years and Government is no longer a participant in fish trading.
 4. The *private sector*, whether commercial business or small suppliers and purchasers is now the only participant determining supply and demand for products or services traded in fisheries-tourism.
 5. Significant *informal* and *formal* “*contracts*” in the trading relationships are identifiable; smaller scale trading is associated more with informal contracts (arrangements) while the more upscale traders such as processing plants or trading boats and multi-day fishing vessels associate more with more formal contracts.
 6. A significant set of small-scale *processors* act also as suppliers of fish products to both a local tourism market and an export trade market. This condition invites risks for quality and safety of products and identifies the need for enhanced quality assurance standards.
 7. Marine-fisheries resources now provide significant opportunity for *tourism services-providers* to earn livelihoods. Dive sites, sightseeing and surface tours are now important factors in the trade in the tourism products. They need to be regulated but by non-coercive and collaborative mechanisms.
 8. Hitherto traders meet as *individual buyers and sellers* for trading goods and services. However, a need has been recognized for creating a forum for suppliers and purchasers to have competitive and open engagements in the form of a fish food festival.

Response: Based on the above findings a number of cases are identified in the tourism-fisheries trading environment where opportunities might be taken to enhance or catalyze innovations that would contribute to sustainable development involving both sectors in focus. Notably in the Grenada case, the opportunities identified do not cite individual entrepreneurship as much as the institutional and stakeholder-oriented initiatives considered to provide current avenues for sustainable development. The following are the key areas that might be responded to.

Case Studies

The following cases 1 to 7 are considered examples of key exemplary fisheries-tourism and agribusiness trade relationships as now exist and expected to be used as key avenues for enhanced economic opportunities in the future. It is through avenues 1 to 7 that economic opportunities are expected to

expand. And it is through avenue 8 (Fisheries Management and Administration of Public Policy regarding Fisheries and Tourism) that economic activity would be facilitated.

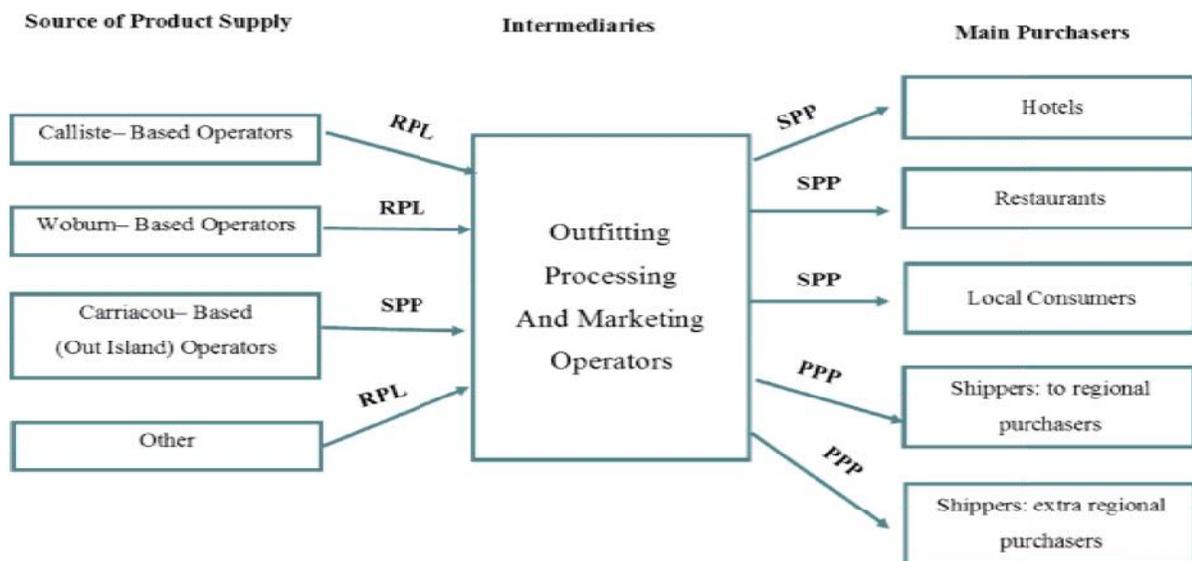
Case #1: A Commercial / Semi-Commercial Scuba-Diver Supplier System

The Setting

Historically, a “bare wind” diver community specializing in reef stocks such as Conch, Lobster, Sea Eggs, Sea Weed, Rock Fishes etc.; now a SCUBA diver community supplying fish products to a local tourism-related market but also to a regional and extra-regional market through various agents. Centers of fishers’ operations include: Calliste, Woburn, Carriacou, Sauteurs and Grenville. This community has become a harvesting, processing and trade network with dive tank-filling services provided within the community. There is also an integrated product-processing and marketing network centered in the south where notably, divers residing in the south and operating on the Grenada Grenadine Shelf route a regular supply of product, mainly Conch, through agents on the Grenada main-island. This trading represents an integrated community and integrated operations especially with regard to ensuring safety while harvesting.

Existing Policy Environment

Maintenance of a policy supporting fishers with opportunity for subsidized inputs and opportunity for free trade in fish products.



