Techno-economic performance of fish landing sites and fishing ports in Grenada: Assessment of the current situation and opportunities for responsible investments

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Executive Summary

The Government of Grenada aims to develop an ecologically sustainable and an economically healthy fisheries sector. Grenada and the World Bank agreed in 2018 on a "First Fiscal Resilience and Blue Growth Development Policy Credit", which aims to support Grenada's efforts to maintain fiscal discipline and support the transition to (and development of) its blue economy. The fisheries sector is a very important sector within Grenada's blue economy.

To support the long-term feasibility of a recently developed business case for investing in Grenada's yellowfin tuna exports and to facilitate government investment decision making on blue growth and fisheries infrastructure in particular, a study was undertaken by FAO, INFOPESCA and Conservation International, with the objective to examine the techno-economic performance of fish landing sites and fishing ports in Grenada.

This report presents the findings and recommendations of the Techno-economic performance assessment of fish landing sites and fishing ports in Grenada, carried out in November 2018. The assessment shows that the Government has established, with assistance from various donors, a highly effective and supportive infrastructure for the small-scale fisheries sector. The fish landing sites and markets are generally well-maintained, operate throughout the year and provide essential services to the fishers, fish vendors, fish exporters and the general public.

The overall status of the fish landing and fish market infrastructure is good, particularly as many of the main fish markets (Grenville, Gouyave and Melville St.) are relatively new and have received proper maintenance and repairs. Some of the smaller fish landing sites encounter minor infrastructural or repair problems. In contrast to the larger sites, these smaller sites have challenges with the state of the equipment (e.g. ice machines and freezers), which require repairs and/or replacement.

The level of activities at the larger sites is high and corresponds to the availability of ice, fuel and fish customers. The smaller sites sometimes cannot supply all these services, because they serve also much smaller fishing fleets and smaller communities.

In recent years the distribution of fishing activities and fish landings over Grenada has changed as a result of increasing export opportunities for yellowfin tuna at Grand Mal (via Spice Island Fish House -SIFH and the Southern Fisherman Association -SFA) and the increase in FAD fishing activities by the fleet in Grenville. The fisheries sector is very dynamic and takes advantage of the opportunities offered. It is a challenge for the Government to maintain a high level of services for this dynamic fisheries sector. On one side, there are significant opportunities in tuna and other species exports, which require public-private collaboration to develop further. On the other hand, the government has a task in facilitating the supply of fish to the domestic population and supporting the livelihoods in small coastal communities.

The financial assessment carried out shows that there is a large diversity in costs and earnings between the fish landing sites. Few sites show a gross profit (Gouyave and Carriacou) or positive gross value added figures (Gouyave, Grenville and Carriacou). The same sites show also positive gross value added figures per full time employee. As a result of the high capital investments at most of the sites, with related high depreciation figures, and the substantial utility and labour expenses, it will be challenge to ever reach net profit levels at most sites. It would nevertheless be possible to realize net profit figures in Carriacou with an investment in a jetty, which would enable an increase in ice sales. At Grenville positive gross profit figures would be possible through an increase in collection of fish landing and freezer fees.

The collection of fees from fishers and fish vendors for the services provided is generally a weak point at most of the landing sites and fish markets.

In recent years, some 54% of the annual fish landings were carried out at the Grand Mal jetty, where SIFH and SFA received the fish landed. No fish landing fees were collected for fish landed at Grand Mal, but the volume of fish landed would be able to generate an additional annual income of EC$ 330 000. Such annual earnings could easily cover the long-term maintenance of the jetty and related infrastructures at Grand Mal.

The assessment shows the need for putting aside funds for replacement and major repair of fisheries infrastructure. While it may be a challenge to replace the Gouyave fish landing site and market after some 40 years of operations, it is clear that annually investments have to be made in maintenance and repairs of the landing sites. In this respect, it would be good that a maintenance and replacement plan be developed and updated every few years. A maintenance and repair plan that includes also re-investments in essential equipment such as ice machines and freezers.

This assessment study identified a number of priority investments in fish landing and fish market infrastructure and equipment, as well as human resources, which would be able to generate substantial benefits for the Grenadian fisheries sector and contribute to the blue economy development objectives of the Government. The priority investments needed include jetty construction and upgrades in Carriacou and Grand Mal, development of a vocational training programme for fisheries, fencing of the fish landing site and processing places at Grenville and increasing the ice supplies to fishers in Melville St., Grenville and Sauteurs. The total budget required for the priority investments identified would be EC$ 3 to 3.2 million (USD 1.1 to 1.2 million), and would incur annual costs estimated at EC$ 400 000, which can largely be recovered from the private sector.

Various additional recommendations are made related to investments that would further increase the functioning of the landing sites, reduce costs and increase benefits, such as increasing the processing of fish, the improvement of data collection and analysis for fisheries management, establishment of an inventory of equipment and spare parts, as well as carrying out an assessment for investment in solar panels to reduce the electricity costs at the landing sites and fish markets. The costs of implementing the additional investments recommended would be just over EC$ 540 000 (USD 200 000) and recurring annual costs would add up to EC$ 60 000.

It is expected that this techno-economic performance assessment provides valuable information for the Government of Grenada to support its decision making process for investments in the blue economy.

This study was made possible with support from the FAO executed Caribbean Billfish Project and the Conservation International executed Innovation Support Facility, which are components of the GEF-funded, World Bank implemented, project P128437: Ocean Partnership for Sustainable Fisheries and Biodiversity Conservation Models for Innovation and Reform (ABNJ) Project.

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Glossary / Abbreviations / Acronyms

ABNJ	Areas Beyond National Jurisdiction
CC4FISH	Climate Change Adaptation in the Eastern Caribbean Fisheries Sector Project
CI	Conservation International
CRFM	Caribbean Regional Fisheries Mechanism
CMLE+	Caribbean and North Brazil Shelf Large Marine Ecosystem Project
EC$	Eastern Caribbean dollar (2.7 EC$ = 1 USD)
FAO	Food and Agriculture Organization of the United Nations
FPI	Fishery performance indicators
GEF	Global Environment Facility
ICCAT	International Commission for the Conservation of Atlantic Tunas
IUU	Illegal, Unreported and Unregulated Fishing
PSMA	Port State Measures Agreement
JICA	Japan International Cooperation Agency
MCS	Monitoring, Control and Surveillance
OECS	Organization of Eastern Caribbean States
SIFH	Spice Island Fish House
SFA	Southern Fisherman Association
USD	United States Dollars
VMS	Vessel Monitoring System
WECAFC	Western Central Atlantic Fishery Commission

1. Background

The Global Environment Facility (GEF) launched the 'Common Oceans' Areas Beyond National Jurisdiction (ABNJ) Program in collaboration with the Food and Agriculture Organization of the United Nations (FAO) in 2011. The primary goal of this program was to promote "*efficient and sustainable management of fisheries resources and biodiversity conservation in the ABNJ, in accordance with the global targets agreed in international forums*". This was accomplished through the FAO executed Caribbean Billfish Project (CBP) and the Conservation International executed Innovation Support Facility components of the GEF-funded, World Bank implemented, project P128437: Ocean Partnership for Sustainable Fisheries and Biodiversity Conservation Models for Innovation and Reform (ABNJ) Project.

The development objective of this project was "*to catalyze pilot investment into selected transformational public-private partnerships that mainstream the sustainable management of highly migratory fish stocks spanning areas within and beyond national jurisdictions"*. Achievement of the Ocean Partnership objectives was only possible through working with all key stakeholders including governments, regional fisheries (management) bodies, civil society organizations, academia and the industry.

Business plans were produced in support of sustainable and economically viable private sector investments in pelagic fisheries in Grenada and the Dominican Republic and at regional levels. These incorporated the technical, economic, biological and financial rationale as well as feasibility proofs for attracting investments involving private and public capital for blue growth investments. In December 2018, the Government of Grenada and representatives of the private sector signed a letter of intent in support of one of the business cases titled "Investing in Grenada's Yellowfin Tuna Exports" that was developed, and a traceability system was installed at three landing sites.

The Grenadian government plays an advocacy role for sustainable development of Blue Economies worldwide. The "Blue Innovation Institute" that was formally established in 2017 is an example of this role. Grenada aims to make its fisheries an ecologically sustainable and an economically healthy sector. Grenada and the World Bank agreed in 2018 on a "First Fiscal Resilience and Blue Growth Development Policy Credit", which aims to support Grenada's efforts to maintain fiscal discipline and support the transition to (and development of) its blue economy.

In order to support the long-term feasibility of the tuna export business case, as well as to prepare for government investment decision making on fisheries infrastructure in relation to the above mentioned credit line, it was considered important that the current situation and opportunities for responsible investments by both the government and the private sector in fisheries infrastructure in Grenada would be assessed.

Therefore a study was undertaken by FAO, INFOPESCA and CI, with the objective to examine the techno-economic performance of fish landing sites and fishing ports in Grenada, through an assessment of the current situation and opportunities for responsible investments in fisheries infrastructure used to land and process fish. This was accomplished by assessing the status of landing site infrastructure, related services, their demand, their current level of utilization and the costs of operation to the Grenadian government, private sector and fishers. The study was also required to identify necessary investments to improve the economic performance of the sites and highlight opportunities to reduce operating costs, whilst increasing the use of underutilized sites and facilities.[1]

[1] FAO: Fishing harbour planning, construction and management. http://www.fao.org/docrep/013/i1883e/i1883e00.htm

1.1. Methodology applied

A methodology was developed to assess the techno-economic performance of fishing ports and landing sites in Grenada, including for the analysis of needs and investment opportunities for fishing port infrastructure and equipment. The assessment methodology was developed based on desk research about the technological and economic aspects of fishing harbour infrastructure, including the recommendations provided in "Fishing harbour planning, construction and management".[2] The methodology applied to the assessment of fish landing site assessment in Grenada included seven key components:

1. **Desk based research and analysis** of peer reviewed and grey literature as well as conversations with fisheries experts.
2. **Expert interviews** (semi-structured) to determine baselines, assess the demand and uptake of services, the needs and opportunities for future investment to increase economic performance and to assess the demand for a vocational fisheries school (and its potential location).
3. **Port visits, meetings with key stakeholders, and documenting of the conditions of port facilities,** including documentation, needs assessments analysis and photography of sites.
4. **Stakeholder interviews at landing sites / ports** (semi-structured) to develop port-specific needs assessments, identifying operating costs, distributions channels, and opportunities to reduce operating costs.
5. **Development of a summary document for each landing site (port profiles),** including fisheries stakeholder opinions for future investments and a list of expert recommendations.
6. **Organization of a stakeholder workshop** to present, discuss and validate findings with key stakeholders.
7. **Preparation of the final report** with findings, stakeholder views and expert assessment.

A team of FAO and INFOPESCA fisheries experts visited the main fish landing sites and fish markets around Grenada: Gouyave, Grand Mal, Grenville, Carriacou, Petite Martinique, Duquesne, Sauteurs, Victoria and Waltham in November 2018, and prepared this assessment report in December 2018.

2. Grenada Context

Grenada is a sovereign country consisting of Grenada and the southern Grenadines. The country consists of four populated islands, the populations of which most commonly live on or near the coast. For this reason, alongside tourism, the fisheries sector is one of the key economic sectors in Grenada and fisheries products are the 2nd most important (USD 8.28 million) export commodity of the country, after nutmeg (USD 8.46 million), according to the OECD (2017).

[2] FAO: Fishing harbour planning, construction and management. http://www.fao.org/docrep/013/i1883e/i1883e00.htm

Figure 1: Map of Grenada.

Source: Destination360 http://www.destination360.com/caribbean/grenada/map

2.1. Fish production in Grenada

Similar to its surrounding neighbours, Grenada has a complex, multi-gear, multi-craft and multi-species fishery targeting both large and small pelagics, demersal species and high value lobster, conch and turtle fisheries. Total fisheries production in Grenada is around 2 700 tonnes per year and of the commercial species landed, yellowfin tuna (*Thunnus albacares*) is of primary importance, accounting for half of the total fisheries production, followed by Atlantic sailfish (*Istiophorus albicans*), Red hind (*Epinephelus guttatus*) and Blackfin Tuna (*Thunnus atlanticus*), among others.

Fisheries around Grenada are mainly small-scale and rely heavily on long-lining, a fishing method which is relatively selective, but has become increasingly problematic with longer fishing trips offshore that suffer from high rates of bycatch. This bycatch includes multiple shark species and blue- and while marlin; species that have been overexploited (or are still subject to overexploitation) and have therefore been assigned quotas under ICCAT.

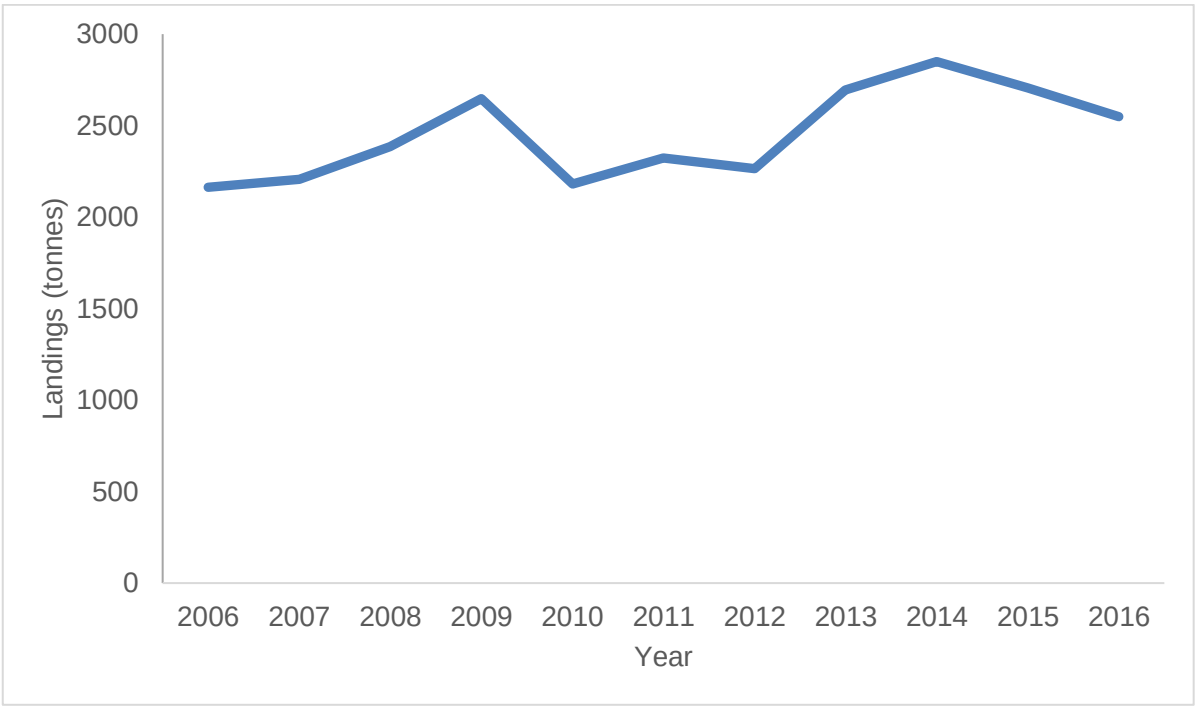
Table 1 and Figure 2 below show the top four fishery species caught by Grenada between 2009 and 2016 and the total fisheries production for Grenada from 2006 to 2016 respectively.

Table 1: Capture fisheries in tonnes for the top 4 commercial species from 2009 to 2016, in tonnes

	2009	2010	2011	2012	2013	2014	2015	2016
Yellowfin tuna* (*Thunnus albacares*)	630	673	789	829	1314	1386	1310	1200
Atlantic sailfish (*Istiophorus albicans*)	183	191	239	178	147	209	200	186
Red hind (*Epinephelus guttatus*)	148	175	112	120	127	126	120	110
Blackfin tuna (*Thunnus atlanticus*)	187	159	150	160	151	113	107	100

Source: FISHSTAT (2018)

Figure 2: Total capture fisheries production in Grenada in tonnes (2006-2016)



Source: FISHSTAT J (2018)

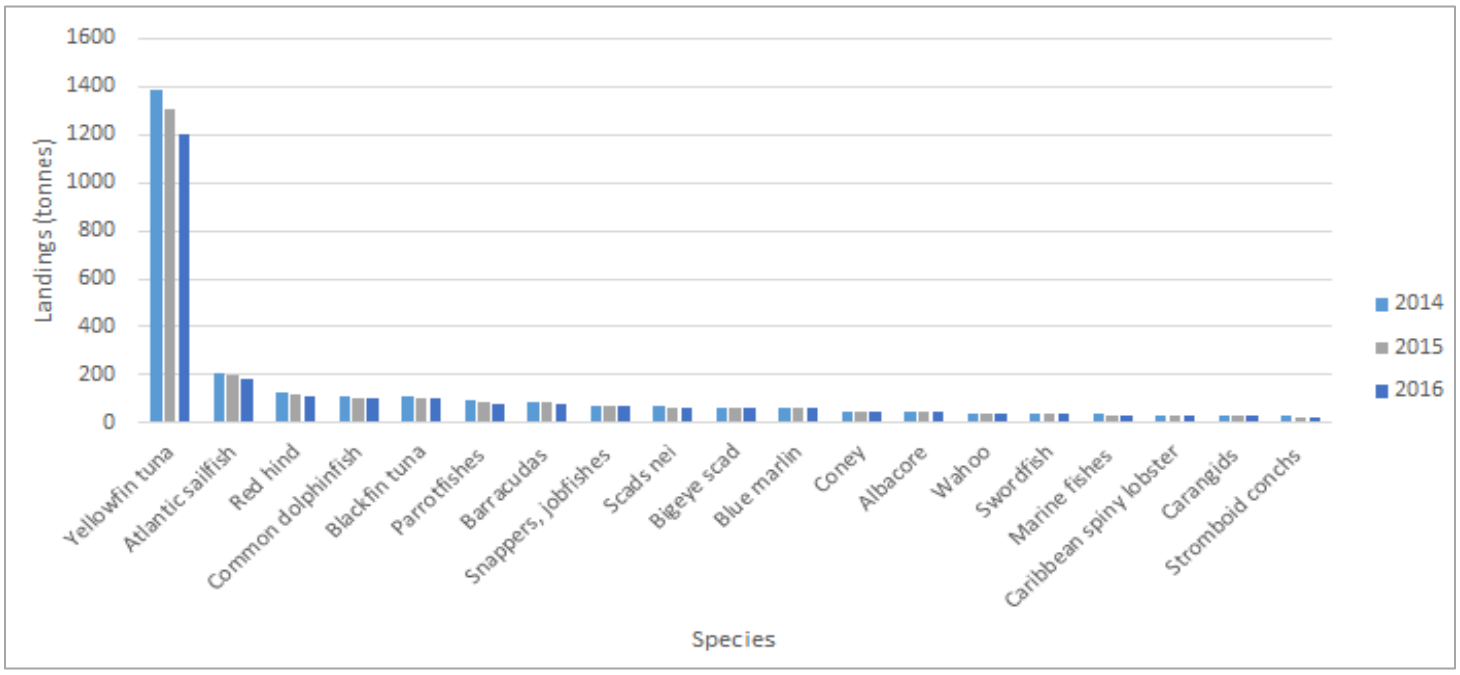
As shown in table 1, the fisheries landings in Grenada are dominated by pelagic fish species. The top ten species comprise about 81% of landings between 2014 and 2016. Species landed between 2014 and 2016 are therefore predominantly (63%) large pelagics (yellowfin tuna, sailfish, dolphinfish, black tuna and marlin) and small pelagics (5%), but demersal species (such as red hind, parrotfishes and snapper) also feature within the top ten representing 9% of landings between them (shown below in Table 2). Shellfish, including lobster and queen conch, are also commercially important but their landed volume is lower as is shown Figure 3.