Key: Raw Product, Live (RPL); Semi- Processed Product (SPP); Processed Packaged Product (PPP). Table 1 – Product Flows Based in South Grenada

Case #2: Dive Services-Providers/ Surface Tours Services-Providers as Suppliers

The Setting

This is an important commercial segment of the tourism services industry that utilizes fisheries ecosystems goods and services. Resource utilization is, in this case, non-consumptive. This segment of the industry includes dive-services providers (dive shops) each equipped with SCUBA and snorkel gear, training services guided underwater tours and in the majority of cases each dive-shop is attached to a major hotel or tourist facility, by arrangement. All utilize a number of popular dive sites as natural or

artificial reefs. A second group of tourism services providers is the surface tour operators that provide snorkeling services as part of their sightseeing product. And yet another operation that utilizes fishery resources includes sport-fishing operations that mostly target pelagic stocks.

Existing Policy Environment

Most tourism services providers are non-consumptive users of resources and are potentially the main beneficiaries of an emerging local area enclosure regime in the form of MPAs now being actively promoted as a matter of public policy. Also as a matter of the same public policy, efforts are being made to transition persons, once utilizing near-shore coastal stocks and habitats for consumptive (food) use, toward non-consumptive tourism-related trade occupations.

Case #3: The Fish Vendors Based at Fish Landing Centres

The Setting

The career (full time) fish vendor at fish landing sites typically is a trader who interfaces between the fishing vessel and consumers and special-demand purchasers of batches of fish products. Each such vendor could have a running “contract” with 2 – 5 fishing vessels for daily purchases, either as owner of 2 – 4 fishing vessels or as part owner or as mere guarantee purchaser of landed catches.

The career fish vendor also maintains a current account with the fish centre for supply of ice to their stalls or to their chiller and/ or freezer facilities. Career vendors also make regular purchases from visiting vessels coming from outside the fish landing district.

Records show variable quantities of through-put of these established (career) vendors. Two of the main fish landing vendor markets are represented as follows:

Market	Ex-Vessel Purchases		Category of Weekly Through Put	No. of Vendors	% Sales to Tourism-services providers (TSP)
	Fishing Boats	Others			
Melville Street:					
2 Brothers	50%	50%	3000-4000lbs	1	40%
Women	70-75%	25-30%	500-1500lbs	5	20-25%
Women	100%	0%	200-400lbs	6	0-15%
Women	100%	0%	150-300lbs	3	0-5%
Total				15	
Grenville:					
1 Man	100%	0%	500-2100lbs	1	>10%
1 Man	100%	0%	600-1800lbs	1	>10%
Husband/Wife	100%	0%	300-1200lbs	1	~5%
2 Men	100%	0%	300-1200lbs	2	<5%
2 Men	100%	0%	250-1200lbs	2	<5%
1 Woman	100%	0%	150-300lbs	1	<5%
Total				8	

Gouyave – Data Unavailable
 Victoria – Data Unavailable
 Sauteurs – Data Unavailable
 Carriacou – Data Unavailable

These figures represent the normal, not high season, through-put. As a result of the facilities available to vendors, provided by the Government authorities, they are uniquely positioned to control fishing effort, especially at the times when fishers cost per days fishing begins to get closest to the gain from the days fishing. Vendors are often the financiers of basic costs such as fuel and supplies for the days fishing.

Existing Policy Environment

The price-fixing and through-put policy for the use of Government facilities at fish landing sites could more adversely impact fishers than vendors. The price-fixing regime administered by Government, within the charges they make on vendors using cool-room, freezer facilities and ice-sale at fish centres, seem to benefit vendors much more than fishers who catch the fish. A review of the system is recommended.

Case #4: The Lobster, Conch, Snapper or Grouper Purchaser-Supplier

The Setting

This includes specialists who cater for one or several of these species for export or for the occasional opportunistic local sales. Such suppliers take advantage of or create scale in operations while maintaining regional and extra-regional supply links. They also take advantage of the special properties of these species that stow well at freezer or chill conditions. These species also have the advantage of avoiding rapid deterioration of product soon after catch since such fish are often landed live or dead for only a short period before landing.

Although regional market conditions allow for mainly export (outflows) of products, however, there are also opportunities for import of these species when local supplies are short e.g. at close season.

Existing Policy Environment

Maintenance of a policy for facilitation of export opportunity for fish products that have a competitive advantage on the regional and extra-regional market. At the same time maintain a policy of facilitation (absence of restrictions) of imports of tourist-chosen fish products, in order to maintain the tourist product year-round.

Case #5: The Tourism Services Providers (Hotel / Restaurants)

The Setting

Hotels and Restaurants are the key tourist services food providers for tourists. The fish product as key brand of food product expected by tourist visiting Caribbean Islands is sourced from both local and imported supplies. As a result, hotels and restaurants would reflect the most discriminating tastes of tourists in terms of both quantity and variety of product. And whenever local fish product suppliers are unable to provide for quality and variety, imports are substituted.