Table 2: top ten species landed in Grenada by percentage (using 2014-2016 average)

Species	% of total
Yellowfin tuna	48.1
Atlantic sailfish	7.3
Red hind	4.4
Blackfin tuna	3.9
Common dolphinfish	3.9
Barracudas	3.1
Parrotfishes	3.2
Snappers, jobfishes	2.6
Scads	2.5
Bigeye scad	2.3

Source: FAO FISHSTAT J (2018)

Figure 3: Total landings (tonnes) for the top 20 species in Grenada (2014-2016).



Source: FAO FISHSTAT J (2018)

In terms of the primary landing sites in Grenada, total average annual landings from 2014-2016 were 2 800 tonnes, with the two companies in Grand Mal (SFA and SIFH) dominating the landings and accounting for more than half of the total landings. These two companies concentrate on yellowfin exports to the US market. Only three landing sites (SIFH, SFA and Grenville) received fish landings of an (off-vessel) value above US$ 2 million when considering the average landings from 2014–2016.

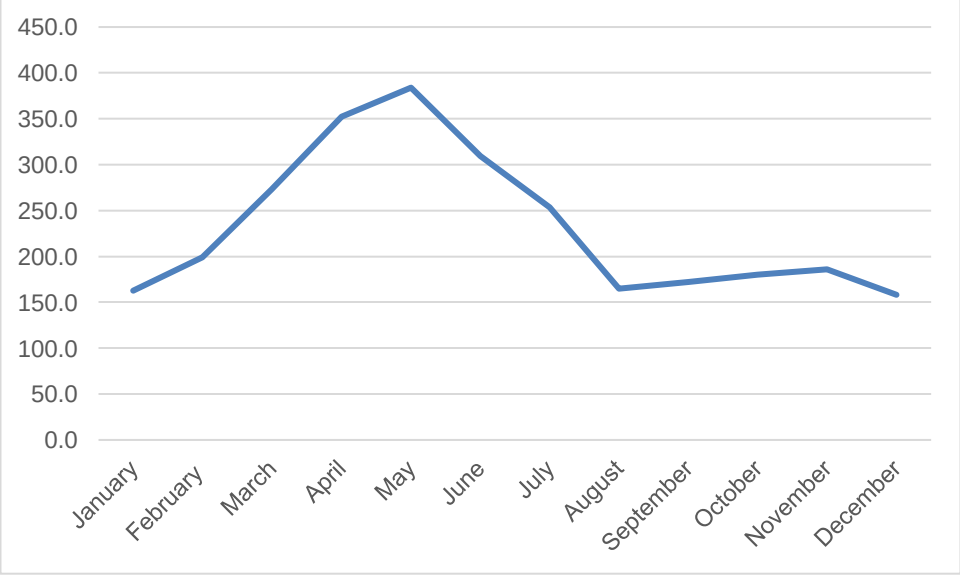
Table 3: Annual Average Landings in tonnes, EC$ million, and US$ million by landing site / company (2014-2016).

Site	Tonnes	EC$ million	US$ million
GRENVILLE	448	6.2	2.3
SAUTEURS	74	0.7	0.3
DUQUESNE	17	0.2	0.1
WALTHAM	83	1.0	0.4
VICTORIA	42	0.6	0.2
GOUYAVE	227	2.9	1.1
MELVILLE ST.	192	2.4	0.9
NORDOM*	8	0.1	0.0
SFA. INC.*	544	7.4	2.7
SIFH LTD.*	962	14.0	5.2
WINDWARD	0	0.0	0.0
CARRIACOU & PETITE MARTINIQUE	192	3.4	1.3
TOTAL	2796	39.0	14.4

Source: Grenada Fisheries Division

Figure 4 below shows the average monthly landings over the period 2014-2016. The landings were highest in May, when almost 400 tonnes of fish were landed in all landings sites. Catches declined between June and August. From August to January landings were low at about 150 tonnes, increasing rapidly over the first four months of the year.

Figure 4: Average monthly landings, all landings sites, in the 2014-2016 average, in tonnes



Source: Grenada Fisheries Division

2.2. The fishing fleet and fishers of Grenada

The fishing sector in Grenada, according to the latest available official records included an estimated some 771 vessels and 2,600 fishers in 2012. However, the 2017 Fishery Performance Indicator study[3] counted 192 active long line vessels (65 of Type I and II and 127 of Type III) distributed over the various ports and approximately 80 active Fish Aggregating Device (FAD) fishing vessels, which mostly fish from Grenville. In addition to these active longliners and FAD fishing vessels there are numerous small-undecked pirogues that are used to fish professionally or from time to time for commercial fishing and household food security purposes. Overall, we estimate that the number of vessels that are used for fishing is still around 700. The fishing vessel registry is currently being updated and it is likely that many of the earlier recorded fishing vessels are not active anymore. On the other hand, some new vessels may have entered operations.

Overall, evidence from earlier data collection activities suggest that a 3:1 ratio in terms of vessels to fishers can be applied in Grenada. Interviews during the fieldwork in November 2018 and previous research suggested that the vessel type and number of fishers shows a high variety. The three most commonly used vessel types are the following:

- Type I vessels usually have 1 or 2 fishers
- Type II vessels usually have 3-4 fishers
- Type III vessels usually have 5 to 8 fishers/crew

The majority of the Type 2 and 3 vessels, and a proportion of the type 1 vessels are engaged in the long-line fishery for large pelagics. The smaller type 1 vessels often fish on FADs or for shellfish, demersal species or practice seine netting for bait fish (used in the long-line fishery for tuna).

The fishers and their vessels are distributed unevenly throughout the country, with some regions being more dependent on fisheries than others. Table 4 below shows the percentage of fishers from official Government statistics active at each landing site in 2012 and compares these with findings from the assessment undertaken in November 2018.

[3] Fishery performance indicator studies for the commercial and recreational pelagic fleets of the Dominican Republic and Grenada. FAO Fisheries and Aquaculture Circular No. 1162. Rome, Italy. Available at: http://www.fao.org/3/i8833en/I8833EN.pdf

Table 4: Percentage of active fishers per landing site and district in 2012 and estimates from November 2018.

Landing site	District	Percentage of active fishers in 2012	Estimated percentage of active fishers in 2018
Grand Mal	St. George	7%	12%
Melville Street	St. George	8%	6%
Gouyave	St. John	41%	12%
Duquesne	St. Mark	3%	7%
Victoria	St. Mark	4%	3%
Waltham	St. Mark	8%	12%
Sauteurs	St. Patrick	7%	2%
Grenville	St. Andrew	9%	30%
Petite Martinique	Petite Martinique	10%	14%
Hillsborough	Carriacou	3%	2%

Source: Grenada Fisheries Division and 2018 estimates from stakeholder interviews and workshop information

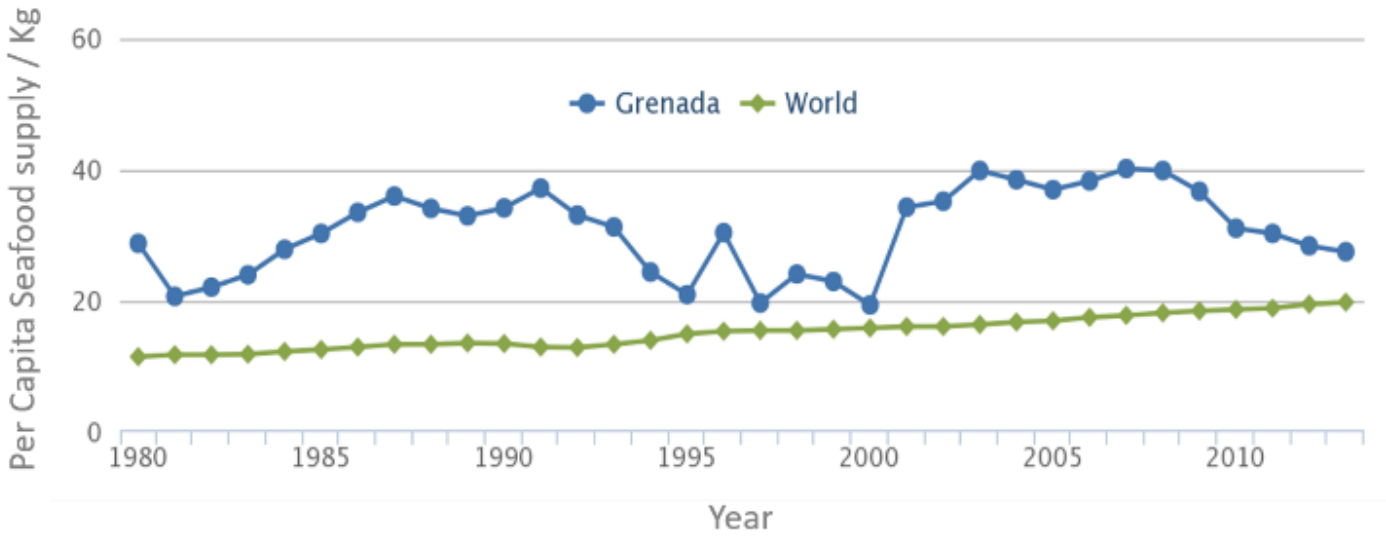
Table 4 shows that there have been some changes in fishing activity in recent years, particularly as a result of wider changes in the industry. These changes include for instance, shifting from small-scale to export focused long-lining, introduction of FADs fishing in Grenville, and a move towards landing sites with sufficient ice supply and fish buyers. Some fishers rotate between working on different vessels and not all of them are working at sea all of the time. The workforce is often not exclusive to a vessel or landing site, which complicates an assessment of the number of fishers and vessels.

2.3. Fish consumption in Grenada

The Grenadians consume fish on average twice per week. Similar to many other Caribbean countries, cured herring, canned mackerel and tuna form the main protein staples in the diet of many Grenadians.

Annual per-capita fish consumption in Grenada was estimated at 28.7 kg in 2011 and 27.5 kg in 2013, a reduction from the 34 kg of the 1990s. However, even given the slight decrease in recent years, fish consumption in Grenada is still one of the highest in the Caribbean. Figure 5 presents Grenada's per capita supply of fish and fisheries products, compared to the global average between 1980 and 2010. Figure 5 presents the average per capita consumption of fish and animal protein in Grenada between 1961 and 2013. The level of fish consumption per capita has remained relatively stable, although the population has risen from just under 90 000 to around 110 000 over the same period.

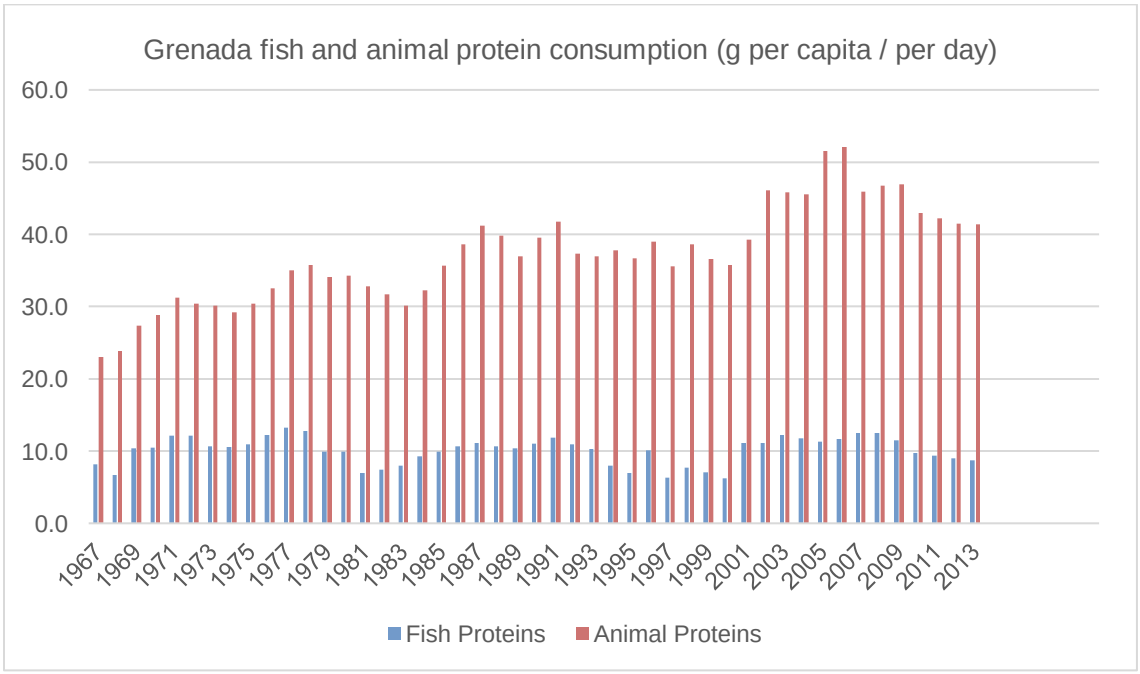
Figure 5. Grenada's per capita seafood supply in kg (1980 to 2014)



Source: FAO FISHSTAT J

As Figure 6 below shows, the per capita protein consumption for Grenada has risen since the 1960s, nearly doubling by 2005. However, the consumption of fish protein has remained fairly stable over that period of time, presumably due to the accessibility of seafood given the size of the available resource around the islands. Other sources of animal protein, particularly chicken, have become relatively more important in the diet of the Grenadian population, especially since the beginning of this century.

Figure 6. Grenada's per capita fish and animal protein consumption in grams (1961 to 2013)



Source: FISHSTAT (2018)

2.4. Food security and nutrition

The Grenada Food and Nutrition Security Policy and Action Plan 2013-2018 refers to sustainable fisheries, underlining the importance of fishery products to food security. Fisheries contribute significantly to food security in Grenada. Seafood will likely continue to do so in the future, since Grenada's EEZ is about fifty times the size of the land, offering significant opportunities for the exploitation of its living resources. The government is also facilitating actively the development of the fishing industry in order to keep fish available and affordable to the domestic consumer. In recent years, the increase of obesity in the Caribbean population[4], including in Grenada, is a concern to the governments. Fish is widely regarded as a healthy source of animal protein, which does not carry with it increased risks of overweight and related diseases.

2.5. Fisheries trade

On average, Grenada imports 700 tonnes of seafood annually, valued at approximately USD 2.5 million. Grenada is host to a positive trade balance facilitated by its exporting of high value fish and concomitant importing of low value fish. This positive trade balance provides average net earnings of USD 5 million per annum.

Imported fish are dominated by six species (herrings, alewives, saithe, pollock, haddock and hake) sourced mainly from Canada, Norway and the USA. To facilitate the tourism industry, limited quantities of salmon, cod, snappers, lobsters, shrimps and oysters are also imported to meet demand of particularly hotels, restaurants and resorts. Grenada's high value fish exports include yellowfin tuna, parrotfish, red hind, dolphin fish and spiny lobster (shown in Table 5). The USA is by far the main importer of fishery products from Grenada, mainly importing fresh yellowfin and accounting for over 90% of the total with the EU-28 a distant second. Total export earnings reached a peak of USD 7.3 million in 2016, and declined to USD 6 million in 2017.

Table 5. Primary export species, quantities exported and primary market destinations for each for (2016).

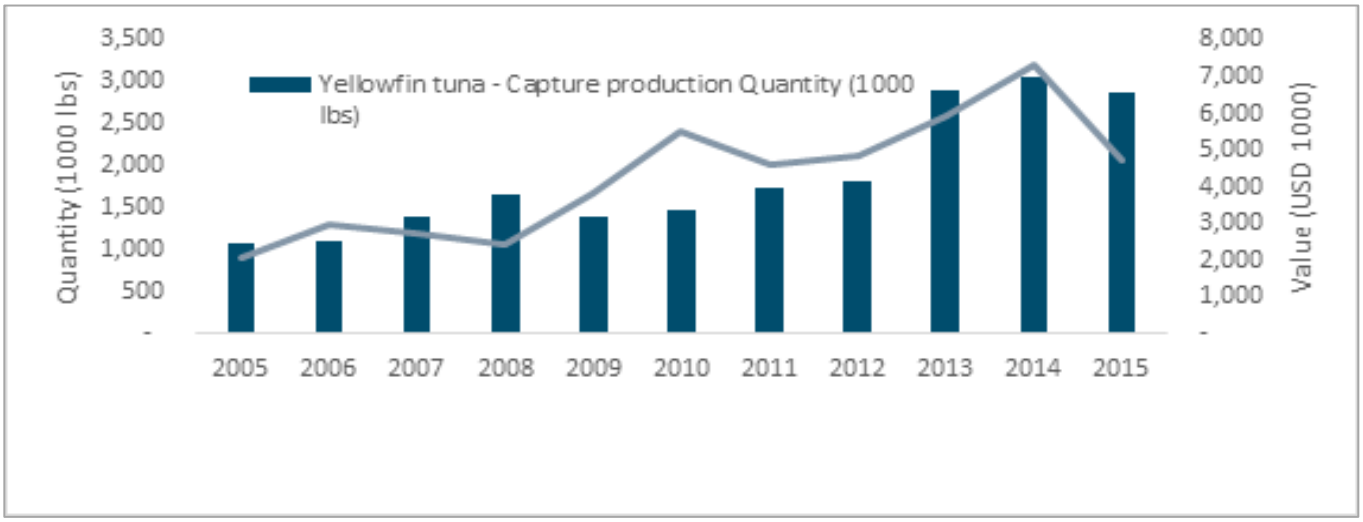
Species	Quantity (tonnes)	Destination market
Yellowfin tuna (*Thunnus albacares*)	526	USA
Parrot fish (Scaridae spp.)	39	(EU – French Depts. Martinique and Guadeloupe)
Red hind (*Epinephelus guttatus*)	20.6	(EU- French Depts. Martinique and Guadeloupe)
Dolphin fish (*Coryphaena hippurus*)	9.5	Caricom*
Spiny lobster (*Palinuridae*)	10	Caricom*

Source: Grenada National Report to the 15th Caribbean fisheries forum

[4] See for instance: http://www.fao.org/news/story/en/item/463472/icode/

Grenada is currently the number 11 supplier of fresh Yellowfin to the US market, averaging 725 tonnes per annum (2014-16) and with an average unit value of US$ 7.00/kg. In terms of quantity, approximately 1 000 tonnes of seafood are exported every year from Grenada along supply chains, that although short, still lack appropriate cold storage and traceability, somewhat hindering the expansion of this trade. Figure 7 below shows Yellowfin tuna catches and exports over a decade (2005-2015) and Figure 8 breaks these down by volume and value. Table 6 shows the major export destinations by value.

Figure 7: Grenada yellowfin tuna capture and exports by quantity and value (2005-2015).



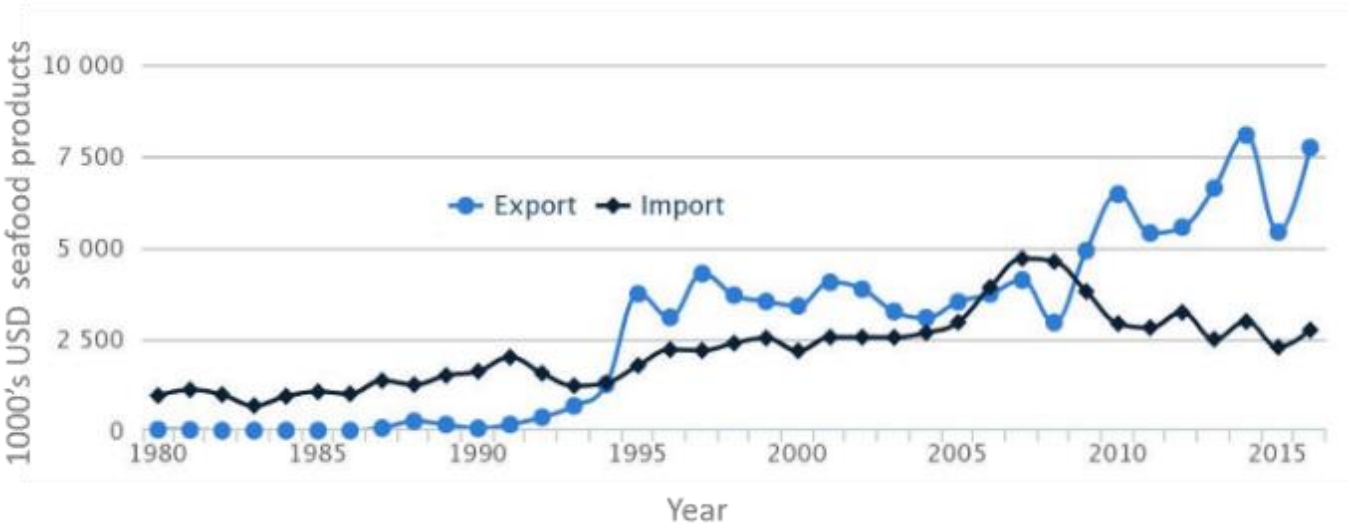
Source: Investing in Grenada's Yellowfin Tuna Exports. A business case to incentivize and facilitate required reductions in billfish mortality. Wilderness Markets. (FAO, 2018).

Table 6: Grenada's fishery exports (in US$ 1 000) per year from 2012 to 2017

	2012	2013	2014	2015	2016	2017
United States of America	4429	5401	5743	4414	6747	5149
France (French Depts. Martinique and Guadeloupe)	526	628	595	497	542	474
Uruguay	0	0	0	0	56	0
Canada	647	513	371	156	47	16
Total	**6104**	**6542**	**6759**	**5067**	**7392**	**5638**

Source: Trade Data Monitor

Figure 8. Total imports and exports of fish and fisheries products to Grenada (USD 1 000)



Source: FAO FISHSTAT (2018)

2.6. Fisheries Governance

The Grenadian government aims to play a leading role in promoting the sustainable development of Blue Economies worldwide, particularly with the establishment of the “Blue Innovation Institute”(BII). As a center of excellence and think-tank on the blue economy, “blue” financing instruments such as debt-for nature swaps, blue bonds, insurance and impact investments are being tested and are under development with support from the BII.

Grenada aims to make its fisheries an ecologically sustainable and an economically healthy sector; an example to the world. Grenada and the World Bank agreed in 2018 on a “First Fiscal Resilience and Blue Growth Development Policy Credit”. The purpose of this credit line is to support Grenada’s efforts to maintain fiscal discipline and facilitate the transition to (and development of) its blue economy. The plans for fisheries development include, the formulation of a capital investment plan, looking into the sustainability of investments into a fisheries school, a fish processing demonstration centre and the construction of dedicated fishing and yachting marinas.

Fisheries Governance is undertaken by the Fisheries Division (Fisheries Management Unit) who are the lead agency responsible for management and development within the fisheries and aquaculture sectors. The Division comes under the Ministry of Climate Resilience, Forestry, Fisheries, Disaster Management and Information (since March 2018), with the authority for execution of management functions derived from legislation enacted in 1986 and 1987, with subsequent amendments. To fulfil its mandate, the Division carries out the following functions: Extension Services, Fishing Technology, Data Management, Marine Protected Areas Management, Resource Assessment and Management, among others. Government facilitates management and development of the fisheries sector via the maintenance of onshore support infrastructure facilities for landing and marketing of fish, including cold storage, ice making, marine safety communication and other services to fishing communities. The Fisheries Division also works with the Coast Guard, Customs, Ports Authority and other

agencies for law enforcement. Fisher's organisations are frequently engaged with and consulted on fisheries management issues.[5]

The Government budget allocation to the Fisheries Division has been approximately EC$ 1.6 million (USD 590 000) in recent years, although the fluctuations in budget have been substantial. A large share of the budget, generally more than 50% of the recurrent expenditures is allocated to personnel. The frequent changes in Ministries under which the Fisheries Division was placed, changes in tasks assigned to the Division and the related numbers of staff to be covered within the budget of the Fisheries Division, make an analysis of the budget allocation trends a challenge. It is clear however that the Fisheries Division, with its limited staff and budget, has done tremendous work in support of the sector in recent years.

2.7. Fisheries Stakeholders

The fisheries stakeholders include the fisheries division of Grenada under the Ministry of Climate Resilience, Forestry, Fisheries, Disaster Management and Information, the fishers and fishmongers of Grenada, the four main processing and exporting companies, importers of fishery products, supermarkets, retailers, restaurant owners and consumers.

There are nine fishermen's organizations in Grenada: seven on the mainland, one each on Carriacou, and Petite Martinique respectively. The Fisheries Division is supportive of the establishment and strengthening of fisherfolk organizations and other stakeholder groups, such as the FAD's fisheries group in Grenville. The Fisheries Division collaborates with these organizations in capacity building and awareness raising activities related to fisheries and assigns where possible responsibility to these groups for certain data collection and management activities.

Fisheries processing/exporting companies and fish retailers in Grenada are not organized at present.

The recent, December 2018, Letter of Intent "On implementing fishery improvements within Grenadian tuna fisheries", signed by the Ministry, SIFH, SFA, Grenville FADs fishers association and the Gouyave Fishermen cooperative society provides a clear example of the willingness of the key private and government stakeholders in fisheries to collaborate to develop the sector in a sustainable manner.

[5] FAO Grenada country profile http://www.fao.org/fishery/docs/DOCUMENT/fcp/en/FI_CP_GD.pdf

3. Techno-economic performance assessment of fish landing sites and fishing ports in Grenada

3.1. Fish landing sites

The fish landing sites across Grenada can be separated into three classes:

1) Primary: These sites provide facilities for shore-based activities and are used to weigh, sort, dress, store and market fish. These sites generally produce ice at the site. The sites are maintained by government employees which also record landings and collect user fees.
2) Secondary: These sites include beaches where fish is landed without dedicated infrastructure and/or government staff.
3) Tertiary: At these sites the fish destined for export or processing for the local market is landed. These sites have the capacity to weigh, grade and prepare the fish for export or domestic transport. There is ice supply available as well. These sites are visited irregularly by Fisheries Division staff for inspection and data collection purposes.

There are in total forty-five fish landing sites around the islands.

Seven sites are primary landing sites with fish market and port facilities (Grenville, Melville Street, Gouyave, Victoria, Duquesne, Sauteurs and Hillsborough in Carriacou)

Thirty-seven of the 45 landing sites are secondary landing sites (beaches/bays without infrastructure). There is currently only one tertiary landing site, which is at Grand Mal, where two of the three fish processing/exporting plants are located: The Southern Fisherman Association (SFA) and Spice Island Fish House (SIFH).

3.1.1. Fish landing site ownership, governance and management arrangements

All of the main fish landing sites and markets assessed in Grenada are government owned. The Spice Island Fish House (SIFH), the Southern Fishermen Association (SFA) and Nordom, located at Grand Mal and Gouyave, however, are private entities that lease building space from the Grenadian government. Many of the sites visited have benefited significantly from Japan International Cooperation Agency (JICA) investments in terms of both infrastructure and equipment. Carriacou and Duquesne also received funding from United States Agency for International Development (USAID), the FAO as well as the Canadian International Development Agency (CIDA). These investments ranged in size from ice machines, to market vending space, to jetty's and fisheries buildings.

Significant fisheries infrastructure (jetty and market) exist at the Government run sites of Mellville st., Gouyave, Victoria and Grenville, where ice (and fuel) are available for sale to the fishers and the general public. SFA is the only shareholder-owned entity (in which members of the cooperative have shares in the company) in Grenada's fisheries sector.

Fisheries governance in Grenada is entrusted to the Fisheries Division (Fisheries Management Unit), which is responsible for the management and development within the sector. The Fisheries Division comes under the

Ministry of Climate Resilience, Forestry, Fisheries, Disaster Management and Information[6]. The fisheries sector within the Ministry is headed by a specialist Minister for Fisheries, indicating the high priority the government gives to the sector. The authority of the Fisheries Division for execution of management functions is derived from the Grenada Fisheries Act (1986) and related Fisheries Regulations (1987). These are largely based on the OECS harmonized legislation. Fisheries management objectives are set to guarantee sustainable fisheries for the benefit of the society of Grenada.

At present, closed seasons for turtle and lobster as well as a moratorium on sea urchin fishing are the main regulations enforced by the Fisheries Division. Monitoring of fishers' behavior in Grenada's EEZ is sparse to non-existent due to a lack of staff, surveillance vessels, staff capacity and training. Fisheries Division staff are however employed at all the main landing sites and fish markets to monitor and enforce the regulations at these sites. Fisheries Division staff are tasked with the daily management of the landing site, including; recording landings data, sales notes, and collecting income from landings fees, ice sales and facility usage from vendors. Additional roles include the maintenance of the facility, including; cleaning, maintaining lockers and market stalls as well as the maintenance of machinery such as ice machines and freezers.

The Government aims to introduce AIS (Automatic Identification system), Vessel Monitoring System (VMS), e-logbooks and other digital monitoring and data collection capabilities onboard vessels, to support monitoring, control and surveillance (MCS) in the fisheries sector in the future. In addition, the implementation of the Port State Measures Agreement (PSMA) is expected to contribute to MCS and help the government to reduce Illegal, Unreported and Unregulated (IUU) fishing and related activities in Grenada (and particularly at its ports and landing sites).

In terms of data collection, at present there is no legal obligation or incentive structure for fisheries data reporting by fishers in Grenada, although Grenada itself has fisheries data reporting obligations to ICCAT, CRFM and FAO. Overall, fisheries data collection, analysis and trends reporting could be significantly improved in Grenada. Steps to facilitate this could include incentivizing fishers to record their catches and increasing the monitoring capacity of the fisheries staff at each site. Incentive schemes could encourage fishers to record their catch in return for a reward (phone credits has been used successfully in SE Asia and Africa) and records are error checked by fisheries staff before the data is filed in a master database (held at the fisheries division at Melville st.).

Grenada's fisheries data collection could also be improved by the installation of computer systems, internet connections and data collection software at each site, all linked directly to the Fisheries Division master database. The installation of these systems requires the necessary training to ensure that all fisheries port managers and staff are able to use them, input landings data and analyze and report on the data collected. At present a part of the fish landings are underreported or unreported at all the landing sites. There are no quotas or minimum sizes applied in Grenada. The open access nature of the fishery and the ease of landing to any beach (secondary site) makes overcoming the gaps in reporting of fish landings a challenge. The aforementioned AIS and VMS technologies as well as an updated vessel register and fishers licensing scheme may help to address the current gaps in reporting as well, although an incentivized approach to data reporting will still likely be needed.

3.1.2. Legal frameworks

The Grenada Fisheries Act of 1986 (No.15 of 1986) is supplemented by the Fisheries Regulations 1987 (S.I. No. 9). Neither the Fisheries Act nor the Regulations mention the roles of fishing ports or landing sites within fisheries management.

Although the Regulations themselves appear to be highly comprehensive, covering subjects such as transportation, licensing, import and export rules, storage and processing, it is unclear the extent to which they are enforced. The level of enforcement is considered limited, due to mainly financial resource restrictions on staff

[6] New name of the Ministry since March 2018

and patrols (where the high cost of fuel is one of the most important constraints for shore or maritime patrols). Controlling IUU in Grenadian waters remains a challenge. In addition, there are no practical mechanisms to compel fishers to become licensed. However, at some sites (e.g. Grenville) withholding of services, such as concessions and rebates for fuel purchases serve as incentives to ensure fishers comply with the rules. The level of compliance depends on the management measures enforced, but was considered better regarding closed seasons than it is for licensing.[7] There are not any regulations currently in place or enforced regarding landing site management and operations, reporting obligations by fishers or fisheries organizations or specific health and safety requirements related to the operations of the landing sites and fish markets.

The Fish and Fishery Products Regulations (1999) SRO. 17, These regulations discuss a number of health and safety related issues regarding the production and transport of fish and fisheries products. The regulations go into detail and are subdivided into the handling of fish, regulations for fish processing / handling facilities and vessels and the transport of fish products.

There are a number of other acts that impinge upon the fisheries sector and indirectly or directly on the fish landing sites and markets, although their principle focus may be elsewhere. Chief amongst these are the Grenada Territorial Waters Act #17 of 1988 Marine Boundaries Act #20 of 1988, the Public Health Act. Fishing Vessel Safety Regulations (SRO3 1990) for Safety at Sea, the Beach Protection Act (1979, sand mining), Land Development Control Act (1990, coastal development), and the Town & Country Planning Act (use of the coastal zone).

Grenada's fisheries act and regulations are also linked to regional and international agreements and conventions to which the country is signatory. Grenada is a member of the Caribbean Community (CARICOM), the British Commonwealth of Nations, the Organisation of Eastern Caribbean States (OECS), the Caribbean Regional Fisheries Mechanism (CRFM), the Western Central Atlantic Fishery Commission (WECAFC), the International Whaling Commission (IWC) and many other regional and international agreements and organizations. Since 2015, the Caribbean Community Common Fisheries Policy is in place, which requires national level implementation in Grenada, what may involve also legislative amendments. This regional policy requires in its Article 14 on "Inspection, Enforcement and Sanctions" that the countries adopt port and "at sea" inspection schemes.

In October 2017, Grenada became a member of the International Commission for the Conservation of Atlantic Tunas (ICCAT) and assured the Commission that it would work towards improving the management of the local tuna resources within its Exclusive Economic Zone (EEZ).

In terms of Grenada's participation in international agreements related to fisheries it is noteworthy that since April 1991, Grenada is Party to the 1982 UN Convention on the Law of the Sea and in 2016 Grenada acceded to the 2009 FAO Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated (IUU) Fishing (PSMA). The latter agreement requires Grenada to establish procedures in its legislation for the designation of ports for foreign fishing vessels entry, advance request for entry into port, conditions for the use of port, exceptions for the use of port, minimum standards of inspection, establishment of a record of fishing vessels inspected in port, and procedures on how to deal with specific offences for non-compliance with the aforementioned.

The country has not ratified the 1993 FAO Compliance Agreement and the 1995 UN Fish Stocks Agreement.

[7] JICA (2008) Grenada country report http://open_jicareport.jica.go.jp/pdf/12058533_02.pdf

3.1.3. Human resources and capacity

The number of staff employed at a fish landing sites in Grenada is generally correlated with the volume of fish landed. The number of full-time staff at each site is shown in Table 7. Employees at the busier sites (SIFH, SFA, Gouyave, Melville St. and Grenville) include: landing site/fish market managers, supervisors, data officers/clerks, fisheries clerks, IMANI trainees from the Ministry of Youth Development, Sports, Culture and Arts, cleaners and cold room attendants. In some cases, full-time contracts with the government are not provided to cleaners, who are instead paid for completing pre-specified tasks. Fish cleaners, vendors and fishers active at the landing sites do not have contracts with the government. Vendors and fish cleaners generally rent the cleaning space and vendor space for which they pay a daily or monthly fee, which includes water and electricity use, as well as cleaning services of the work space.

Twenty years ago, staff of the Fisheries Division would attend a vocational fisheries training school to learn the skills required to carry out their roles. This school closed down and since the closure no vocational training has been received by Fisheries Division staff. Nevertheless, some of the fisheries staff have benefited from international and regional capacity building and training opportunities provided by bilateral donors and regional and international organizations.

Table 7. Number of full time employed (FTE) fisheries staff at each site.

Landing site	Number of FTE staff
Gouyave	9
Grenville	9[8]
St Georges / Melville	9
Grand Mal	30 (SIFH)* / 15 (SFA)*
Carriacou	8
Petite Martinique	0
DuQuesne	1
Victoria	2
Sauters	4
Waltham	1
Windward	2

Source, interviews and stakeholder workshop.
*Note that these are not government staff

Little standardized, formal training of fishers in Grenada (other than sporadic training programs associated with JICA programmes and some FAO and other donor projects) has been undertaken in recent years. A new training initiative which was started by the Fisheries Division in 2018 is a positive step to improve the current practices of fishers around the island. The first results from this new initiative are positive, including improvement of quality of export products, more processing knowledge among fishers and greater value-addition to products. In general, more formal fisheries training for fishers will help increase the capacity and value of Grenada's fisheries. Better fishing practices (sustainability and productivity-wise), increasing product value (through value addition) and better product handling (increasing health and safety / food hygiene standards) are likely benefits from future

[8] The exact number of employees at the Grenville landing site and fish market may be higher, up to 15 people, but the modality of their contracts was difficult to verify; therefore a similar number as for Gouyave and Melvillle st is applied in the comparative analysis of the landing sites further in this report.

investment in the training of Grenada's fishers. A formal training program to raise the status of fishing as a career amongst Grenada's younger generations is needed, as at present, fishing is perceived as a career for those who do not do well at school and those incapable of pursuing higher education. Formal training will both help increase the technical knowledge base of new fishers entering the fleet and highlight fishing as a career that can generate significant income earning opportunities for new entrants in the fisheries sector.

All government employees at landing sites visited were employed on a full time basis. There are no part-time government fisheries employees working at these sites. During the "low" fishing season (August/September to December), the workers note a drop in their workloads due to reduced landings, which provides the possibility of arranging training and capacity building of the staff in the low season, alongside involvement in maintenance activities at the sites.

3.2. The status and condition of the landing site infrastructure

The main fish landing site buildings and fish markets are being well used, but some could do with some routine maintenance. The Grand Mal landing site where the exporters SIFH and SFA are located does not have a fish market. All the Government owned and operated landing sites have market stalls, where fish vendors can sell the landed fish. However the use of these facilities is highly variable, with some such as Melville St., or Grenville and Gouyave being used daily (and often nearly at capacity) while others such as Duquesne or Victoria are relatively unused.

Table 8: Inventory and condition of infrastructure of the largest fish landing sites

Landing site	Building	Market stalls	Jetty	Moorings	Offices	Parking	Lockers	Toilets	Fencing
Grand Mal (SIFH)	Adequate but not purpose built	None	Needs repair and fencing / lighting; currently open access	public access issue as moorings are used by multitude of sea users	Sufficient	Sufficient	Yes (12)	Yes	No but required
Grand Mal (SFA)	Space is limited, but the building is in good condition	Fish shop	See SIFH	See SIFH	Sufficient	Sufficient	None (fishers share the lockers with those at SIFH)	Yes	No but required
Gouyave	Good condition, could do with routine maintenance and repairs	5	Good condition	Sufficient	Sufficient	Sufficient	Yes (25) but needs increase	Yes	Yes
Grenville	Good condition, could do with routine maintenance and repairs	8 (but dedicated processing space is needed, with tiled surfaces and water available)	Good condition, needs water supply	Throughout the bay	Sufficient space, computers not connected, A/C needs renewal	Sufficient	Yes (30) but needs increase	Yes	There is a partial fence around the perimeter of the landing site, but in reality it is open access
Melville St	Good condition, but could do with routine maintenance and repairs	8	Good condition, inner harbour needs dredging	Larger vessels moorings are limited	Sufficient	Sufficient (paid parking)	Yes (28) but needs an increase	Yes	Yes

Source: November 2018 fieldwork.