The scale of preferences of fish products determined from a survey is given as (the demand side):

Demand By	SPECIES RANKING									
	1	2	3	4	5	6	7	8	9	10
<i>Hotels</i>	M-Mahi S-Fish	Lobsters	R-Snapper	Conch	Oysters/Scallops	Squid	Crab	Imported Salmon		

<i>Restaurants</i>	M- Mahi	S-Fish	YF Tuna	Snapper	K-Fish	Barracuda Salmon	Lobster	Conch	I- Shrimps	Grouper
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Table 7: Species preferences reflected at Hotels and Restaurants

Marketing and Supply Issues Cited By Hotels and Restaurants (Structured and Semi-Structured Interviews)

1. Mahi-Mahi is highly marketable and in high demand for reasons such as: species recognition, choice texture, stow well, non-fishy smell, year round supply, and good taste.
2. There is the option to buy fish supply directly or indirectly from fishers.
3. There are sometimes issues of bad quality due to improper transportation and stowage of the fish.
4. The market prefers fillets and loins.
5. The market would prefer the delivery of lobsters as tails only.
6. There is the disadvantage of incompletely cleaned conch; the market is changing however.
7. Choice snapper is often scarce.
8. Choice species are very expensive in the market.
9. A regular size of lobster specimen would greatly favour the marketing at “the table”.
10. Both lobsters and conch supplies require a reliable supplier (agent).
11. Availability of imported product options for security of supply when local supplies are short.

Existing Policy Environment

Maintenance of a free market for import and export of fish products in order to guarantee the *security of supply* of choice products within the tourist industry.

Case #6: The Fish Harvester as Supplier

The Setting

All fishers (harvesters) must maintain a linkage with the market through a purchaser and the relationship between fisher and purchaser is either a virtual or formal “contract”. The more formal contracts will represent the relationship between upscale fisher (vessel) and purchaser while the informal contracts will be represented in the smaller-scale fisher-purchaser relationships. The following generally characterizes the fisher/ harvester versus purchaser relations where the vessels are ranked by scale.

Table – Characteristics of Fisher versus Purchaser Relationships

Category of Fish Harvester	Related Purchaser	Main Characteristics of the Relationship
I. <i>Multiday fishing vessel</i> equipped with longline technology. <ul style="list-style-type: none"> – 30-45ft LOA – 4-5 Crew – Complete with ice and stowage – 4-5 days; 3-4 nights fishing trip – Fish seller 	Fish processing plant with main focus on export of quality fresh fish. <ul style="list-style-type: none"> – Supplied ice and other outfitting services and goods. – Fish purchaser of catches of multiday fishing vessels 	Purchaser guarantees a stable price based on quality of product supplied. Harvester is guaranteed access to a market for landed products. An account is established between purchaser and seller for supply of ice; and other outfitting supplies so as to optimize the value of products being traded. A more tightly contracted informal or formal trading relationship.
II. <i>Single day fishing vessel</i> equipped with longline technology.	Fish processing plant with main focus on export of quality fresh	Similar relationships as for the multiday longline fishing vessels

<ul style="list-style-type: none"> - 25-30ft, LOA - 2-3 Crew - Fish seller equipped with stock of ice and with fish stowage - Fish seller 	fish. <ul style="list-style-type: none"> - Alternative: career vendors with stowage at fish centre or with private stowage facilities. - Fish purchasers 	except that single day vessels might target species other than tunas and would have market such species with fish vendors.
III. Single day fishing vessel equipped with multiple types of gear/ technology <ul style="list-style-type: none"> - 18-25ft, LOA - 2 Crews - Fish Seller 	Fish vendors but not excluding fish processing plants. <ul style="list-style-type: none"> - Purchasers buy for supplying to local consumers or for supply to regional market for purchaser. 	Single day vessels maintain informal contractual relationships with vendors for the marketing of fish. Many vendors fully or partly own single day vessels and are notable sources of cash flow for the vessels they trade with.
IV. Single day fishing vessels with fishing gear for opting between trolling for pelagics or for targeting bottom reef fish.	Fish vendors supply to a local consumer market. <ul style="list-style-type: none"> - Fish purchaser 	As above
V. Fish, Crab and bottom long lining fishing vessel	Trading vessels purchasing small vessel catches over a period of time. <ul style="list-style-type: none"> - "At sea" purchases by trading vessels. 	A purchaser buys pick-pick portions from small vessels to build a full cargo for export.

Case #7: Fish Importers (Commercial)

The Setting

Commercial imports of processed fish preparations from USA, Canada and Europe have always been provider of food security in Grenada. The most popular imports have been: Cod fish (now largely unavailable), Herrings, Alewives, Saithe, Haddock, Pollock and Hake. These fish types are consumed mostly by the local consumers, nevertheless they are part of the diet of tourists. Such fish types are a regular part of the commerce of a number of local businesses. A minor but significant portion of the fish import market includes Cod, Salmon, Snappers, Groupers, Trout, Mahi-Mahi and others; they satisfy for temporary shortages of supply.

Existing Policy Environment

Maintenance of a policy of free trade in fish products in order to assure food security and also to assure security of supply of fish products as part of the overall tourism product in Grenada.

Case #8 (Focal Area): The Existing Fisheries Management Model

The Setting

Grenada maintains a fisheries management unit called Fisheries Division, as part of Government's law-based sustainable development strategy for promotion and regulation of the utilization of all fishery resources. The fisheries division maintains linkages with each and every important segment of the fishery to include each cited as cases #1 to #7. The scope of responsibilities of the unit range from the maintenance of fisheries ecosystems health to the regulation of quality controls for traded fish products.