Table 9: Inventory and condition of infrastructure of the smaller fish landing sites

Landing site	Building	Market stalls	Jetty	Moorings	Offices	Parking	Lockers	Toilets	Fencing
Carriacou	Good condition, could do with routine maintenance and repairs	5	There is an old jetty at 200 meters distance, but outdated. Needs a new jetty	Throughout the bay	Sufficient	Sufficient	None	Yes	No
Windward	Could do with routine maintenance and repairs	2	Yes. Wooden	Private	Sufficient	Sufficient	Yes (12) could do with routine maintenance and repairs	Yes	Yes
Petite Martinique	None	none	One public one private, could use main-tenance	private	None	none	Yes (15)	None	No
Victoria	Practically unused	3	none	Private	Practically unused	Sufficient	Yes (16) Unused	Yes	No
DuQuesne	Good condition	3	none	Throughout the bay	None	Sufficient	Yes (6) but needs increase	No but public toilet adjacent	No
Waltham	Good condition, but could do with routine maintenance and repairs	2	none	Throughout the bay	None	Sufficient	Yes (16) but needs increase	No	No
Sauteurs	Good condition, but could do with routine maintenance and repairs	3	Full harbour, quite high, relatively unused	Throughout the bay	Sufficient	Sufficient	Yes (23) but need repair	Yes	No

Source: November 2018 fieldwork.

The status of the jetties is a major issue at some of the sites (e.g. Carriacou and Petite Martinique) where the construction of new jetties is a key priority, and others (e.g. Grand Mal) where fencing and some major maintenance work is necessary. Moorings and their uptake seems to be highly variable as anchoring sites in sheltered bays are frequently used. The fishing vessels need a safe mooring place when not landing fish or loading up before going to sea. Most sites have lockers, the condition and occupancy level of which is also highly variable with some (e.g. Victoria) not being used at all and others (e.g. Waltham, DuQuesne and Melville street) needing more as the existing lockers are fully occupied (and sometimes are already shared). The situation with the lockers in Sauteurs is most critical, as the 23 lockers at this site are in an inadequate state and cannot be used at present. Toilets are available at each of the sites.

3.3. Inventory and condition of equipment

Tables 10 and 11 below shows the main equipment inventory and its condition for the landing sites visited in November 2018, covering the availability of an ice machine on site, freezer and cold storage space for frozen and fresh fish respectively. Vehicles, ice boxes, safety equipment for handling ammonia, equipment for processing and the availability of adequate lighting, A/C units, water supply/pumps in the facility and computers for office staff and managers were also assessed.

Table 10: Inventory and condition of equipment at the main fish landing sites.

Landing site	Ice machine	Freezer	Cold storage[9]	Vehicles	Ice boxes	Ammonia handling equipment	Processing equipment	Lighting	A/C	Water supply/ pumps	Computers
SIFH	Yes	Yes (freezer room and blast freezer)	Yes	Yes (forklift)	Yes	No	Yes	Needed for jetty	Yes	Yes	Yes
SFA	Yes	Yes	Yes	No	Yes	No	Yes	Needed for jetty	Yes	Yes	Yes
Gouyave	Yes (2)	Yes. 1 slow freezer room; 1 freezing room; 1 blast freezer	Yes; 1 cold storage room; one bait room	No (forklift broken)	Yes	No	No	Yes	Yes	Yes	Yes
Grenville	Yes (2)	Yes	Yes Cold storage and chill room	No	Yes	No	No	Yes	Yes (6) need repair / replacement	Higher capacity water pump needed	Need to be connected
Melville St	Yes	Yes	Yes; one chiller room one cold storage room	No	Yes	No	No	Yes	Yes (15)	Yes	Yes

[9] The term “cold storage” is used in this report to indicate the storage for fresh fish.

Table 11: Inventory and condition of equipment at the smaller fish landing sites.

Landing site	Ice machine	Freezer	Cold storage	Vehicles	Ice boxes	Ammonia handling equipment	Processing equipment	Lighting	A/C	Water supply/ pumps	Computers
Carriacou	Yes	Yes	Boxes	Yes pickup truck	No	No	No	No	Yes	Yes	Yes
Windward	No	No	No	No	Yes	N/A	No	Yes	No	No	No
Petite Martinique	Yes	No	No	No	No	N/A	No	No	No	No	No
Victoria	Yes	Yes	Yes. 1 cold room	No	No	No	No	Yes	No	Yes	Yes
DuQuesne	No	Yes	No	No	No	N/A	No	Yes	No	Yes	No
Waltham	No	Small freezers	No	No	Yes	N/A	No	Yes	No	Yes	No
Sauteurs	Yes but needs repair	Yes	No	No	No	No	No	Yes	No	Yes	Yes

Source: November 2018 fieldwork.

3.4. The status of fishing-related services provided at the landing sites

3.4.1. Finance (credit / loans)

Credit supply programmes to support fishers were in operation previously at some Government operated sites, but these programmes have been discontinued some years ago. In the past, these programmes provided ice and fishing gear on credit. At present, only SIFH and SFA provide credit to the fishers that land fish to them. Fishers use this credit in the wholesale shop on-site to purchase fishing gear, bait and ice. SIFH also provides credit to fishers based in Carriacou that land their catch at the SIFH facility.

3.4.2 Ice supply

All of the fish landing sites have ice available in some form. Ice is produced on site in Gouyave, Grenville, Melville St, Grand Mal, Carriacou, Petite Martinique and Victoria (which also supplies fishers in Waltham). A fishermen's cooperative in Sauteurs also produces a small amount of ice. Fishers in Duquesne purchase ice directly from traders and fishers from Windward buy ice from the Carriacou fish market. Ice is generally charged to fishers at EC$ 0.20 per lbs and EC$ 0.30 per lbs to the general public.

3.4.3 Freezer and cold storage space rental

All government owned landing sites have a freezer. The freezer capacity at all landing sites appears to be sufficient, with the exception of Grenville, where through the recent introduction of Fish Aggregating Devices (FADs) fishing, the landings of Yellowfin tuna exceed the available freezer space (which is approximately 2 tonnes). A doubling of freezer capacity at Grenville to meet this increase in landings is required, unless the fishers manage to transport their fish on ice efficiently to the exporters at Grand Mal.

As shown in Table 10 and 11 above, cold storage facilities are not available at all sites. All sites however use ice boxes (mainly made from PE plastic – and produced by Trinidad and Tobago based Rotoplastics), or occasionally fiberglass containers, filled with ice. These boxes are often privately owned and placed in the public space of many of the fish markets.

The installation of actual cold storage facilities for maintaining fresh fish is necessary, as the present freezing of fish overnight, for sale the next day (and subsequent refreezing if unsold) increases the likelihood of food safety problems Moreover, the general hygiene is at stake if fish stays too long outside the cold storage without ice at the market stands. Vendors are paying, between EC$ 10 per day per vendor to EC$ 0.10 per lbs per day or per 3 days for fishers renting freezing space. Overall, it appeared that these fees remain largely uncollected. Labelling of the bags and boxes with fish as well as individual fish stored, including the name of the owner and date of storage would allow for better collection of the freezer fees.

3.4.4 Fuel

Fuel for the fishing vessels is available near most sites. However, Gouyave and Grand Mal have fuel stations available on site. In Grenville fuel is provided by a local cooperative, and near the Melville St and Carriacou fish markets there are private sellers of fuel. None of the northern sites (Sauteurs, Duquesne, Waltham and Victoria) have their own fueling stations. Fuel charges vary slightly between sites. The licensed fishers can purchase fuel at a reduced (subsidized) rate at Gouyave and Grand Mal and get a rebate if they purchase elsewhere. Through the rebate system the fishers file for an annual fuel rebate via the Customs and Excise Division to reclaim EC$ 1.50 per gallon of gasoline and EC$3 per gallon of diesel. In some instances the payment of the rebate is withheld until other dues (e.g locker rental or ice charges) have been paid.

3.4.5 Bait

The landing sites of Grand Mal (SIFH) and Gouyave supply bait for long liners, generally in the form of frozen squid. In Duquesne, fishers use seine nets to catch live jacks which are kept in holding pens and sold as live bait (at EC$ 100-200 per ‘dip’) to local or visiting long line vessels. The bait is sold at a higher price (2-3 times the price, paid in US $) to foreign vessels visiting Grenada’s coastal waters, which sometimes results in a bait shortage for Grenadian vessels. Recorded landings for Duquesne and various other sites are lower than the actual landings, as the live bait is not landed to the shore and therefore not recorded.

Another species frequently used as bait in pelagic longline fishing is the four-wing flyingfish. The CRFM/WECAFC Sub-regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean[10] (2014) recognizes the use of flying fish as bait in long –line fisheries in Grenada and Trinidad and Tobago in particular and expressed concern about the not recoding of these catches, which is negatively impacting on the management decision making process regarding this fisheries. The plan also notes that “the high demand for flyingfish and other small pelagic fish catches of beach seines to be used as bait for longlining has a negative impact on the food security of local populations. Flyingfish and beach seine catches have traditionally been a source of low cost food and protein in rural areas. The increased demand for these species as bait in the longline fisheries has resulted in increased prices and in some cases removed some coastal pelagics altogether from local food supplies”.

[10] Available at: http://www.fao.org/fi/static-media/MeetingDocuments/WECAFC16/Ref19e.pdf

3.4.6 Fishing Gear and Equipment

Fishers at Grenville, Grand Mal (SIFH) and Victoria have fishing tackle shops on site. For fishers at SIFH, fishing gear is available for purchase on credit if the fisher lands his fish directly to SIFH. The tackle shop operated by the fishing cooperative at Victoria also supplies basic engine repair spare parts, although the shop is seldom used due to the low number of fishers working out of Victoria. The tackle shop at Grenville is privately owned and is used regularly by type I vessel' fishers. Fishers receive significant incentives from the government in the form of concessions for the following items: outboard and inboard engines, boat repair materials, spare parts, boat building materials for initial construction of commercial fishing vessels, fishing materials and equipment, navigation and safety items, deck equipment, boat auxiliary supplies, fish export supplies and fuel (excluding lubricants). Without these concessions, many fishers stated that the high import taxes would be prohibitive to purchasing new gears.[11]

3.4.7 Repairs, workshop space and dry haulage

None of the sites visited in November 2018 has a repair service available to fishers, who usually maintain and repair their vessels themselves, or employ others privately to do so. Dry vessel haulage is not available at any of the sites visited. Instead, many fishers use the landing site car parks or nearby beaches to dry dock and store their vessels and carry out vessel painting and hull maintenance works. Many fishers stated they are capable of fixing basic engine problems, but would benefit from additional training to overhaul old engines, repair more severe problems and not sacrifice fishing time. The sometimes long waiting time for service technicians to repair the engines is a major concern to the fishers, particularly in the midst of the fishing season. Especially fishers on Petite Martinique stated that significant time can be spent waiting for an engine technician to visit the island from the mainland and that this is negatively impacting their fishing activity.

3.4.8 Toilets

Toilets are available at all of the Government run sites visited during the fieldwork.

3.4.9 Lockers

Lockers are available at all sites as shown above in table 11. In the majority of cases there is a high demand for increased locker space. Fishers frequently have to share lockers, because of the few number of lockers available. There is an urgent need to maintain the lockers at various sites better, to avoid that they fall apart as in Sauteurs, and will become of no use to the fishers.

3.4.10 Vendors stalls and fish cleaning facilities

All the Government run facilities have market spaces for direct sales. In the case of Carriacou and Windward the sale of fish is direct from the fishers at the fish markets, but in Grenville, Melville St, Gouyave, Duquesne and Sauteurs there are also vendors (mainly female) who buy the fish (at approx. EC$5-6 per lbs) from the fishers and sell it on ice for EC$7 per lbs to buyers at these fish markets. In the Government run markets, the vendors/fish hawkers are private individuals who reach their arrangements with the fishers based fish quantity and supply/demand. Vendors pay a daily fee of EC$20 to use the vendor stalls, including water and electricity. Ice is purchased separately.

A fish gutting and cleaning service is also available to buyers who wanted their fish gutted, headed, cut and/or fileted. This generally costs EC$1 per lbs.

[11] https://www.gov.gd/egov/news/2018/jul18/04_07_18/item_1/coast-parametric-approved-fishing-industry-grenada-carriacou-petite-martinique.html

Cleaning of the landing sites and market space is done by staff paid for by the Grenadian Government either as employees or contractors and the team of cleaners can include up to 3 employees, depending on the size of the site.

3.4.11 Fish processing space rental

Fish processing space in Gouyave was rented in 2018 by Nordom Ltd at EC$ 2 000 per month on an annual license basis. The license for renting freezer space Vineyard Ltd, a lobster exporter, also based at Gouayve, was under revision at the time of the visit.

3.4.12 Electricity and fresh water supply to fishing vessels

The availability of fresh water and electricity to fishers on jetties was not a major concern. Fresh water was available to fishers from the jetties at Gouyave, Grenville and Grand Mal. Although electricity was run the length of the jetties at Grand Mal and Gouyave, fishers had little use for this as engine batteries were largely charged using boat engines and power tools were largely battery powered. Where fresh water was not available directly to moored fishers, drinking water tanks were filled at the adjacent market. Dues for fresh water or electricity were not collected at sites visited, which represents a loss of potential revenue. Similarly, charges for moorings were frequently not collected and fishers used jetty structures on a 'first come first served' basis. If fishers used swinging moorings instead of boat anchors, these were usually maintained by the vessel owner and largely consisted of old engine blocks and concrete.

3.4.13 Transport and export services

Grenville is the most remote fish landing site on Grenada (35 Km away from the Maurice Bishop international airport at the south-west of the island). Grenville has a commercial dock for trading and shipping, from which one individual is exporting frozen lobster to Trinidad and Tobago and/or Barbados. The northern sites are within short drives of each other, but there is little exchange between them, beyond the purchase of ice. Sauteurs in the far north of Grenada is nearly 50 Km away from the airport, but the fishers landing there do not intend to export. Melville st. and Grand Mal (SIFH / SFA) are located closest to the airport, being 10-14 km away respectively, placing them in an advantageous location regarding air freight. Gouyave is 31 km from the Airport and still accessible enough to export fresh produce. Carriacou and Petite Martinique have a daily ferry connection with St George's, which takes approximately two hours.

Two air transport options from Grenada are: the Virgin Airlines and British airways flights to London, and the AmeriJet and American Airlines connection directly to the USA. For yellowfin tuna, the value chain is extremely simple: the fishers land the fish at the Grand Mal jetty, and within five minutes the product is in the packaging plant (SIFH or SFA), and ready for export. Sometimes flight connections are a problem in the supply chain. The main export route to other Caribbean countries goes through Trinidad (Port of Spain) or Barbados via Liat and Caribbean Airlines flights and products are competing for space with passengers. Often the fish is forced to remain in Grenada at the airport until a plane with sufficient cargo space is available. To prevent losses due to lengthy delays at the airport, SIFH installed a refrigerated container on the airport grounds.

3.4.14 Health and security

Many of the larger landing sites and jetties are open to the public and access is not restricted.

There is however security at Grenville, Gouyave and Melville St. during both the daytime and night-time. Carriacou, Windward, Petite Martinique, Victoria, Sauteurs and Waltham all have no security provision at all. At Grand Mal the SIFH and SFA security is available both day and night, but is provided privately by a security company, rather than Government staff. The public access to jetties also hampers the process of ensuring the health and security of fishers and members of the public alike.

The health and safety of workers at the landing sites and fish markets is a specific area for improvement. The sites that operate ammonia-based ice machines encounter potential hazards associated with the maintenance of these machines. There is clearly a need for personal protective gears. For the work in the freezers, adequate working clothes are required as well. Currently the workers on the ice machines and in the freezers are at a risk.

3.5 The current use of the fish landing site infrastructure and equipment

3.5.1 Ice producing capacity and demand for ice

The total ice producing capacity in Grenada is currently 89 tonnes per 24 hours. This is the capacity that exists on paper from 16 ice machines (Table 12). The ice producing capacity is not equally distributed over the islands and fishing communities. The landing sites with the largest capacity are Grand Mal (34t), Petite Martinique (20t) and Gouyave (12t). The investments in ice production have been made both by the government and the private sector. At present the government operated sites have a capacity of 34.5 tonnes and the private sector has a capacity of 54.5 tonnes.

Table 12: Ice producing capacity per landing site (2018)

landing site	number of ice machines	capacity per 24h	Sufficient according to site managers
Carriacou	2	4t and 6t (10t total)	No
DuQuesne	0		Not applicable
Grenville	2	2.5t and 2.5t (5t total)	No
Gouyave	2	6t and 6t (12t total)	Yes
Melville St.	2	6t	No
Petite Martinique	3	2, 8 and 10t (20t total)	Yes
Sauteurs	1	0.5t	No
SIFH	2	12t and 20t (32 t total)	Yes
SFA	1	2t	No
Victoria	1	1.5t	Yes
Waltham	0		Not applicable
Windward	0		Not applicable
Total	**16**	**89 tonnes**	

These ice making capacity figures do however not say much about the real production of ice in Grenada. As is shown in table 13 the ice production at government operated sites was around 950 to 1 000 tonnes in 2017. The ice sales recorded in 2017 added up to EC$ 465 000, which is an increase of 3% compared to the EC$ 450 000 in ice sales in 2016. Gouyave, Grenville and Carriacou are the main ice producing landing sites of the Government.

Table 13: Ice production by government operated landing site in 2017

Landing site	2017 Ice sale revenue in EC$	Estimated lbs of ice produced[12]	Estimated tonnes of ice produced
Grenville	171381	771042	350
Sauteurs	5411	24344	11
Victoria	31004	139487	63
Gouyave	174207	783755	355
Melville St.	83678	376467	171
Carriacou	127000	571373	259
TOTAL	465685	2095118	950

The 950 tonnes of ice produced is much lower than the full capacity of ice production by the government owned sites, which would add up to approximately 12 000 tonnes if the machines would run day and night[13]. The average actual use of the capacity available is around 8% for all sites. This low figure is caused by a combination of lack of parts, only daytime production, in contrast to 24 hours, and limited ice storage capacity. Grenville used in 2017 some 19% of its ice making capacity, while Carriacou and Melville hall were at 7 and 8% respectively.

For the private sector operated ice machines a higher operating capacity of the ice machines is estimated, of around 25%[14]. Also the private sector ice making facilities have constraints in terms of slow delivery/unavailability of spare parts, technicians and skilled staff to operate the machines. Moreover, during the low season some of the ice machines are switched off, as demand is limited then from fishers for some months. The total annual ice production by these sites combined is estimated at 4 500 to 5 000 tonnes for 2017.

The ice to fish ratio that should be applied in tropical fisheries is 3:1, which means that the total production of ice required in a year in Grenada should be approximately 8 000 tonnes. An average type III long line vessel carried about 2 tonnes of ice per trip, while small-scale vessels should use around 160 lbs of ice per average fishing day. Not all fishers purchase sufficient ice to maintain the quality of the products on-board. However, due to capacity building/training in fish handling and food safety and a greater focus on export markets and tourism sector needs domestically, the volume of ice demanded by fishers will likely increase as awareness grows.

The estimated annual ice production for 2017 and 2018 was approximately 6 000 tonnes (nearly 1 000 tonnes by government operated sites and 5 000 tonnes by the private sector), which needs to increase by at least 25% to meet the standard ratio of 3:1 aforementioned. However, there is a large seasonality in catches, with a peak

[12] Note: an estimated 70% of ice is sold to fishers and 30% to the public at respectively 0.20 and 0.30 EC$/lbs.
[13] Operating at full capacity, 24hours a day, for 360 out of 365 days per year. This is not possible in reality, due to needs for spare parts, regular maintenance and repairs and operational staff limitations.
[14] The estimate is that the private sector ice machines are operated longer and that spare parts are brought in more rapidly and repairs are done more timely. It is expected that the private sector ice plants are operated three times as efficient as the government sites, following some discussions with the operators

in the period March – June each year (see figure 4). In some of the peak fishing season months the fish landings can be nearly 400 tonnes. This means that an ice demand of more than 1 000 tonnes can be expected monthly during the peak fishing season.

These 1 000 tonnes can likely be produced for a substantial part by the private sector. It is estimated that the 54 tonnes of ice producing capacity per day available at the private sector will be producing at around 40% of this capacity in these months, supplying the sector between 600 and 700 tonnes monthly. There does not seem much interest at present among the private sector operators to increase their ice production significantly. Therefore the remaining 300 to 400 tonnes will have to be produced by the government owned and operated ice machines. As mentioned above, many of the ice machines at landing sites are not being used at the capacity they could be used. In 2018, only 8% of the capacity of government operated ice machines was used. This capacity was not equally distributed over the year. In some months an estimated 20% of available production capacity was realized and in other months it was very low. Assuming that in an optimum situation with the currently available 34 tonnes/24hours ice production capacity some 8 - 9 tonnes ice could be produced per day, this would mean that the monthly production by the government operated sites would be between 200 and 260 tonnes at maximum.

Based on the above, it is reasoned that the monthly shortage, particularly in the fishing season and around Christmas and carnival is between 40 and 200 tonnes of ice in Grenada. Of course the demand is not evenly spread over the island.

Discussions with the fish landing site and fish market managers, as well as fishers, revealed that the needs for (additional) ice are highest in Grenville, Melville St. and Sauteurs. The ice production capacity in Grenville should approximately increase by 15 to 20 tonnes/24 hours to meet the high season demand, and in Melville st. it should increase by 6 to 8 tonnes/24 hours. In addition, it would be highly beneficial for the fishing community in Sauteurs to have an ice machine of at least two tonnes/24hours.

Moreover, it was suggested that the construction of a jetty in Carriacou could result in a doubling of the ice sales there, with greater income for the fish market. There seems to be scope for increasing the current 7% use of annual ice producing capacity to about 20% in Carriacou with the existing ice machines and a jetty to deliver the ice to the vessels. The latter would imply that this site would be able to supply 20 to 30 tonnes extra per month to the vessels.

The investment in the ice producing capacity at the three landing sites (Grenville, Melville St. and Sauteurs) and the jetty in Carriacou is a necessity. This will address the demands and will enable an increase in the use of ice on board of vessels and in the fish markets with significantly positive contributions to the fish export value and food safety. Losses of fish for the value chain will be reduced with positive contributions to national food security as well.

3.5.2 Freezer room and cold storage use and capacity

The larger facilities in Grand Mal (both SFA and SIFH), Grenville and Gouyave are using almost the entire freezer space / capacity available. All the other sites are using half or less of their freezer capacity where it is available and possibly for extended periods. The re-freezing practices at some sites by fish vendors in particular should not be continued for food safety reasons. The cold storage use, as is available in the larger sites, is hardly used at present. Fishers and vendors often prefer the use of their won ice boxes that are placed on-site.

3.5.3 Port capacity in terms of occupancy of vessel moorings

The reality of fisheries port capacity and occupancy in Grenada is one of high dynamics, with vessels moving and mooring depending on where they have access to ice and markets, which often meant in recent years that they preferentially moored and landed their fish at Grand Mal. The majority of the long-line fishery (yellowfin tuna focused) is offshore, therefore vessels moving and mooring at various landing sites (based on their needs and not constrained by having to return to their port of origin) has shaped fishing behavior. For example, if fishers need ice they moor where ice is available (which itself is variable) or if they have caught yellowfin tuna they will most likely land these at Grand Mal where SIFH and SFA are based. Furthermore, the Carenage in St Georges also serves as an important mooring site for a large number of the type III long-liner vessels as it is a deep and safe harbour. Therefore, assessing the levels of occupancy of moorings has not been possible due to its dynamic nature. A great degree of flexibility is available to vessels as the jetties are government owned and therefore public and the use of the jetties is not charged.

The following estimates are made regarding vessel mooring capacity:

- Melville St could moor approximately 20 type I vessels and 5 type 2 / 3 outside
- Gouyave could moor approximately 15-20 type II and type III vessels
- Grand Mal could moor approximately 12-16 type II and type III vessels
- Sauters inner harbour could moor approximately 5-8 type I or II vessels but shelter within the harbour could be available to the entire local fleet
- Grenville jetty could moor approximately 5 type 2 vessels and 12 type 1 vessels. The jetty is mainly used for landings and loading, while mooring is done throughout the bay, rather than alongside the jetty.
- Waltham, Duquesne, Victoria, Carriacou, Windward and Petite Martinique have no allocated mooring space but vessels anchored locally.
- The Careenage in St Georges could accommodate between 30-40 vessels at any time throughout most of the season. The majority of vessels moored there are generally from Petite Martinique.

3.5.4 Locker room storage – size / condition / ability to expand / uptake

Most sites have lockers available for fishers, but these are frequently fully occupied and there is generally a demand for more locker space, especially to store outboard engines and fuel tanks. The condition of the lockers is highly variable dependent on the sites and described in Tables 11 and 12 above.

3.5.5. Off-vessel fish prices

The prices received by fishers at the point of landing are very stable throughout the year at around EC$ 5-6 per lbs. Although price fluctuations vary slightly by site, this price stability is unlike that of any other countries of the Caribbean region. Grenada formerly had fixed prices set by the state and although this system was abolished various years ago, the situation remains largely unchanged.

According to interviews conducted at SFA and SIFH, the yellowfin tuna prices paid to fishers in 2018 were by grade:

- Grade A: EC$ 11.50 /lbs
- Grade B: EC$ 9 /lbs
- Grade C: EC$ 5 /lbs

The quality of the tuna landings was generally of good in 2016 and 2017, as a result of the usage of ice, and the length of the fishing trips (sometimes only day trips). Despite this, Grade A only represented around 40% of yellowfin landings in Grenada in recent years. The reason for this relatively low percentage of Grade A tuna was the fact that the processing plants determine the quality with a cut in the upper body, rather than a tail cut. Tail cuts would probably result in a higher percentage of Grade A tuna. The fishers often requested that the processing plants take the samples from the tail, but these refused as this allows them to pay lower prices (according to assessing the grade as lower). The position of the processing plants remains strong as there are only two plants buying the yellowfin tuna active in the market in Grenada.

3.5.6 Destination of landings (domestic, export) by volume, value and grade

The sites that presented high local sales and home consumption were Grenville, DuQuesne, Gouyave and Sauteurs in 2018. As table 14 below shows, other landing sites (Nordom, Carriacou, Petite Martinique, SFA and SIFH) were heavily export focused in 2018.

Table 14: Estimates of destination (percentage) of landings by site

	Grenville	Melville St	Gouyave	Nordom	DuQuesne	Sauteurs	SIFH	SFA	Carriacou	Petite Martinique
Export	5	5	10	100	0	0	75	75	85	90
Local sale	70	80	90	0	50	80	25	25	10	5
Home use	25	15	0	0	50	20	0	0	5	5

Source: estimated from stakeholder workshop (2018)

3.5.7 Fish handling capacity at the landing sites

None of the sites visited have official sorting areas, with sorting generally undertaken onboard fishing vessels as the fish are landed. Finning, gutting and sorting is predominantly carried out on board the fishing vessels before the fish are landed. No sorting is taking place at the landing sites by the fishers, but the market vendors/hawkers sort and ice the fish for sale.

There is no processing carried out in the fish landing facilities. The finned and gutted yellowfin is packed (usually two per box), with gel ice for exporting.

The only place where there was some curing / salting takes place is Grenville. Some quantities of bycatch from the Yellowfin fishery is salted and dried at this site on wooden tables. If vendors cannot sell the Yellowfin tuna they purchased, after a period of about 4 days, they salt and cure it. The locations for fish processing are not fenced off or roofed/protected and are open to the public, dogs and birds (a similar situation was observed at all of the fish landing sites). To improve food safety and hygiene in the process curing / salting these products this situation needs addressing.

The value addition of fisheries products on Grenada was observed to be close to zero. The only processing carried out is for preserving the fish, which otherwise would have been thrown away. This is predominantly undertaken by salting and curing as mentioned above.

Many of the market stalls at sites need some maintenance, especially in the places where they are used intensively, such as Melville St. fish market. In several sites (e.g. Victoria, DuQuesne, Waltham and Sauteurs) it became evident that the market stalls play a less significant function in terms of addressing the marketing needs of fishers. The price paid for ice is very consistent through the landing sites, but the collection rate for ice fees seems variable. At Melville St., the ice plant was not allowed to sell ice to the vendors during some parts of 2017

and 2018, which was one of the primary intentions of the original JICA investment at the site (the vendors were supposed to be the primary beneficiaries of the ice plants).

The price of fresh fish has been surprisingly stable on Grenada, and is approximately the same for almost all types of fish, excluding snappers (that commanded a slightly higher price). The general price for fresh fish at the markets all over Grenada is EC$7-8 per lbs. The dried salted fish in Grenville is sold at EC$ 12 per lbs, but calculating the loss in weight due to drying (generally 60% of the weight is lost in the drying process) this processing does not add value.

There is not any fish auction hall in Grenada. Fresh fish is only sold in the fish markets at the landing sites. The supermarkets only sell imported frozen, dried and canned fish. The only local product that is being sold in the supermarkets is frozen conch which sells at EC$ 15 per lbs.

Cured fish such as salted cod and smoked herring are staple food in Grenadian cuisine. This fish is commonly mixed with rice. Another commonly made dish, mainly consumed in the morning, is 'fried bake' & 'saltfish souse'. The salt fish is first soaked to remove the saltiness and then fried with tomato, onion, carrot, seasoning, peppers and cucumber. In addition to salted fish imports, Grenadians also eat fresh fish, conch, marlin, snapper and mahi mahi. There are marked regional differences in fish consumption habits: small tuna on the East Coast, yellowfin tuna on the West Coast and demersals in Carriacou.

Hotels restaurants and other tourist's facilities are mainly interested in locally caught tuna, conch, lobster and squid. However, very little squid seems to be available. The hotel sector generally buys its fish from the exporters and from small vendors in the fish markets.

Fish vendors in the main markets (Melville Street and Grenville) purchase directly from the fishing boats. Their weekly turnover depends on the season, but is generally between 150 lbs and 4 000 lbs. The fish from these two markets is mainly supplying the local population, with under 20% going to tourists (including direct sales, restaurant and hotels' purchases).

Traceability systems were installed recently at SFA, Gouyave and Grenville as part of tuna exporting business case investments supported by the FAO-Government of Grenada Caribbean Billfish Project. The systems are being tested (November 2018) and should result in higher market acceptability in the USA and the EU export markets for tuna. Other sites do not have traceability systems in operation, but recordings of landings by vessel, fisher and species are collected by the Fisheries Division.

In practical terms, there is no chain of custody, apart from the recording of Yellowfin entering the three packaging plants (SIFH, SFA and Nordom).

There were no eco-labelled Grenadian fishery products in 2018. More importantly, there was no price premium for well-handled fish, which disincentivizes fishers to land a prime product.

As the fish destined for export is directly landed at the packaging site in Grand Mal, road conditions have little impact on the market performance as distances are relatively small and therefore have little or no impact on quality. The access to the airport is easy – a one hour drive from the SFA and SIFH packaging plants. Fisheries products destined for local consumption accessed the local market without any noticeable problems. The only parts of the country that appear to have some problems with accessing the main markets are Carriacou and Petite Martinique, but generally, the boats from these sites land directly at the Grand Mal jetty.

- Photos from all of the sites are available in the site profiles in **Annex 1**.
- Site maps are available for the three largest Government owned and managed sites, Grenville, Gouyave and Melville St. in **Annex 2**.

- A table including all the Government charges is provided in **Annex 3.**

3.5.8. Utilities

The utilities provision to the fish landing sites and fish markets owned and operated by the Fisheries Division is adequate. All sites are connected to the electricity grid of the Grenada Electricity Services Ltd. (GRENLEC), the water system of the National Water & Sewerage Authority (NAWASA) and have at least one Landline, Internet, Mobile & Entertainment (LIME) telephone connection. Shortages in supply hardly occurred in recent years. The reliable supply of these utilities does not necessitate parallel systems of generators or water pumps. The government pays the invoices of the utilities providers regularly; as such, it is a reliable client of the utility companies.

The fish markets and landing sites spent in recent years an average EC$ 574 000 (USD 212 000) annually on the combined utility bills. Over the 2015-2017 period, some 76% of this amount was spent on electricity, 14% on water and 10% on telephone and internet costs.

3.5.8.1. Water

The total annual water consumption at the landing sites and fish markets in Grenada is estimated at 14 500 m^3 (3.8 million gallons). Most water in 2015 - 2016 was used for cleaning purposes, but part was used for ice production. The fish markets/landing sites at Melville St., Gouyave and Grenville consumed the most water in 2015 - 2016, with around 33% for Mellville St. and 20-25% each for Gouyave and Grenville.

The average annual total costs of the water consumption at all government operated landing sites was around EC$ 80 000 (USD 29 600). The price of water (approx. 0,021 EC$ per gallon) is relatively high; about double the price of water in the USA. However, considering the fact that substantial amounts of freshwater are made through desalination plants, the pricing reflects those higher production costs. The water quality from the system is high and no water quality problems have occurred in recent years.

The water consumption is fairly stable throughout the year, with a 20% increase in water usage during the fishing season months compared to the low season. In some of the fish landing sites, such as Gouyave, the water consumption nearly doubles in the December months and is also higher around Carnival. The reason for the higher water consumption is that more ice is purchased by the public for festivities and celebrations in December and August.

Some of the sites also supply water as a service to the fishers. This happens relatively frequently in Melville St. and Gouyave. The average annual income of water sales by all landing sites was around 2 800 EC$ (1 000 USD) over the 2015 -2017 period, making it a minor income source for the landing sites.

3.5.8.2. Electricity

Electricity consumption by the fish landing sites and fish markets is estimated at around 580 Megawatt per year. Melville St. and Grenville consumed in 2015 - 2016 some 46% and 30% respectively, comprising most of the electricity among the fish landing sites and markets on Grenada[15]. The electricity usage by Gouyave appeared to be low, which may be because of low level of activities in part of the period for which the data were made available. The current (2018) electricity use by Gouyave is likely similar to Sauteurs or even higher.

[15] If Carriacou/Windham and Petite Martinique are included in this estimation, then Melville St and Grenville respectively consume about 44% and 28% of the total electricity use by the landing sites.

A large share of the electricity is being used for the ice machines and freezers. The average consumption by ice machines is between 70-80% of the total electricity consumption at the main landing sites. The freezers consume another 15-20% of their total electricity use.

The average annual electricity used at the landing sites costs the government approximately 430 000 EC$ (160 000 USD), which includes 15% VAT on the non-fuel origin part of the electricity supplied.

Table 15: Electricity usage per landing site

Electricity usage per fish landing site/market[16]			
	Usage KWH/month	average monthly charges (EC$)	Percentage of total
DuQuesne	2100	1575	5%
Gouyave	430	322	1%
Grenville	13000	9750	30%
Melville st.	20000	15000	46%
Sauteurs	4600	3450	10%
Victoria	1100	825	3%
Waltham	2700	2025	6%
	43930	**32947**	

Source: Fisheries Division

The above table of average monthly electricity costs does not include the costs of electricity of repeater stations and offices such as in Melville St. and Grand Mal. Total monthly costs including these stations and offices would be approximately 45 000 EC$ (16 600 USD). At Christmas time, Carnival and the peak fishing season, the use of electricity is substantially higher; sometimes 20% more, as more ice is produced.

The average price per KWH was around 0.75 EC$ (0.28 USD/KWH) in 2015 - 2016, which was high compared to the USA with 0.11 USD/KWH or Barbados with 0.18 USD/KWH, but also substantially lower than some other Caribbean countries, such as Jamaica (0.44 USD/KWH).

Fishers and other users of the landing sites and markets can also make use of the electricity available. In recent years the landing sites charged users some 1 200 EC$ (440 USD) annually for electricity.

3.5.8.3. Telephone and internet

The total telephone an internet costs of the fish landing sites and fish markets is estimated to be some 56 000 EC$ (USD 20 700) annually. Of this total, some 75% of the costs are incurred at Melville St., as the number of landlines is high due to the Fisheries Division offices above the market. Most international calls are being made from these offices. The telephone costs are around 10% of the total annual utility costs of the landings sites and markets, and as such are a major expense item. The telephone connections are essential to communicate about landings, ice needs/availability, needs for spare parts and repairs. Gouyave, Grenville and Melville St. all have internet connections as well, while the other sites are only equipped with telephone (landlines). Both telephone and internet function well at these sites. For accounting purposes, data collection and reporting, all fish landing sites should be equipped with computers and internet access, to reduce paperwork and improve analysis, reporting and communication between the Fisheries Division and the various sites.

[16] Data from 2015 and 2016 – the usage of electricity by Gouyave is currently higher than reported in the table.

3.6. Future proofing and climate change adaptation

Future investments in Grenada's fisheries sector must be well thought out and consider the long-term (at least 15-30 years) evolution of the industry. Investments made today must benefit the sector and its workers for a long time to come. As noted in earlier sections, the infrastructure investment support provided by JICA has had a considerable positive impact on Grenada's fisheries sector.

Of the fish landing sites visited, Sauteurs has the only "true" harbour with a breakwater and relatively protected waters inside of the structure. The breakwater is however not large enough to stop larger swells reaching the local jetty. Some of the other jetties (Grand Mal and Gouyave in particular) have been built too high to facilitate safe and efficient loading of ice and offloading of fish, although this problem could well be overcome using a dock crane. The design and construction materials used appear however to be firm and should be able to withstand most storms and hurricanes. The Grand Mal jetty, but also many of the other wharfs and jetties, require continued maintenance and repairs in order to withstand tropical storms and hurricanes.

As standard practice, after every major tropical storm event, all jetties and fisheries buildings should be officially checked for damage and repaired as needed. An inventory should be maintained at pre-storm standards. Many fishers continue fishing in rough weather conditions and the most dangerous part of such fishing trips is the loading of ice and offloading of fish in bad weather.

When storms are severe or a hurricane advisory warning is made by the Government, fishers generally move their smaller (type I) boats higher up the beaches or into carparks and store their engines and fishing gear in lockers or at home. For larger boats (types II and III) this is not possible and fishers have to either move their vessels to other ports elsewhere, find sheltered moorings or anchor in deep water. There are also some spaces in the Carenage that are relatively safe in tropical storm conditions, although these are thought to provide insufficient shelter in cases of major hurricanes affecting Grenada.

Most of the moorings used are home-made by the fishers and consist of heavy objects, such as engine blocks, to serve as anchors. This is not sufficient for riding out large prolonged storms. Poor moorings could drag considerably and end up grounding a vessel or causing collisions with other vessels. It is therefore important to invest in proper mooring buoys in sheltered bays and places where vessels can relatively safely ride-out the storms and hurricanes.

At Melville St. the poor seawall design has led to a buildup of sediment within the vessel mooring area. Only the smallest (type I) vessels can use the protected mooring area inside. Dredging of this area would be highly beneficial to the Melville st. fishers and the functioning of this fish landing site.

At Petite Martinique the poor breakwater design has caused considerable erosion at the landing site. Small fishing shacks and the fishers meeting place risk being washed into the sea. Fishers can no longer land their boats close to their meeting site and have to move further from their traditional landing area.

Fishery buildings at Victoria and Waltham both show signs of seawater encroachment and erosion, although a layer of large boulders has been placed to line the Victoria building. This is unlikely to be a long-term solution. Fishers in Waltham expressed a need for a concrete platform to haul-up their boats and requested the maintenance of the slipway.