Existing Policy Environment

The parent fisheries law and its subsidiary legislation are used as principal *policy instrument* for the promotion and regulation of the fishery. Government is not a participant in trading of goods and services; and all fish prices are deregulated.

Recommendations (See Cases 1 to 8)

1. Since SCUBA has provided fishermen with considerable ability to access stocks of conch, lobster, sea eggs, seaweed and rockfish or reefs, it is critical that the Fisheries in collaboration with the Tourism Authorities maintain a collaborative effort for the conservation of the stocks. A transition from consumptive to non-consumptive use of reef stocks is highly recommended also.
2. Currently considerable investments are being made in utilizing marine stocks; habitat and sea space for commercial activities such as dive-services, sports fishing and coastal tours. Collaborative management by both Fisheries Authorities and the providers of marine ecosystems services is recommended.
3. Fish quality standards at fish centres are improving; however, there is need for greater emphasis on HACCP Standards to be maintained by the fish vendors.
4. Greater vigilance with respect to the application of HACCP Standards is recommended for exporters of fish products.
5. Hotels and Restaurants should ensure that the suppliers of fresh fish are HACCP Certified, especially when these suppliers are small scale processors.
6. There is a challenge within the community of fishers and fish processors (especially Tuna for export), to maintain a high grade optimum quality of fish for export. It is recommended that the Fisheries Authorities ensure that fish quality is maintained for a “Grenada Brand.”
7. It is critical that imports of fish are always maintained in order to ensure suppliers for the tourism industry.
8. It is recommended that the Fisheries Authorities always maintain collaborative management links with all sectors in the Fisheries-Tourism Business Community.

Tourism-Fisheries Trade-Related Opportunities

<i>1.0 Processing-packaging on-board upscale ocean fishing vessels</i>
<i>1.1 Description of the opportunity:</i> A community of multi-day upper-scale fishing vessels harvesting a stock of Tuna and Tuna-like species exists. The supply of Yellow-Fin Tuna drives a vibrant export trade. Three on-hand fish processing plants do the final processing of headless and gutted pieces of whole fish already partially prepared before landing by fishing vessels. Ensuring best quality of the fish product immediately after catching is most essential for securing top price in the export market of final destination. There is therefore opportunity for on-board processing with packages so as to improve quality assurance and value-added for fishing vessels. The fresh Tuna export is mainly consumed by tourists in east coast US.
<i>1.2 Potential for the opportunity:</i> Already there is historical experience, in Grenada, with attempts at on-board quality-assurance even with small scale 18-25ft (LOA) vessels and where uptake of adaptations were shown to be very effective. Therefore building on current relationships between upper-scale fishing vessels and fish processing plants as services providers and source of market, simple adaptive technologies could be adopted so as operationally achieve the objectives of pre-packaging of fresh fish on-board fishing vessels.
<i>1.3 Resource Sustainability Issues:</i> No significant adverse implications for the standing fish stocks are identifiable.
<i>1.4 Business relations issues:</i> The trade relations between fishing vessels and processing plants can be

<p>negotiated so that processing plants can act the role of suppliers of material support while fishing vessels can be enabled to deliver the enhanced fish product. Both actual and virtual contracts exist between the two.</p>
<p><i>1.5 Policy Support Issues:</i> This type of innovation would require the support of an adaptive Government administered quality assurance/ inspection regime at critical control points.</p>
<p><i>1.6 Development Issues:</i> Such an innovation requires public policy support for training etc., within the community of stakeholders.</p>
<p>2.0 Ensuring Optimal Fish Quality Assurance Towards A National Product Branding.</p>
<p><i>2.1 Description of the opportunity:</i> A seven point grading system is now being used to rank the quality of fresh Tuna export. Routine texts could place pieces of whole tuna from first to low grade between catching and delivery to the consumer. As a result, because of the policy and practices of handlers, the average optimal quality could vary from first to low grade. With an overall policy of maximizing overall average rate of quality assurance the optimal quality rating for the exporters could maximize on the high end, while the opposite could be the case if the standards of exporters target less than a maximum average quality rating.</p>
<p><i>2.2 Potential for Opportunity:</i> Fish exporters in collaboration with the Government as quality assurance, compliance control authority could agree to adopt policies and practices for controlling the optimal standards that export grade tuna must meet. Such policies and practices were adopted and met in the past.</p>
<p><i>2.3 Resource Sustainability Issues:</i> No significant adverse impact on the fish stock due to such a policy and practice is identifiable.</p>
<p><i>2.4 Business Relations Issues:</i> If the Government authorities were to adopt public policy (in collaboration with fish exports) and with the aim of implementing a regime to maximize overall average rate of quality assurance then it is expected that exporters will adjust their business plans accordingly.</p>
<p><i>2.5 Policy Support Issue:</i> Maintenance if a policy of maximization of overall average rate of quality assurance will call for an enforcement that is non-coercive and collaborative.</p>
<p><i>2.6 Development Issues:</i> Stakeholder negotiations training and verification that is periodic.</p>
<p>3.0 HACCP Certification for Minor Fish Suppliers</p>
<p><i>3.1 Description of Opportunity:</i> Fish processing plants and trading boats would be HACCP Certified but minor fish traders supplying the tourism market generally would not. Findings show that such minor suppliers maintain constant contracts with tourism-related purchasers and exporters and therefore such suppliers should be certified for their compliance control standards.</p>
<p><i>3.2 Potential for Opportunity:</i> Health regulations require food handlers to be certified for health/safety compliance controls. No difficulty is expected in adopting more effective compliance standards</p>
<p><i>3.3 Resource Sustainability Issues:</i> No significant adverse implications in enforcing compliance control standards, is identifiable.</p>
<p><i>3.4 Business Relations Issues:</i> The requirement of certification will generate compliance, raise quality standards, profile the traders and generally improve prices offered by purchasers.</p>
<p><i>3.5 Policy Support Issues:</i> Application of existing or enhanced policy instruments will improve compliance with high standards of quality and all purchases of fish products to be more confident in the product delivered by supplier.</p>
<p><i>3.6 Development Issues:</i> Certification requires collaboration among vested interests and would also require training for fish suppliers. Market promotion is highly recommended.</p>
<p>4.0 Promotion of Quality Fish Trading Through the Fish Food Festival</p>
<p><i>4.1 Description of the Opportunity:</i> A single forum where communities of fish suppliers and fish purchasers could meet in the context of a fish food festival could expose certified fish handlers/ suppliers and certified purchasers and where quality products would be displayed; each to promote and market their vested interest.</p>
<p><i>4.2 Potential for Opportunity:</i> Currently there is only limited exposure of purchasers to suppliers except in the case of the outlets of fish processing plants that have already established a profile. It is mostly</p>