It is clear that regular maintenance and repairs are needed for the infrastructure in place. In addition, many fishers expressed unawareness of the safe shelter options for their vessels. Advice on how to prevent damage and losses of vessels and gears can perhaps be obtained from the FAO-GEF Climate Change adaptation in the Eastern Caribbean Fisheries (CC4Fish) project in which Grenada participates.

3.7. Multi-use options / diversification of income streams

3.7.1. Sport fishing, yacht charters and coast guard stations

The productive and clear waters around Grenada as well as the steady flow of tourists between November and June offer diversification opportunities for fisheries stakeholders. Various fishers interviewed were agreeable to the idea of taking tourists sport fishing, although none has sufficient equipment to do so. They are well aware that the price of a billfish caught commercially versus one caught recreationally by tourists was large and were therefore interested to understand potential future opportunities to invest in sport fisheries. The majority of the sport fishing activities that occur in Grenadian waters are carried out by private charter companies who have little to no involvement with the commercial fishing fleet, except during the yearly billfish fishing tournament.

Luxury yacht charters operate from the island (there are 3 known companies on Grenada). These charters are under foreign ownership and employ few local Grenadians onboard their vessels.

Considering the knowledge of local geography and fishing grounds, Grenada's fishers would be candidates to help expand these industries. Although without external investment, this is unlikely due to a lack of capital for adequate vessels and equipment.

The current port and landing site infrastructure need consideration before any investments are made to try to integrate fishers into the sport fishing and yachting industries. The main tourist areas are not located near the main fish landing sites apart from Melville St. If existing landing site infrastructure would be used to accommodate sport fishers and/or yacht cruisers, regular transport links between hotel accommodations and port facilities would be needed to facilitate access of customers to these distant facilities. Moreover, significant updates to the fishing jetties concerned would be needed considering that these are not up to the standards needed for tourist activities. For example, fresh water, electricity and clean, secure jetties would be needed before tourist operators would be able to use the fishing landing facilities. The security of expensive luxury vessels would also be a concern as none of the landing sites have secure areas that only authorized personnel can access.

Grenada has one coastguard station, which is located in Prickly Bay at the South of the island. The official roles of the coast guard are search and rescue as well as drug interdiction. There is no official remit for the coastguard to work on fisheries enforcement at present. No ancillary services at fish landing sites were observed during the fieldwork.

3.7.2. Dive tourism and other water sports

Dive and snorkel tourism have been expanding in Grenada and 3 dive-tourist-focused operators are currently operating on the island (2 in Grand Anse, 1 in St Georges). Although these dive operations are foreign owned, the crew employed onboard the dive vessels is mainly Grenadians (including skippers, dive masters, boat crew, dive locker staff). There may also be some potential to develop other marine-based activities such as water taxis and other watersports. It should be noted that many of the local hotels provide already sports equipment rental, which may preclude successful independent investment in stand-alone companies specializing in such activities. Considering the scuba dive and snorkel operators shares many of the same resources with the local fisher population, it is important that both consider one another into the future regarding investment planning, collaboration and general coastal zone development. Similar to the sport fishing and yachting industry, scuba dive operations are operated mainly from the beaches of southern Grenada where divers are loaded on and off vessels at the beach. This negates the use of jetty / formal landing facilities.

If future developments in the scuba dive sector were to be made in other parts of the island of Grenada, it is likely that these new scuba dive facilities would need to be built near potential diving grounds. Then it would be an option to moor and load-offload scuba divers at the fish landing sites and store scuba diving equipment at some of these sites. This would require modifications to the landing sites in terms of security and to provide sufficient space and safety precautions to have tourists using the same facilities as the commercial fishers. Again, security would be a primary concern and could be addressed by fencing off landing sites and regulating

access of individuals using the jetties and facilities. The current landing sites are not deemed suitable for dive tourism by the dive operators as they are generally far away from the main dive sites (marine protected areas) or tourism areas.

3.7.3. Oil and gas exploration

In 2018, the Grenadian government announced that significant oil and gas has been found in Grenada's territorial waters. More oil and gas exploration was jointly funded by Russian and Chinese companies who plan to fund the drilling of three new wells within Grenada's EEZ. The Grenadian government has been reserved about releasing more information about developments. If the oil and gas industry does develop locally, it may provide some jobs for Grenadian people if the skills needed can be developed. Considering the proximity to the coast and nautical experience, this industrial development may lead to a diversification opportunity for some Grenadian fishers and other fisheries stakeholders. It is noteworthy, however, that the development of oil and gas in Grenada's waters will need to consider current and future fishing activities (as well as the proximity to Marine Protected Areas) to ensure collaboration between the two industries. The correct designation of closed areas and the proper assessments and regulation of environmental impacts likely to occur from the oil and gas drilling is of paramount importance. In many countries a share of the oil and gas earnings is placed in a development fund for the population and the environment. Such a fund may contribute to sustainable development of sectors such as the fisheries sector, and may provide for compensation in case of damages to environment, biodiversity or coastal livelihoods.

The scale of the current fish landing sites is not deemed suitable for co-location of vessels and related activities of the oil & gas industry, as the space needed is much larger.

3.7.4. Cruise liners

Grenada is a popular stop-over point for many of the Caribbean cruise liners generating an annual revenue of over USD 18 million to the country. It should, however, be noted that very few of the employees come from the islands visited by these vessels. These vessels share the Port of St George facilities with approximately 30 local fishing vessels as well as some that come to offload catch from Carriacou and Petite Martinique. The sheer size of the cruise liners and the number of tourists on board make them to large to use fish landing and fishing port facilities in Grenada at present.

Cruise liners generally stop for one day in Grenada and passengers are primarily funneled towards terrestrial-based activities in St Georges such as the local museums and markets. The only viable way at present for fishers to interact with the cruise line business would be through the sale of fish. The cruise liners generally do not procure food for their passengers at the islands they visit. The requirements cannot be met in terms of quality certification and a stable supply of sufficiently large volumes cannot be provided. The tuna fishers may however generate enough supply to deliver to cruise liners if they do some value addition, such as preparation of Grenada Craft Salt Cured Tuna Products[17] or fresh tuna steaks or loins. If a processing plant were to be built, this may provide one way in which the fishing industry could expand towards supplying this segment of the tourism sector.

The current fish landing sites and facilities are not deemed suitable for interactions with cruise liners.

3.7.5. Aquaculture

Aquaculture often accompanies fisheries diversification. Grenada recently launched the Grenada Sustainable Aquaculture (GSA) project, which is focused on onshore recirculating aquaculture systems for the production of

[17] Salt Cured Tuna, or Mojama, is made using the loins of the tuna by curing them in salt. The salt is then removed, the loins are washed and then laid out to dry in the sun and the breeze. This traditional method needs, in order to meet international requirements, be performed in a hygienic environment with proper care for food safety. See also: Wilderness Markets, Market recommendations for Grenada yellow fin tuna exports

Pacific white shrimp (*Litopenaeus vannamei).* Applications for further sustainable aquaculture projects have been suspended as of October 2018. It is unknown if the GSA plans to explore marine aquaculture possibilities. There may be consequences of farm-raised aquaculture products on Grenada's wild-caught product prices in the market if aquaculture would develop further.

None of the landing sites visited is preparing to diversify into aquaculture, or to facilitate marine cage culture. Some of the fish landing sites may be suitable for storage of feed for marine cage culture operations and to provide a place for mooring as well as fish landing. No major changes to the current infrastructures are needed to support such operations. The development of marine cage culture, or fisheries based culture (e.g. doplhinfish and lobster) may be possible in Grenada and could be facilitated with existing on-shore infrastructure. However, in order for such a sector to develop it will be required that investments in cages, feed and particularly skilled and experienced aquaculture staff be made.

A holding tank to keep lobster alive between catch and export is currently present at SIFH. This initiative will likely be followed by others, if successful. It is not real aquaculture production, but some of the recirculation/filter and feeding techniques from aquaculture will be utilized for these small holding tank systems, that can easily fit in the current landing site facilities.

3.8. Potential plans for future investment

3.8.1. National Government

The Government of Grenada has been implementing a policy aiming to develop the fisheries sector and to increase its contribution to income, employment and foreign exchange earnings. The country is actively promoting the application of the FAO Code of Conduct for Responsible Fisheries (CCRF) in its fisheries management and has initiated the application of the Ecosystem Approach to Fisheries (EAF). The Ministry of Climate Resilience, Forestry, Fisheries, Disaster Management and Information focusses (in 2018) on six priority areas for the sector:

- Increasing the fish exports and related earnings for Grenada
- Building capacity among fishers in all aspects of fishing, navigation, safety at sea, fish handling and processing, value addition and business planning, through establishment of a vocational school
- Contributing to the sustainable use of the fisheries resources in Grenada's EEZ
- Strengthening the Fisheries Division in terms of staffing and funding to carry out its duties, with an emphasis on succession planning
- Improving the quality of fish available to the domestic markets and for exports
- Implementing marine protected areas, where these are deemed needed and impactful

The Ministry has allocated funding to the Fisheries Division for the development and implementation of the capacity-building programme for fishers, and is working significantly on improving the fishery data collection to comply with ICCAT's reporting requirements.

In terms of the fish landing site infrastructure, the routine maintenance is ongoing for the various fisheries buildings, as well as small upgrades to the fish markets. A process for leasing out the Gouyave landing site to the private sector was ongoing.

With regards to the collection of the fish landing fees, as well as fees for use of the freezers at some of the sites, the Ministry is aware of the need to increase efforts to collect these fees from the fishers and fish vendors at the landing sites.

3.8.2. Bilateral resource partners

Many of the landing sites and fish markets in Grenada were built with the generous support from the Government of Japan (JICA) in recent decades. The JICA particularly supported the construction of the larger landing sites and markets in Melville St, Gouyave, Grenville and Grand Mal. Some JICA support to the fisheries sector and its infrastructure requirements is expected to continue in the coming years.

Some of the smaller landing sites and markets, such as those in DuQuesne, were built with support from FAO and the Canadian Government, and other sites were mainly financed by the Government of Grenada itself. Currently (2016-2018) the Government of the Netherlands has been supporting the establishment and start-up phase of Grenada's Blue Innovation Institute, and there seems scope for further collaboration between the two countries on this subject.

3.8.3. Multilateral resource partners

Grenada participates in the Caribbean and North Brazil Shelve Large Marine Ecosystem Project (CLME+) Project, a 5-year project (2015-2020) implemented by the United Nations Development Programme (UNDP) and financed by the Global Environment Facility (GEF). This project assists participating countries in improving the management of their shared Living Marine Resources through an Ecosystem-Based Management approach. Grenada participates in the sub-project on flying fish management, which is executed by the CRFM, and benefits from advice on flying fish management and capacity building of staff and fishers.

Grenada together with 6 neighbouring Eastern Caribbean countries benefits from the Climate Change Adaptation in the Eastern Caribbean Fisheries Sector project (CC4FISH), which is also financed by the GEF. This project is executed by the FAO and the Secretariat of the WECAFC. The project has three components: increased awareness and understanding of climate change impacts and vulnerability for effective climate change adaptation in the fisheries and aquaculture sector, improved resilience of fisherfolk and coastal communities and aquaculturists, and climate change adaptation mainstreamed in multilevel fisheries governance. The project will be implemented over the period 2016-2020.

Grenada has been one of the beneficiary countries of the Caribbean Billfish Project, which is a USD 1.95 million project component of the GEF-funded, World Bank implemented, Ocean Partnership for Sustainable Fisheries and Biodiversity Conservation Models for Innovation and Reform (OPP). The Caribbean Billfish Project aimed to develop business plans for one or more long-term pilot projects aimed at sustainable management and conservation of billfish within the Western Central Atlantic Ocean. The 3 year Caribbean Billfish Project, which ended in December 2018 and supported this study, consisted of the following 4 components:

1. Generating value and conservation outcomes through innovative management.
2. Strengthening regional billfish management and conservation planning.
3. A functional and responsive Consortium on Billfish Management and Conservation.
4. Business plans developed for pilot investments in sustainable management and conservation of billfish.

Linked to the above mentioned OPP, the investment support facility of Conservation International, supported the Caribbean Billfish Project in the development of a business case to reduce the pressure on overexploited billfish stocks and increase the export value of yellowfin tuna.

4. Externalities

4.1. Social impacts

4.1.1. Unofficial Markets

In some instances, parallel fish markets exist outside the official Government owned and operated fish landing and fish market sites. These parallel markets generally do not use ice and are selling fish cheaper than at official market sites. It is noteworthy that these unofficial markets are also not subject to landing, fishing cleaning or fish vending fees. While removing these informal markets may have some minor social impacts, they currently have important negative impacts on the proper functioning of the government run markets and landing sites. The parallel sale and market channels increase competition to those fishers and vendors selling inside the official markets. Moreover, the landings and sales go unrecorded and, due to no or limited ice use, the food safety for consumers is a risk.

4.1.2. Gender

In Grenada the capture fishing operations at sea are dominated by men. There are no female fishers, although at Grenville one lady mentioned occasionally fishing with her family. The beach seine fishers at DuQuesne are assisted sometimes by women when landing particularly large catches if there are insufficient men from the village to help. In general, fish cleaners at the landing sites and markets are a mixture of men and women, whilst fish vendors are predominantly women. Women employed by the Government at the landing sites and markets generally carry out administrative roles. The cold room attendants and ice machine technicians are all men. In terms of Government staff distribution over all of the sites, there is a roughly even split between male and female employees (including managers, assistants, technicians, data collectors and admin staff).

4.1.3. Cooperative structures

Very few formal and functioning cooperative structures exist for the fish landing sites and fish markets around Grenada. Sauteurs has a cooperative owned ice machine, Grenville has one for fuel and Victoria (St Marks Fishermen Cooperative) for engine maintenance and parts (although this was said to be largely not functioning). Discussions related to cooperatives generally receive a positive response and fishers on the whole are willing to consider forming cooperatives to increase revenues and share benefits with others. Many fishers did, however, note during interviews that significant improvements in management and organization between them would be needed if such endeavors were to be successful. Developing and strengthening both the vertical[18] and horizontal[19] linkages across the value chain was proposed in the study conducted by Wilderness Markets. For example by improving relationships with buyers and sellers (vertical) and via cooperatives or trade associations (horizontal).[20]

4.2. Environmental impacts

4.2.1. Bycatch and non-target species.

The bycatch from Grenada's yellowfin long liners (sharks, sailfish, mahi mahi and other billfish) is all sold on the domestic market or consumed by the fishers themselves. These non-target, yet marketable products, are generally kept on board, largely without the use of ice. Many of these species that fishers consider bycatch are, however, highly desired by the hotel / restaurant and foreign markets. Improving handling practices for these species would likely improve acceptability in the tourism industry. Improving the fish quality may result in

[18] https://www.marketlinks.org/good-practice-center/value-chain-wiki/vertical-linkages-overview
[19] https://www.marketlinks.org/good-practice-center/value-chain-wiki/horizontal-linkages-overview
[20] Wilderness Markets (2018) Investing in Grenada's Yellowfin Tuna Exports. Organizational Capacity Review Assessments Supply Chain Entities. November 30, 2018

increased local market prices and may open new opportunities in foreign markets. The government employees at the fish landing sites have a role to play in the management and monitoring of bycatch.

4.2.2. Foreign trade regulation – vulnerable species.

The bycatch in Grenada's longline fisheries has (so far) no implication for the trade of Yellowfin tuna to foreign markets. The Marine Mammal Protection Act (MMPA), however, (that requires countries exporting to the United States to meet certain standards in marine mammal monitoring and avoidance by fishing activities) is important to consider. Although no marine mammal bycatch was noted in interviews with fisheries stakeholders, it would be prudent for Grenada's fishing industry to stay up to date with trade regulations particularly for countries they currently trade with. Compliance with foreign trade standards and rulings may limit future export opportunities, making it difficult for Grenada's catch to gain full market price to the most important markets (the United States for Yellowfin tuna and China for lobster, although the European Union also holds considerable promise – particularly with the new addition of a direct commercial flight between Germany and Grenada twice a week). The turtle fishery of Grenada may cause problems in the future when considering the marketing of sustainable fishing practices as well as in the application for certification. Particularly western markets consider the harvest of turtles and their eggs unethical. The government employees at the fish landing sites have a role to play in the enforcement of fishing regulations and monitoring of fish and aquatic mammals landed and entering the markets.

4.2.3. Pollution incidents

Pollution incidents related to fishery activities both land or sea-based have not been recorded. Safe operating practices are however important for the conservation of Grenadian waters. Marine pollution incidents would likely have a significant effect on the local tourism industry and larger pollution events could have longer-term implications for the fisheries, particularly related to the recruitment of commercial fish and shellfish species through damage to critical fish habitats.

For this reason, the Grenadian government must ensure safe effluent discharge from sewage as well as facilitate the proper disposal of used oil, which can be significant from marine diesel engines that undergo regular and long trips. In this respect, tourism stakeholders identified oil pollution and waste affecting the area of corals in the marine park at Dragon Bay near the Grand Mal fish landing sites. It was however not certain whether the pollution originated from the fishing sector activities or came from elsewhere.

Fish processing/cleaning waste from fish landing sites is currently either collected and fed to local livestock or disposed of in the available waste bins. There may be a potential to use this waste as fertilizer although the total amount of waste is unknown. Moreover, it could be used to produce silage if handled properly.

A scoping study would be required to investigate if this is an economically viable option and if there is demand for the silage.

5. Financial Analysis

5.1. Income from landing sites and fish markets

Each of the government owned and operated fish markets and landing sites in Grenada provide services to the fishers and fish vendors, as well as to the general public. The services are many and include a wide variety, including the sale of ice, provision of locker rooms for rent, provision of fish vendors space, freezer storage, maintenance of a jetty, a secure parking place, sale of bait fish, washrooms, water and electricity supply, fish processing and cold storage space rental, conference room rental, and ice bin and scale rental. These services are provided in generally clean and well-maintained facilities by competent staff.

In order to maintain, upgrade and replace these facilities and to keep a high service level provided to the sector user fees are charged for the services and products provided. The Grenadian Government aims to break-even on the costs and earnings of the system of fish landing sites and fish markets, while facilitating the efficient functioning and development of the sector.

Over the period 2015 -2017 an average annual income of 694 000 EC$ (257 000 USD) was obtained from the provision of the above services and the charging of a landing fee to fish landed at and sold through these government owned and operated facilities[21]. The charges for each service are shown in annex 3.

Two-thirds of the income on the main island was derived from ice sales to fishers, fish vendors and the public, which was on average EC$ 450 000 (USD 166 000) annually. Landing fees collected added up to 11% (74 000 EC$) of the total income. The income from rental of vendor stalls and freezer space rental on the main island was around 8% each (>54 000 EC$ annually) and locker rental fees added up to about one percent of the total income earned.

Table 16: Average annual earnings 2015-2017 of the main fish landing sites and fish markets (EC$)

Average annual earnings 2015-2017 of the main fish landing sites and fish markets (EC$)						
	Grenville	Perc.	**Gouyave**	Perc.	**Melville St.**	Perc.
Ice sales	162831	77%	145624	58%	126556	67%
Landing fees	5897	3%	43983	17%	9726	5%
Vendor stall rent	30133	14%	5094	2%	20247	11%
Freezer Fees	2975	1%	41454	16%	3964	2%
Locker rental	3533	2%	0	0%	2417	1%
Other income	7036	3%	15996	6%	26608	14%
TOTAL	212405	100%	252151	100%	189516	100%

Source: Grenada Fisheries Division

The ice sales are the major source of earnings at the three main fish landing sites and markets on Grenada. The demand for ice by the fishing fleet, vendors and general public is higher than actual production levels, which implies that there is scope for increasing income from ice production and sale.

The landing fees have not been contributing to the total earnings as much as might have been expected, as more than 160 000 EC$ should have been collected annually at the three main landing sites combined, given

[21] This estimation does not include Carriacou and Windward landing sites, as only data for 2017 were obtained from these sites. Including these two site the total income would be EC$ 885 000 (USD 327 000)

the level of fish landed and marketed at these three sites. Instead less than 60 000 EC$ was collected in landing fees annually, which is less than 40% of what could have been collected.

Important sources of earnings included under “other income” in table 16 above are in Gouyave the rental fees from the processing room rental and in Melville St. the parking fees.

Table 17: Average annual earnings 2015-2017 of the smaller fish landing sites and fish markets (EC$)

Average annual earnings 2015-2017 of the smaller fish landing sites and fish markets (EC$)								
	Sauteurs	Perc.	**DuQuesne**	Perc.	**Waltham**	Perc.	**Victoria**	Perc.
Ice sales	5902	46%	136	4%	0	0%	10335	84%
Landing fees	3014	24%	1887	51%	9053	82%	795	6%
Vendor stall rent	635	5%	0	0%	13	0%	338	3%
Freezer Fees	2683	21%	842	23%	957	9%	804	7%
Locker rental	0	0%	569	15%	703	6%	0	0%
Other income	525	4%	247	7%	312	3%	41	0%
TOTAL	12759	100%	3681	100%	11039	100%	12314	100%

Source: Grenada Fisheries Division

The four smaller landing sites (Sauteurs, DuQuesne, Waltham and Victoria) together handle not more than 8% of the total annual fish landings in Grenada. As a consequence, the level of facilities and services provided to the fishers is lower. Duquesne and Waltham do not have ice machines at present. Moreover, the number of fishers and fish vendors using these sites is rather limited. Nevertheless, they provide an essential service to the local communities. The collection of landing fees is, similarly as at the main sites, lower than could be expected from the fish landings recorded at these sites. On average only EC$ 15 000 is annually collected as landing fees at the four sites combined, while this could have been more than double.

The ice sales at the landing sites largely depend on the functioning of the ice machines. Problems with slow delivery of spare parts and limited maintenance to the ice machines, but also the freezers, resulted in lower earnings from these smaller sites than could have been expected. The deplorable status of the 20+ lockers at Sauteurs makes that the site cannot charge any fees for the few lockers that are being used by fishers currently.

A major repair of the lockers at that site would be required, which would enable the fish market to generate more income.

Table 18: Estimated annual earning 2017 Carriacou + Windward fish markets (EC$)

Estimated annual earning 2017 Carriacou + Windward fish markets (EC$)		
Ice sales	127000	66%
Landing fees	40000	21%
Vendor stall rent	3000	2%
Freezer Fees	20000	10%
Locker rental	1450	1%
Other income	0	0%
TOTAL	191450	100%

While no information is available from Petite Martinique, the earnings estimations for 2017 of the fish markets in Hillsborough and Windward on Carriacou indicate that there is demand at these sites among the fishers and vendors for ice sales, freezer space and lockers. In contrast to the sites in Grenada the landing site management in Carriacou appeared to collect the landing fees of nearly all fish that is landed. The parallel landing of fish was minimal, which may however change with the opening of the new jetty in Tyrell Bay. It seems that some fishers started landing fish there, which means that those fish will not be recorded at the official sites. Thus, income from landing fees in Carriacou is likely to reduce in 2018 if nothing is done about the parallel landings.

In terms of contribution by landing site to the total income realized by all government operated landing sites and fish markets it is clear that the main sites Gouyave (28%), Grenville (24%), Carriacou and Windward (22%) and Melville St (21%) together account for 95% of the earnings.

4.3. Landing fee analysis

At all the government operated landing sites annually some EC$ 114 000 is being collected in fish landing fees. This could have been almost double if all fish landed at these sites would have been charged for. This would have implied an overall increase in total revenue of the government operated landing sites and markets of nearly 13%.

Moreover, in recent years 54% of the annual fish landings were carried out at the Grand Mal jetty, where SIFH and SFA received the fish landed. No fish landing fees were collected for fish landed at Grand Mal. If a 0.1 EC$/lbs landing fee would have been charged on these landings, this would have given an estimated additional annual income of EC$ 330 000. At 0.05 EC$/lbs this additional income would have added up to EC$ 115 000 approximately.

It is perhaps unrealistic to capture landing fees for all fish landed, but it is likely that the government could increase its total annual income from fish landing sites with one-third to 50% if landing fees would be charged at all sites. Currently, one can argue that the government is maintaining facilities at Grand Mal (particularly the jetty) and has leased out the government owned buildings there to SIFH and SFA[22], but is shooting itself in the foot by not collecting the fees to maintain the jetty and replace the landing site infrastructures after their economic lifespans.

4.4. Costs of landing sites and fish markets

4.4.1. The fish landing site and fish market infrastructure costs

The ownership and operations of the fish landing sites and fish markets by the government carries with it high responsibilities in terms of providing the services needed for the fishers and fish vendors at a cost that is acceptable, while at the same time ensuring fish quality, food safety and safe working conditions at these sites.

Most of the fish landing sites and fish markets have been built by the Government of Grenada with support from the Japanese Government. The oldest infrastructures that are still used are Sauteurs and Windward, which were built in the mid-1980s and are well-maintained. However, most of the other sites, including the main sites, have been constructed or have been upgraded significantly in the last 15 years. The economic lifespan of fisheries

[22] The incomes to the government from the lease agreements SIFH and SFA were not available to the team, and are therefore not taken into account in this analysis.

infrastructure is generally estimated at around 40 years, which means that the country will be able to benefit from its investments in fisheries infrastructure for many more years.

The total investment over the last 3 decades in fish landing sites and fish markets infrastructure in Grenada is estimated at around EC$ 62 million (USD 23 million), and the current rough value would be around EC$ 45 million. Using a straight-line depreciation rate for the 40 year lifespan this would mean a depreciation of EC$ 1.5 million annually. This amount should preferably be set aside annually for rebuilding or replacing the current infrastructures at the end of their life cycle.

4.4.2. Equipment costs

The fish landing sites and fish markets were equipped with ice machines and freezers at the time of construction. Some of these ice machines and freezers have been replaced since or have undergone major revisions and upgrades. This makes it complicated to estimate the total value of the main equipment at the landing sites. Based on the number of ice machines (11) and a conservative estimation of purchase, transport and installation costs it is estimated that the combined replacement value of the currently used ice machines in government owned and/or operated sites is around EC$ 1.3 million. With an estimated lifespan of 10 years the annual depreciation would be at least EC$ 130 000.

Another important equipment at the landing sites and markets is the freezer. Freezers are essential to store the fish in case it is not sold directly and thus play important roles in the fish value chain. There are at least 15 freezers in use at the fish landing sites currently and the total investment made in these freezers is estimated between EC$ 600 000 and 700 000. Given that the freezers are less susceptible to break downs than ice machines and as their life span is with about 15 years much longer than for ice machines, they are discussed here separately. A total annual depreciation of EC$ 40 000 is the minimum rate that should be applied for the freezers used by government owned sites in Grenada.

The above implies that annually some EC$ 200 000 should be set aside to replace the ice machines and freezers at the fish landing sites and fish markets at the end of their lifespan. Luckily, not all these equipments were constructed and installed at the same time, so the replacement can be spread out over many years as well. Nevertheless, it is essential to make sure that replacements can be made when these are needed.

4.4.3. Maintenance costs

Annually the Government currently allocates approximately EC$ 100 000 for maintenance and repair of the fish landing sites and fish markets. The distribution of these costs depends largely on what is needed by each site and is focused on priority repairs and maintenance activities to keep the sites functioning.

4.4.4. Utilities costs

As described in section 3.5.8 on utilities, the provision of electricity, water and telephone services to the government owned and operated fish landing sites is efficient.

The total annual utility costs of all landing sites and fish markets owned by the government is around EC$ 570 000 (USD 210 000) of which 76% is spent on electricity, 14% on water and 10% on telephone/communication.

4.4.5. Labour costs

The fish landing sites and fish markets functioning depends largely on the staff working at these sites and providing the services to fishers, vendors and the public. The total number of full-time employees at the

government owned and operated sites is around 45 persons. Each of the main sites (Grenville, Gouyave and Melville St) have 9 staff working on site, including market supervisors/managers, assistants/clerks, cleaners and cold room assistants involved in ice sales and freezer operations. The smallest sites, such as in Waltham and DuQuesne only account with one full-time employee each. The other sites employ between three and eight staff.

The total expenses on salaries of staff, to ensure all the sites can operate throughout the year, is estimated at around EC$ 700 000 (USD 260 000) annually.

4.5. Overview of earnings and costs per landing site

There is a large variety in costs and earnings of the various government owned and operated fish landing sites and fish markets in Grenada. The number of fishers, vendors and fish buyers who make use of the sites varies and also the initial investments differ greatly. Therefore, the overview is presented in two parts, starting with the main sites.

Table 19: Costs and earnings and financial indicators of the main fish landing sites and markets

	Grenville	Gouyave	Melville St.
Average income 2015-2017	EC$	EC$	EC$
Ice sales	162831	145624	126556
Landing fees	5897	43983	9726
Vendor stall rent	30133	5094	20247
Freezer Fees	2975	41454	3964
Locker rental	3533	0	2417
Other income	7036	15996	26608
TOTAL EARNINGS	212405	252151	189516
Estimated costs 2016/2017			
Utilities costs	119652	29286	245832
Labour costs	144000	144000	144000
Maintenance costs	22000	20000	30000
General expenses	5000	5000	5000
TOTAL OPERATIONAL COSTS	290652	198286	424832
Annual depreciation			
Depreciation of buildings	236250	708750	303750
Depreciation of equipment	18900	29700	15750
Financial indicators			
Gross Profit	-78247	53865	-235316
Net Profit	-333397	-684586	-554816
Gross value added	65753	197865	-91316
Net value added	-189397	-540586	-410816
Gross value added per FTE	7306	21985	-10146
Capital investment	9450000	28350000	12150000
Return on Capital	-6%	-5%	-7%

At each of the three main sites ice is sold, fish landing and freezer space use fees are collected, vendor stalls are rented out and lockers can be hired by the fishers. The income from these services did not differ largely

between the 3 sites and ranged between EC$ 190 000 and 252 000 (USD 70 000 - 93 000) annually in recent years. In contrast, there was in recent years a large difference in utilities costs, as at Melville st. the Fisheries Division offices are located. The combination of offices, a large fish market and a transmitter/receiver station, results in relatively high electricity, as well as water and telephone bills compared to the other sites. The capital invested in infrastructure also largely differs between the sites, as this has been three times higher in Gouyave compared to Grenville.

As a consequence, the comparison in economic or financial performance between the three sites does make little sense. Instead, it is better to analysis the situation at each site individually. In the analysis the following indicators are used:

1. Gross Profit = Total earnings - Total costs, excluding the depreciation of buildings and equipment.
2. Net Profit = Gross Profit - Depreciation (and interests) of buildings and equipment[23].
3. Gross value added of the landing site = Gross Profit + Salaries paid
4. Net value added of the landing site(s) = Net Profit + Salaries paid
5. Gross value added per full time employee (FTE)
6. Capital investment = initial investment in buildings (infrastructure)
7. Return on Capital = Net Profit (+ interest on debt - Depreciation and taxes) divided by the Capital Investment[24]

4.5.1. Grenville

The annual operational costs at this site are some 37% higher than the earnings made at this site. As a consequence, the profit indicators are all negative. Nevertheless, the gross value added is positive and the gross value added per employee is positive as well. This tells us that the contribution of each employee to the economy is positive.

In order to make this site economically viable it will be either required to reduce costs or increase earnings. An increase in earnings is possible by collecting more actively the landing fees, which could bring the current landing fee income of about EC$ 7 000 to some EC$ 50 000. If the landing fee of 0.05 EC$/lbs would be raised to 0.1 EC$/lbs this would generate a total annual landing fee income of nearly EC$ 100 000 at Grenville. Gross profit figures would then become positive.

In addition, the income from freezer space rental could increase to over EC$ 20 000 if bags and boxes of fish would be labelled properly with name and date and fees would be collected daily. The locker rent could increase to a maximum of EC$ 9 000 from the current income obtained which is less than EC$ 4 000 annually. The proper collection of the freezer, locker and vendor stall fees at Grenville would result in an additional income sufficient to cover for the depreciation of the equipment on the site, facilitating replacement of ice machines and freezers in a timely manner.

4.5.2. Gouyave

Of the three main sites Gouyave was the only site that showed a positive profit indicator in recent years. The average gross profit with nearly EC$ 54 000 was not high, but provides a good indication of the economic viability of the site. The gross value added is highly positive and the gross value added per employee is higher than the salary level of the average staff, thus the contribution of each employee at Gouyave to the economy is very positive.

[23] Equipment in this analysis includes only ice machines and freezers
[24] Return on Capital of +3.5% or higher would generally attract private sector investments

Similarly as at Grenville, this site could increase its earnings. A simple increase in earnings is possible by collecting more actively the landing fees. Currently just over 50% of the landing fees are collected, while if all fish landed would be charged the fee the total landing fee income could reach EC$ 75 000 annually. Moreover, from the 25 lockers available on site an annual rental income of EC$ 6 000 could be obtained if fees would be collected. The income from lockers and freezer fees, if well collected, would be able to cover the repair and eventual replacement of these items easily. The possibility to rent out the processing space and the adequate freezer and cold storage space enables the Gouyave fish landing site and fish market to further increase its income.

Given the large investment in the facility, it will be nearly impossible to generate enough income to make a net profit and reach positive net value addition figures. The number of staff at this facility is needed to operate it, thus no major savings can be made on labour costs. On the other hand, the usage of the processing and cold storage space and the equipment at the site can be improved and a private sector company or joint venture could probably do this better than the government. Closer collaboration with the private sector in terms of operating and management of the Gouyave site is being arranged for at present (2018).

4.5.3. Melville st.

The financial figures presented in the above table 19 are blurred by the fact that a substantial part of the utility expenses are made for the Fisheries Division offices and transmitter/receiver station. On the other hand, even when these costs would be subtracted, it will a challenge for this site to generate a gross profit. In order to generate more profit it is essential that the earnings from services provided would be increased.

Landing fees which are currently around EC$ 10 000 annually could be increased here to EC$ 40 000 per year if collection would be done actively. Moreover, locker fees collected are now just about EC$ 2 400 while EC$ 9 000 could be collected on a yearly basis. Vendor stall rental income could easily be increased with EC$ 10 000 as well, from the currently collected EC$ 20 000. Including also some better collection of freezer fees the total annual income obtained from service fees could increase at this site with some EC$ 50 000 compared to the present situation.

Fact is however that the use of the Melville st. fish market and landing site is being constrained by the limitations in ice producing capacity on-site. As a result, many of the fishing vessels need to source ice from Grand Mal or elsewhere and have directed their landing of fish to these other sites in recent years. The unreliability of ice availability at Melville st., combined with the apparent insufficient availability when the ice machines are functioning, to supply ice to the long liners and the vendors at the market, needs to be resolved urgently. An increase in ice sales will likely have the greatest positive impact on the financial feasibility of this site.

4.5.4. Carriacou and Windward

The Carriacou and Windward fish landing sites and fish markets, which are managed and operated largely as one, present the most positive financial figures of all sites assessed. These sites show a gross profit, present highly positive gross and net value added figures and the gross value added per full time employee is positive as well. The reason for these positive figures can be found on the income side, where the active collection of service fees provides a healthy income. On the costs side it is clear that no savings can be made in terms of labour and utility costs. The advantage of these landing sites is that the infrastructure and equipment investments have been relatively low, which is reflected in lower annual depreciation. If an additional EC$ 35 000 income could be generated annually, then the operations would be running at net profit, ensuring long-term feasibility.

Given the large demand for ice, some investment in a jetty and additional ice machines could make the Carriacou fish landing site financially feasible[25].

Table 20: Costs and earnings and financial indicators of the Carriacou and Windward fish landing sites and markets

	Carriacou and Windward[26]
Average 2017	EC$
Ice sales	127000
Landing fees	40000
Vendor stall rent	3000
Freezer Fees	20000
Locker rental	1450
Other income	0
TOTAL EARNINGS	191450
Estimated costs 2017	
Utilities costs	48000
Labour costs	121000
Maintenance costs	10000
General expenses	4000
TOTAL OPERATIONAL COSTS	183000
Annual depreciation	
Depreciation of buildings	22275
Depreciation of equipment	21600
Financial indicators	
Gross Profit	8450
Net Profit	-35425
Gross value added	129450
Net value added	85575
Gross value added per FTE	16181
Capital investment	891000
Return on Capital	-9%

4.5.5. Sauteurs, DuQuesne, Waltham and Victoria

The four smaller fish landing sites and fish markets (Sauteurs, DuQuesne, Waltham and Victoria) all presented negative financial figures in recent years. The annual costs are 4 to 10 times higher than income generated at these sites. The labour costs are presenting 30 to 70% of the total operational costs of these sites. However, given that the number of employees is already at minimum levels to keep these sites functioning, it will not be possible to reduce labour costs at these sites. Changes are therefore required at the income side.

The four sites could increase earnings from:

[25] Investment related calculations are presented elsewhere in this document.
[26] The information presented in this table was provided by the market supervisor in Carriacou and includes some estimations.

Ice sales – The number of fishers and vessels, as well as the location on the northern tip of Grenada's main island far from other ice supply options, would make an investment in an ice machine in Sauteurs logical. The demand is sufficiently high, as is shown also by the installation of a small ice maker (capacity approximately 1 tonne) at the next door cooperative. Nevertheless, the demand for ice is much higher than can actually be produced. An increase in ice supply will likely lead to increased landings of fish and accordingly greater use of freezing capacity at Sauteurs.

Lockers rental – An increase up to EC$ 14 000 annually is possible if fees would be collected and the lockers at Sauteurs would be repaired and/or rebuilt.

Landing fees – An increase to EC$ 40 000 would be possible if parallel landings are reduced and an active approach to collection of landing fees is taken. This would be complicated in Waltham and DuQuesne, as insufficient numbers of staff are available on-site to collect these fees throughout the year.

Table 21: Costs and earnings and financial indicators of the smaller fish landing sites and markets

	Sauteurs	DuQuesne	Waltham	Victoria
Average income 2015-2017	EC$	EC$	EC$	EC$
Ice sales	5902	136	0	10335
Landing fees	3014	1887	9053	795
Vendor stall rent	635	0	13	338
Freezer Fees	2683	842	957	804
Locker rental	0	569	703	0
Other income	525	247	312	41
TOTAL EARNINGS	12759	3681	11039	12314
Estimated costs 2016/2017				
Utilities costs	46404	21521	24300	11628
Labour costs	65000	14000	14000	51000
Maintenance costs	6000	4000	4000	4000
General expenses	3000	2000	2000	3000
TOTAL OPERATIONAL COSTS	120404	41521	44300	69628
Annual depreciation				
Depreciation of buildings	23625	23625	16875	27000
Depreciation of equipment	2700	2700	2700	8100
Financial indicators				
Gross Profit	-107645	-37839	-33261	-57314
Net Profit	-133970	-64164	-52836	-92414
Gross value added of the landing site	-42645	-23839	-19261	-6314
Net value added of the landing site	-68970	-50164	-38836	-41414
Gross value added per FTE	-10661	-23839	-19261	-2105
Capital investment	945000	945000	675000	1080000
Return on Capital	-17%	-10%	-11%	-12%

Given that the Duquesne, Waltham and Victoria sites are serving small coastal communities, the markets serve an important social purpose as well. These landing sites and markets were not established by the government for development of the fishing industry, but instead to keep some economic and employment opportunities in poorer areas of the island. Using a purely financial analysis to look at the costs and benefits of these sites may therefore be less appropriate for these sites, and perhaps also for Sauteurs.