individuals that maintain contracts as suppliers and purchasers. The fish food festival could provide opportunity for competitive exposure of buyers and sellers in the context of the single location.
<i>4.3 Resource Sustainability Issues:</i> No significant adverse impact on resources is identifiable.
<i>4.4 Business Relations Issues:</i> Exposure of potential buyers and sellers in the competitive environment and with options for future business contracts could catalyze economic activity.
<i>4.5 Policy Support Issues:</i> The fish food festival will provide opportunity for the authorities administering policy instruments to demonstrate the support available to suppliers and purchaser.
<i>4.6 Development Issues:</i> An initiative that will generate collaboration among stakeholders will need to be planned and implemented for the purpose.
<i>5.0 Transitioning Livelihood Opportunities for Tourism-Fisheries Service Providers</i>
<i>5.1 Description of the Opportunity:</i> Utilization of marine fisheries stocks habitat and sea space is an expanding part of the tourism product. Key aspects of the tourism product is nautical tourism, underwater sightseeing at dive sites and sport fishing; all considered as tourism services providers and utilizers of fisheries ecosystem goods and services. A current and incipient policy for both CZM and MPAs attempts to optimize benefits from the tourism-fisheries trading opportunities. Such initiatives result in restrictions for the utilization of resources by traditional close-to-shore people and in favor of greater access for commercial tourism services providers. This occupational displacement calls for initiatives to compensate displaced persons by transitioning such displaced persons into commercial activities as new economy. Such displaced persons could be trained to join the tourism services providers for diving, fishing and sightseeing.
<i>5.2 Potential for the Opportunity:</i> Implementation of a current MPA program has highlighted the need for compensation of traditional users with opportunities for alternative livelihoods and this need to ensure alternative employment is now part of the overall MPA policy.
<i>5.3 Resource Sustainability Issues:</i> The MPA and CZM program has two of its main objectives: (i) to ensure conservation of marine stocks and habitat, and also; (ii) to provide opportunity to utilize marine resources for economic benefits for the citizens.
<i>5.4 Business Relations Issues:</i> Persons being introduced to new economy after previous involvement in traditional economy requires training and opportunity to engage with experienced participants in the new economy.
<i>5.5 Policy Support Issues:</i> A MPA policy that promotes alternative use of traditional stocks, habitat and sea space while recognizing both traditional and new-economy livelihood opportunity is a sustainable plan of action.
<i>5.6 Development Issues:</i> Transitioning livelihoods from traditional to new economy requires training and opportunity for business engagements between stakeholders.
<i>6.0 Community-based Management of Dive-sites</i>
<i>6.1 Description of the Opportunity:</i> Commercial dive-services providers are an important part of the tourism-fisheries trade. Presently there is limited controls for participants in the trade, unclear criteria for participation and lack of a system to monitor use-pressure placed on dive sites. There is therefore opportunity for creation and implementation of a mechanism for monitor control and surveillance (MSC) of the activities of dive services providers so as to ensure sustainability of the dive services industry.
<i>6.2 The Potential for Opportunity:</i> Lack of capability in Government to independently monitor the current state of the dive sites; willingness of dive site users to engage in joint MCS.
<i>6.3 Resource Sustainability Issues:</i> Individual interests of dive services operators could over-ride community interests resulting in over-use of the resource base.
<i>6.4 Business Relations Issues:</i> High operations costs for individual dive services providers result in less than sufficient profit margins.
<i>6.5 Policy Support Issues:</i> The application of top-down policy instruments is not currently practical; collaborative management is the preferred option for this type of trading.
<i>6.6 Development Issues:</i> Development of a workable regime for sustainable use of marine fisheries-

services options require consultations between Government authorities and commercial stakeholders.

Summary of Recommendations based on Opportunities Identified

1. A greater role for multiday fishing in the “front-end” processing and packaging of fresh fish for the export market.
2. Raise the average quality of export grade fresh fish by adopting measures that would ensure that both fishers and processors guarantee that the highest proportion of the exported fish is represented by 1st and 2nd grade specimens.
3. Train and certify all small-scale fish suppliers using HACCP quality control standards; and adopt a policy-based mechanism for enforcement of compliance control measures.
4. Use an annual Fish-Food Festival as a means of exposing buyers and sellers of Fisheries-Tourism goods and services to each other, in open forum.
5. Support a local policy-based strategy now in train that would expand opportunity for linkages of fisheries and tourism in the context of the *green* and *blue* economy; utilization of marine ecosystems goods and services.
6. Promote community-based management for dive-sites on reefs now increasingly used as key eco-tourism product.

References

Government of Grenada Central Statistics Office, Ministry of Finance

Government of Grenada Fish Data Records, Ministry of Agriculture

Appendices

Fisheries Linkages with Tourism (Dive-Services, Sport Fishing, Day Tours)

Dive Services Providers (Name)	Location	Linked to
#1 Scuba Tech – Frederica	Lance Aux Epines	Calabash Hotel
#2 Aquanauts – Seupel	True Blue, Spice Island Beach Resort	True Blue Hotel Spice Island Inn
#3 Eco Dive – Christine Curry	Grand Anse, Lagoon Road	Coyaba Hotel Camper Nicholson
#4 Dive Grenada	Grand Anse	Flamboyant Hotel
#5 Devotion to Ocean “D20”	Point Salines	Rex Grenadian
#6 Native Spirit Scuba – Blackman	Grand Anse	Radisson Hotel
#7 Sandals Dive Shop	Point Salines	Sandals Resort (La Source)
#8 Arawak Divers	Hillsborough, Carriacou	Hillsborough
#9 Lumba Dive	Harvey Vale, Carriacou	Harvey Vale
#10 D for Diving	Harvey Vale, Carriacou	Harvey Vale

Fisheries Linkages to Tourism (Snorkeling, Sightseeing, Day Tours)
[Alternative to Landside “sites of interest”]

Tour Services/ Snorkeling (Name)	Location	Linked to
1. Carib Cats	Belmont	
2. First Impression – Morsden Cumberbatch	Lagoon Road Allamanda Hotel	Allamanda Hotel
3. Shadow Fax	Port Louis	Camper Nicholson
4. Sea Ferries – Susan Howard Clark	Yacht Club	
5. Sun Adventures	Lagoon Road Port Louis	Camper Nicholson Port Louis
6. Rhum Runner	Carenage	Renwick/Thompson

Chapter 6: Consolidated recommendations

Peter A. Murray, Iris Monnereau, Patrick McConney and Davina Layne

The recommendations made in the four case studies have been summarized and consolidated so that they reflect suggested actions that may be considered by CRFM Member States:

Cultural linkages

1. “Fish-Frys” have been very successful regionally, from a business and livelihoods perspective. In some cases, successful development of a “*Fish-Fry*” to improve livelihoods and food security does not lie in increased fish consumption but lies in value added products and improving the crafts made of fish waste (e.g. fish leather or bowls made of grounded fish scales) and entertainment.
2. In several countries in the region Fishermen’s Week activities have been developed for fisherfolk and those associated with the industry as well as for outsiders; among the type of successful attractions are fish boning competitions, the climb-the-grease-pole competitions, crab racing and boat racing competitions. These types of activities could be broadened to attract and educate tourists in conjunction with cultural/traditional activities.
3. Annual Fish-Food Festivals (e.g. the various lobster festivals in Belize) can be utilised as a means of exposing tourist to the local fishing culture and improving the linkages between buyers and sellers of Fisheries-Tourism goods and services.

Consumption and market linkages

4. Traceability and appropriate quality and food safety handling of fish is crucial for improving the linkages between the fisheries and tourist sector. Fish quality standards at fish centres / markets are improving; however, there is need for greater emphasis and training on Sanitary and Phyto-sanitary (SPS) Standards to be maintained by the fish vendors. There needs to be an increase in training of fisherfolk (including fishers, vendors, cleaners etc.) in all aspects of quality and food safety; support for a simple yet effective traceability system for fish vendors; a legislative framework build around the concept of SPS. This is also important for those countries exporting fish (e.g. to tourist markets such as EU countries in the Caribbean).
5. Adopt a policy-based mechanism for enforcement of compliance control measures for small-scale producers. There is a challenge within the community of fishers and fish processors (especially Tuna for export), to maintain a high grade optimum quality of fish for export; Fisheries Authorities should endeavour to ensure that fish quality is maintained for “[Country] Brands”. Hotels and restaurants should ensure that the suppliers of fresh fish follow proper SPS approved procedures and standards, especially when these suppliers are small scale processors. This ensures safe seafood consumption by tourists.
6. In some countries it is important to address the current mismatch of supply and demand between small-scale fishers and the hospitality trade and improving quality and reliability throughout the supply chain. To service the tourist market local producers need to find profitable and competitive ways to meet tourism industry demands for volume, quality, regularity traceability, and safety requirements. Develop projects to assess the viability of supplying the Cruise Tourism Sub-Sector with locally produced food as well as directly marketing to the Member States of the European Union and the United Kingdom.
7. The appropriateness of the approaches in eco-labelling or certification currently being explored by The Bahamas Department of Marine Resources, The Bahamas Marine Exporters Association, Friends of the Environment in Abaco, The Nature Conservancy and other conservation partners,

working with the World Wildlife Fund to move The Bahamas spiny lobster fishery towards meeting the Marine Stewardship Council standard for sustainable fisheries needs to be determined, for appropriate countries, given the small-scale nature of the spiny lobster fishery and the cost associated with achieving and maintaining certification.

8. There is need to consider / carry out feasibility assessments for certification and eco-labelling of seafood for tourism market. Eco-labelling and certification could enhance the sustainability and traceability of a fishery. In order to achieve the necessary “economies of scale” to address issues such as certification and eco-labelling, it is critical that traders collaborate, whether through: 1) a joint venture arrangement, where traders engage in a solitary commercial enterprise without actual partnership or incorporation, or 2) as retailers’ (marketing) cooperative, where traders use their purchasing power to acquire discounts from suppliers and share marketing expenses. Further, these issues may be best handled under public-private partnership.
9. Traders should embrace the use of information and communications technology in all aspects of their business (from record keeping to marketing) to enhance productivity and efficiency. At a minimum, all traders should have a presence on the World Wide Web whether through a business website, Facebook Page or LinkedIn Company Page.
10. Traders targeting the non-English-speaking markets should address the issue of language in their business plan. This could include adding summary pages in languages other than English to business website, hiring a translator when required or acquiring language skills through staffing and training.
11. Assess and monitor volume, value and range of seafood consumed by tourists and carry out quality assessments of seafood at establishments catering to tourism sector
12. Noting that imports of fish contribute significantly to ensure supply to the tourism industry, carry out assessments of volume and value of imported compared to domestically produced fishery products
13. Develop project for data sharing with regard to the quantum and range of seafood consumed by tourists
14. In order to improve business resilience with respect to overdependence on certain specific markets, and vulnerability to exogenous economic shocks, traders should consider additional markets such as the cruise-tourism sector
15. There is need to consider / carry out feasibility assessments of the scope for value-added production for tourism market
16. In keeping with the Regional Lionfish Strategy, various activities have been undertaken in the case-study countries, such as lionfish derbies and cook-ups, to encourage market and public awareness. Consideration should be given to expanding/replicating this type of activity by the private sector. This can be done in conjunction/parallel with more fish handling training for fishers, enhancing the familiarity of chefs with lionfish and improving the reliability of lionfish supply.
17. The influx of sargassum in recent years has affected the fishing sector greatly. Several products have been developed (ranging from fertilizer, plywood to cosmetic and food products) that can supply alternative sources of income and cater to the tourist market

Recreational linkages

18. Visitors enjoy recreational fishing activities in the region such as game-fishing, spear-fishing, swimming with the turtles during catamaran cruises and diving among the shipwrecks. Since SCUBA has provided fisherfolk with considerable ability to access stocks of conch, lobster, sea eggs, seaweed and rockfish or reefs, it is critical that the Fisheries Authorities in collaboration with the Tourism Authorities maintain a collaborative effort for the conservation of the stocks. A transition from consumptive to non-consumptive use of reef stocks is worthy of consideration.

19. With the importance given to the economic value of the industry and the strong conservation ethics employed by sport fishers and managers, consideration should be given to expanding its scope and value through an application for "branding" the Caribbean as a prime sport fishing destination.
20. Currently considerable investments are being made in utilizing marine stocks, habitat and sea space for commercial activities such as dive-services, sports fishing and coastal tours. This can result on conflicts between the various parties involved. Collaborative management by both Fisheries Authorities and the providers of marine ecosystems services is recommended.
21. Promote community-based management for dive-sites on reefs now increasingly used as key eco-tourism product.
22. Strengthen coordination between Fisheries Department and other relevant agencies to improve enforcement with regards to sports fishing
23. Encourage development of marketing campaign(s) catering the tourist markets highlighting sustainable and unsustainable fishing practices. These can entail brochures per country explaining sustainable sources of seafood, minimum sizes and closed season.

Aquaculture

24. The Caribbean region imports a large part of the seafood that is consumed. As regional stocks are often fully or overexploited, aquaculture can be developed to cater increased seafood demand. In the region aquaculture is still in its infancy and it has potential for further growth.
25. Aquaculture suitability and feasibility study to identify sites for small scale aquaculture production for the local market
26. Feasibility study on expanding aquaculture certification from a few production locations and evaluating the scope for Green Labelling of aquaculture produce in the region
27. Consideration might be given to developing interactive tours for tourists (and schools) to visit the aquaculture facilities, whereby visitors are shown and educated on all aspects of aquaculture rearing creating a unique and interesting attraction for visitors.

Governance

28. Development of National Policy and Legislation to guide the course of development of the industry; including legislative amendments of Fisheries Acts and Regulations to accommodate Certification and Eco-labelling provisions as well as the review and upgrade of draft legislative instruments (e.g. the *Public Health Act*, the *Consumer Protection and Safety Act*, the *Food Safety Bill*, etc.) concerning consumer protection and food fraud.
29. Development of a National Policy in collaboration with stakeholders with respect to marine ecotourism interactions as well as legislative framework to govern such interactions (including safety, user rights and animal welfare).
30. Improve enforcement of existing legislation regarding the Marine Protected Areas as well as review (and update where necessary) existing zones designated in the marine management plans, towards minimising user-conflicts (e.g. between consumptive versus non-consumptive use).
31. It is recommended that the Fisheries Authorities ensures and maintains collaborative management links with all sectors in the Fisheries-Tourism Business Community.
32. Creation of a public credit registry and the establishment of a private credit bureau (i.e. credit-information sharing system) should enhance commercial financing.
33. Support should be given to local policy-based strategies that would expand opportunities for linkages of fisheries and tourism in the national context of green and *blue* economy development.

Climate Change and Disaster Risk Management

Climate Change and Disaster Management issues impact on the fisheries and hence, though in this context, only indirectly on the tourism sector at least one of the case studies has made recommendations in this regard:

34. Disaster Preparedness Plan for the sector as a proactive measure to improve resilience in regards to the impacts of Climate Change
35. In terms of susceptibility to natural disasters and the absence of or inadequate insurance, “risk pooling” and spreading the risks across a large population are two prudent strategies for small, vulnerable, economies; hence agencies offering fisheries-related insurance would be prudent to have other investments with higher net returns and less risk.
36. To improve access to financing, the setting up a public credit registry and support for the establishment of a private credit bureau (i.e. credit-information sharing system) may be key policy interventions. These measures should reduce information asymmetries and increase synergy among agencies thereby assisting in reducing the cost of, and improving access to, commercial finance.
37. Assess impacts of hurricanes and extreme weather events on income and livelihood of fishers in support of building capacity among fishers to cope with the impacts of Climate Change and Climate Variability
38. Monitor effect of climate change on life history, distribution, behaviour, abundance of species, which are in demand for the tourism sector, including sports fishing.
39. While it is difficult to change the perception of risk associated with the operations, business risk can be mitigated through a safety management programme. This should include policies (e.g. guide to client ratio), hiring standards, training requirement, qualifying clients (e.g. matching the customers abilities and interest to the activities), safety practices (e.g. rescue drills, first aid) and signed waivers advising customers of the risk. In addition, the business should be structured so that personal liability is minimised, for example contract out certain services that may be high risk (e.g. catering). Note where contractors are used, the risk they are assuming needs to be clarified and proof of insurance is required.

Other opportunities for innovation in fisheries-tourism linkages

In addition to the several innovative ideas set out in the case studies and the recommendations, there are an increasing number of opportunities that can be created for social and economic benefit through diverse partnerships and thinking beyond present boundaries. Not all focus on tourism, but several can do so. A small selection is presented below in no particular order for further consideration.

1. Seasonally diversified use of underutilized infrastructure such as fish landing site market and processing buildings in the off season.
2. Summer school camps associated with a fish landing site to show case the diversity of skills and technology of which the public and visitors may be unaware.
3. Increase in fish art in places frequented by visitors in order to reinforce the importance of marine resources and seafood in their awareness.
4. Fisheries-related fun touristic activities such as mastering the skill of throwing a cast net or even fish boning.
5. Conversion of fish processing waste into by-products such as fish leather and silage, or specialty food products such as promoting local production of “tobiko” flyingfish roe etc.
6. Twinning a major fishing port in the Caribbean with a fisheries counterpart in a country that is already a source of visitors in order to reinforce the region as an attraction.
7. Include fishing families in home-stay community-based tourism as done, for example, at Tarcoles on the Pacific coast of Costa Rica and operated by the fishing cooperative

8. Include more local seafood cooking classes in the activities package of upscale resorts and in addition to chefs include local fisherfolk, often women, who prepare such meals.
9. Promote culture and heritage by establishing 'fisheries through the years' – a look at collections of fishing and boating equipment and other materials which show how fishing has changed over the past few decades.
10. Encourage tourists to be engaged with the tourism product by featuring their activities (e.g. catching / cooking / boning fish in a destination) in videos or still photography. These videos and photos can then be used on you tube and other social media to promote the destination.

Many of these activities can be done individually but may be more appealing if grouped and offered as a package to tourists.

CRFM

The CRFM is an inter-governmental organisation whose mission is to “Promote and facilitate the responsible utilisation of the region’s fisheries and other aquatic resources for the economic and social benefits of the current and future population of the region”. The CRFM consists of three bodies – the Ministerial Council, the Caribbean Fisheries Forum and the CRFM Secretariat.

CRFM members are Anguilla, Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, The Bahamas, Trinidad and Tobago and the Turks and Caicos Islands.