Annex 3 provides a full list of charges for the Government facilities

6. Conclusions and recommendations

This techno-economic assessment of the fish landing sites and fish markets in Grenada shows that the Government has established, with assistance from various donors, a highly effective and supportive infrastructure for the small-scale fisheries sector. The fish landing sites and markets are generally well-maintained, operate throughout the year and provide essential services to the fishers, fish vendors, fish exporters and the general public.

The overall status of the fish landing and fish market infrastructure is good, particularly as many of the main fish markets (Grenville, Gouyave and Melville St.) are relatively new and have received proper maintenance and repairs. Some of the smaller fish landing sites have been constructed in the 1980s and early 1990s. Many of the smaller sites encounter minor infrastructural or repair problems that can be relatively dealt with easily. In contrast to the larger sites, these smaller sites have challenges with the state of the equipment (e.g. ice machines and freezers), which require repairs and/or replacement.

The level of activities at the larger sites is high and corresponds to the availability of ice, fuel and fish customers. The smaller sites sometimes cannot supply all these services, because they serve also much smaller fishing fleets and smaller communities.

In recent years the distribution of fishing activities and fish landings over Grenada has changed as a result of increasing export opportunities for yellowfin tuna at Grand Mal (via SIFH and SFA) and the increase in FAD fishing activities by the fleet in Grenville. The assessment showed that the fisheries sector is very dynamic and takes advantage of the opportunities offered.

It is a challenge for the Government to maintain a high level of services for this dynamic fisheries sector. On one side there are significant opportunities in tuna and other species exports, which require public-private collaboration to further develop. On the other hand the government has a task in facilitating the supply of fish to the domestic population and support the livelihood opportunities in small coastal communities.

The financial assessment carried out shows that there is a large diversity in costs and earnings between the landing sites. Few sites show a gross profit (Gouyave and Carriacou) or positive gross value added figures (Gouyave, Grenville and Carriacou). The same sites show also positive gross value added figures per full time employee. As a result of the high capital investments in most of the sites, with related high depreciation figures, and the relatively high utility and labour costs, it will be challenge to ever write net profit at most sites. It would nevertheless be possible to realize net profit figures in Carriacou with an investment in a jetty, which would enable an increase in ice sales. At Grenville positive gross profit figures would be possible with increased collection of fish landing and freezer fees.

The collection of fees from fishers and fish vendors for the services provided is generally a weak point at most of the landing sites and fish markets.

In recent years some 54% of the annual fish landings were carried out at the Grand Mal jetty, where SIFH and SFA received the fish landed. No fish landing fees were collected for fish landed at Grand Mal, but the volume of fish landed would be able to generate an additional annual income of EC$ 330 000. Such annual earnings could easily cover the long-term maintenance of the jetty and related infrastructures at Grand Mal.

The assessment shows the need for putting aside funds for replacement and major repair of fisheries infrastructure. While it may be a challenge to replace the Gouyave fish landing site and market after some 40 years of operations, it is clear that annually investments have to be made in maintenance and repairs of the landing sites. In this respect it would be good that a maintenance and replacement plan should be developed and updated every few years. A maintenance and repair plan that includes also re-investments in essential equipment such as ice machines and freezers.

This assessment study identified a number of priority investments in fish landing and fish market infrastructure and equipment, as well as human resources, which would be able to generate substantial benefits for the Grenadian fisheries sector and contribute to the blue economy development objectives of the country. The priority investments would be focused on jetty construction and upgrades in Carriacou and Grand Mal, development of a vocational programme for fisheries, fencing of the fish landing site and processing places at Grenville and increasing the ice supplies to fishers in Melville St., Grenville and Sauteurs. The total budget required for the priority investments identified would be ECS 3 to 3.2 million (USD 1.1 to 1.2 million), and would result in annually recurring costs of EC$ 400 000, which can largely be recovered within a few years.

Various additional recommendations are made as well related to investments that would further increase the functioning of the landing sites, reduce costs and increase benefits, such as increasing the processing of fish, the improvement of data collection and analysis for fisheries management, establishment of an inventory of equipment and spare parts, as well as carrying out an assessment for investment in solar panel to reduce the electricity costs at the landing sites and fish markets. The costs of implementing the additional investments recommended would be just over EC$ 540 000 (USD 200 000) and recurring annual costs would add up to EC$ 60 000. Some of the investments recommended below require further study or analysis of the related costs and benefits.

6.1. Priority investments

6.1.1. Jetty upgrade, fencing and security at Grand Mal

What: Repair, maintain and secure the jetty at Grand Mal to reduce fish/food safety risks, increase the safety of fishers, and facilitate loading/unloading of fish and ice.

Why: At present the jetty is open access for both people and animals. The jetty has not been well maintained, needs repairs and maintenance of the structure, installation of ladders and dock fenders, installation of lighting, a fence for security and the construction of a data recording office/security guard hut at the entrance. Maintenance and stock components for the ice machine to meet continued demand in the market also needs consideration.

Costs: approximately EC$ 1 million initially, followed by annual costs of ± EC$.150 000

Benefits: Improved health and safety and hygiene practices on the jetty, more consistent collection of service fees from users, public safety, and reduced theft and damage of fisheries assets. Landing fees of 10c/lb X annual landings of over 3 million pounds represents EC$ 300 000 per year. These benefits will cover the costs of investment and recurring maintenance, data recording, utilities and security costs.

6.1.2. Jetty construction in Carriacou, Hillsborough

What: Build a jetty at the beach side of the Carriacou – opposite Hillsborough fish market

Why: The original jetty is located hundreds of meters away from the fish market. The port authority has moved to Tyrell Bay and the current jetty in Hillsborough will be closed and subsequently not maintained. The landing of fish and loading of ice from the beach to the vessels is cumbersome, with risky/unsafe working conditions and negative hygiene impacts. A new jetty would enable ice sales and fish landings for a site, which has higher capacity to provide services and would also deliver higher revenues from ice sales and fish exports to the Treasury.

Costs: approximately EC$ 1 million to EC$ 1.2 million, followed by annual costs of ± EC$ 80 000.

An all steel solution (useful life of 50 years easily achievable nowadays) would be preferred above a concrete/steel combination, as this would come in pre-cut and pre-treated components and only needs assembly on site after the piles have been driven. The environmental impact would be much less as compared to an all concrete solution. The beach line can remain as is, i.e. no rubble or rock at the waterline to avoid problems with erosion, and the jetty can start right at the fish market.

The construction costs could be subdivided in various items, including:

- USD 5 000 for a bathy and topo survey of the area,
- USD 30 000 for a geotech borehole (assuming the equipment and lab are available locally),
- USD 10 000 for a wave hindcast survey (unless this is available for the site in question),
- USD 25 000 for the static design (2 man months Architect),
- USD 6 000 for dynamic verification (hurricane+earthquake) of the static design,
- USD 300-350 000 for the jetty construction itself depending on where the steel comes from (logistics) and if pile drivers are available locally,
- USD 10 000 for 2 site visits by a fishing harbor expert, depending on the arrangements vis-a-vis designer.

Benefits: A newly constructed jetty will:

a) Reduce risks for fishers and vessels

b) Enable the fish market to supply more ice also to the larger vessels (long liners) directly; serve 30 more vessels than the 10-15 vessels served currently

c) Reduce the fuel consumption of local long-liners i.e. no need to travel to Grand Anse or Gouyave anymore for ice

d) Increase the supply of fish to Carriacou – currently there is a shortage of supply

Current landings are around 400 000 lbs annually. Landings are expected to increase by 100 000 lbs. Landing fees of 10c/pound X extra 100,000 lbs landings annually is equivalent to EC$ 10 000 per year. Ice sales increase of EC$ 300 000 represents 1.5 million lbs of ice or ± 700 tonnes of ice (the current capacity of ice production of

10 tonnes per day is likely sufficient). The aforementioned benefits will likely cover the costs of investment in the jetty and the recurring maintenance and utility costs, as well as repairs and future replacements of the ice machines.

6.1.3. A fisheries vocational training program

What: Establishment of a vocational school for fisheries in Grenada.

Why: To professionalize key segments within the catching sector, a standardized course followed by certification is required. The course would be accessible and encouraged or mandatory for registered fishers. The course should be available to all fishers and others in the supply chain and where possible linked to existing technical colleges, curricula and advertised in Grenada's school career days.

The training programme should preferably include the following components:
1) safety at sea
2) boat building and repair (fibre glass boats)
3) navigation and captain duties
4) engine maintenance and repair
5) maintenance of refrigeration systems/ice machines
6) fish processing
7) marketing and business planning

The Fisheries Division started some initial training and there is a budget for some value chain training for 2018 and 2019. Additional training for approximately 25-50 fishers per component per year is needed for the coming 5 years. The conference room in Gouyave could be used for the theoretical part of courses and there is also space to keep training materials (e.g. navigation equipment, engines, ice machines). While it is logical to have the vocational school located at the fish landing site in Gouyave, as “Fishing Capital of Grenada”, it is important to consider the possibility for two satellite sites (making use of existing facilities in Carriacou and Grenville) to facilitate certain courses in other main fisheries-dependent communities. Melville St. also has a conference room, which could be used to deliver part of the training for fishers in the South West of Grenada.

Why: At present there are no formal capacity building and training programmes for people working in the fisheries sector in Grenada.

Costs: approximately EC$ 200 000 initially in training materials and EC$ 50 000 to establish the curriculum, followed by annual costs of ± EC$ 100 000

Benefit: Better trained fisheries stakeholders will mean safer working environments and practices as well as increased revenues and diversification opportunities. The school will also likely drive entrepreneurism in the sector. It will promote the status of Grenada’s fishers from a job for those with poor education to a sought after career path. Reduced accidents and fatalities in fisheries, reduced reliance on imported expertise and spare parts, increased value addition, increased hygiene and food safety, improved business mentality and investments in fisheries, as well as higher export prices would be the desired outcomes. Better trained fishers could generate higher incomes and value alongside subsequent investment generated in the sector, contributing to increases in taxes paid.

6.1.4. Fencing around the fish landing site and processing improvement in Grenville

What: Build a fence around the Grenville landing facility and jetty to restrict access to non-fisheries stakeholders.

Why: At present the fisheries facilities at Grenville are open access, which makes both regulation and possible contamination almost impossible to control. The processing (salting and drying) is carried out in an unhygienic fashion, which should be closed down and moved into a formal and organized processing area.

Costs: EC$ 450 000 plus EC$ 30 000 annual maintenance and repairs

Benefits: At Grenville, fencing off the fishing market will enable better regulation of the site for the same reasons as Grand Mal, enable managers to restrict access and ensure better capacity to collect revenues from services provided or develop these services. Access to only authorized personnel will also increase the health, safety and hygiene standards of the site helping to improve safety and the market value of landings. Improve regulation of activities that occur in and around the facilities and the collection of dues for the use of said facilities.

6.1.5. Increase the capacity of ice production in Grenada

What: Increase the ice availability to fishers and fish vendors at the fish landing sites and fish markets in Grenville, Melville St. and Sauteurs.

Why: There is a shortage in ice availability to fishers and fish vendors in Grenada of 40 to 200 tonnes of ice per month in the fishing season.

The ice production capacity in Grenville is currently 5 tonnes/24 hours and should approximately increase with 15 tonnes to 20 tonnes/24 hours to meet the high season demand and support the increased in fishing operations by the FAD fishers in Grenville. In Melville st. the current 6 tonnes/24 hours production capacity should be doubled to 12 or 14 tonnes/24 hours, to enable sufficient supply of ice to the market vendors and facilitate the long-line fishing vessels operating from Melville st. and the nearby Carenage. While there is currently a small ice producing facility at the Sauteurs landing site, operated by the fishing cooperative, it would be highly beneficial for the fishing community there to have an ice machine of at least 2 tonnes/24hours. This will enable the fishers to provide proper icing and transport high value fish and lobster to the exporters at Grand Mal and Gouyave.

The above 23 tonnes/24 hours additional ice production capacity will in reality only provide 5 to 6 tonnes ice extra per day. This means that these 3 additional ice machines will not be able to address the gap in ice supply on the island during the fishing season. It is assumed that the private sector will invest in additional capacity at Grand Mal as well. The combined investments will solve the ice shortage in Grenada.

Costs: EC$ 430 000 plus EC$ 40 000 annual maintenance

Ice machines' approximate costs are: 15 tonnes/24 hours (USD 100 000); 6 tonnes/24 hours (USD 40 000) and 2 tonnes/24 hours (USD 20 000), including transport costs and installation.

Benefits: The investment in the ice producing capacity at the three landing sites (Grenville, Melville St. and Sauteurs) will address the demands of fishers and fill the current gap in supply, particularly during the fishing season (December – June). The increase in ice availability at these key sites will enable an increase in the use of ice on board of vessels and in the fish markets with significantly positive contributions to the fish export value and food safety. Losses of fish for the value chain will be reduced with positive contributions to national food security as well.

Associated benefits will be that earnings will increase from ice sales at the three sites. Moreover, more fish will be landed in Sauteurs and Melville st., supporting the financial viability of these sites also through increased landing fees and vendor stall rent fees.

6.2. Additional recommendations for investments identified

6.2.1. Fish Processing improvements

Aside from SIFH, where bycatches from the yellowfin tuna fishery are processed for local supermarkets, no formal processing areas or equipment are present at any of the other landing sites. Where salting and drying activities do take place, this is done outside the market areas, in uncovered, not suitable areas in unsanitary conditions. The current situation could be improved by investing in drying and salting racks and/or solar dryers in those areas where certain bycatch species are salted and dried.

Recommendation: Processing areas for salting, drying and curing of fish should be situated within the enclosed areas of the main landing sites and markets, so that access is restricted to those involved in the processing.

Benefits: Dedicated sites for processing will contribute to meeting food safety and hygiene standards, and increase opportunities to develop value added production in Grenada, e.g. Grenville.

Cost: The construction or purchase of the processing racks and solar dryers would cost around EC$ 150 000.

6.2.2. Fishery data collection, analysis and management information systems

Fisheries data collection and analysis is important for fisheries management decision making process and is currently in Grenada below the international standards required. This is largely due to limited training and equipment for data collection and processing available. The recording of data into paper booklets increases the workload, requiring the data to be inserted into the central computer system at Melville St. The use of paper records also increases the likelihood of errors and data loss, problems that are easy to overcome if electronic data capture and analysis methods are used.

Recommendation: Computers that have internet access need to be available to fisheries staff at each of the landing sites. Every landing site should have a trained staff member who is responsible for data collection and reporting and can use the computer and the data capture software. This will mean that landings, costs and dues data can be recorded on a daily basis and the use of paper records can be phased out.

The establishment of a new framework to support a National Fisheries Information System (such as in Trinidad and Tobago) or a Fisheries Management Information System (FISMIS) such as in The Bahamas, which

generates summary reports and can be used to print out licenses and certificates by authorized staff (as needed). Such as system will be able to provide an efficient data capture, analysis and management information structure that facilitates reporting to the Government, CRFM, ICCAT and FAO as well.

Benefits: Improved data collection and analysis contributes to the national and regional level management of fisheries, will support enforcement, increase revenues from landing sites (via improvements in the collection of dues) and contribute to meeting the reporting obligations of Grenada under regional and international fisheries agreements and conventions.

Costs: Setting up of a FISMIS system with computers, software and training costs around EC$ 300 000, and the annual maintenance and security of the system, as well as training of staff, and cloud space (as needed) costs around EC$ 40 000 per year.

6.2.3. Establishment and maintenance of an inventory of essential spare parts

Spare parts are required at many of the fish landing sites around Grenada. For example, Melville St had in 2018 a shortage of ice due to a broken ice machine, because certain essential parts and skilled personnel to maintain the ice machines were not available. Regular maintenance of much of the fisheries-associated equipment on Grenada is needed. The provision of spare parts must be accompanied by training to make an investment in spare parts for the key equipment used at the landing sites and fish markets (e.g. ice machines, scales and freezers) worthwhile.

Recommendation: An inventory of spare parts should be established and maintained at Melville st. with the most important spare parts and at least one technician (but better two) should be trained to carry out the maintenance of the essential equipment at all landing sites. A national-level inventory list of all of the equipment at fish landing sites, as well as an inventory of spare parts that are most frequently needed is recommended. Each site also requires a routine maintenance log and a dedicated, trained member of staff responsible for conducting that routine (daily) maintenance. Health and safety equipment for repairing the Ammonia freezers is also an urgent requirement.

Benefits: An inventory of spare parts will require an initial small investment, but will reduce the long-term costs associated with limited maintenance and will reduce the “down-time” when equipment is not in working order (which helps to increase the functioning of landing sites and revenue generation).

Costs: The establishment of the inventory with essential spare parts will cost approximately EC$ 80 000, and training of landing site staff in daily maintenance and of the dedicated technicians in larger maintenance and repair will cost an additional EC$ 20 000. Recurrent costs involved in maintenance and repair and replacement of ice machines and freezers will become lower in the short term with own staff trained and spare parts available.

6.2.4. Renewable energy sources

Many of the government landing facilities could reduce their electricity running costs by installing solar panels on the roofs of the landing sites and markets. Grants for such investments may be available, but it is likely that some research into different funding opportunities will be needed.

Recommendation: Determine the energy needs for the main landing sites, assess the suitability and affordability of using solar panels and related battery systems to reduce the electricity costs. A solar panel specialist can easily calculate the needs and savings that could be made for each specific site.

Benefits: This would reduce the electricity costs and emissions of each facility; electricity costs are now 74% of the utility costs and 40% of the total operating costs of all landing sites and fish markets. This will support Grenada positioning itself as a sustainably run "green" island, something which is increasingly important in the tourism sector, and will help Grenada meet climate change targets.

Costs: EC$ 10 000 for an assessment of the various solar energy options/scenarios for each of the landing sites. The investment in solar energy systems will depend largely on the calculations made, which will show the costs, monetary benefits and the time to recover the initial investment before benefits will be realized.

Annex 1: Site profiles of the main fish landing sites and fish markets in Grenada.[27]

Site name: Carriacou

Port Statistics
Number of vessels: 20
Type I: 15-20
Type II: 0
Type III: 0

Number of fishers:
Men: 15
Women: 0

Building staff
Number of fisheries staff:
Men: 4
Women: 4

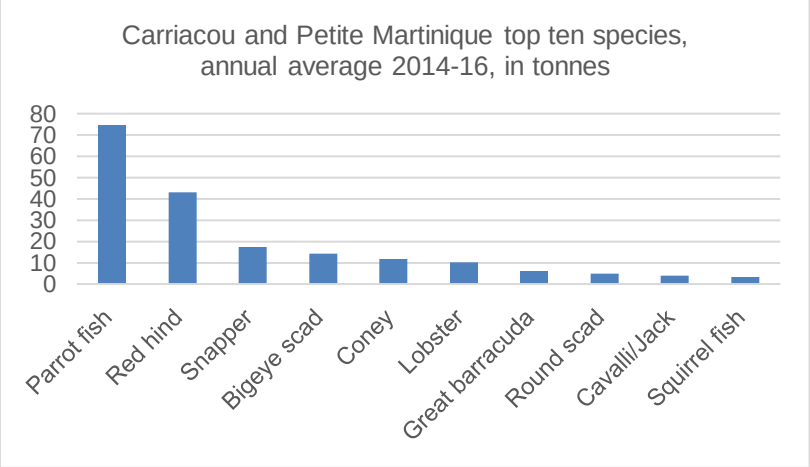
Number of market vendor spaces: 6

Number of vendors:
Men: 15 (fishers)
Women: 0

Market
Fishers at Carriacou sell their fish directly to the local buyers (and pay for the use of facilities) There are no specific fish vendors active at the market

Equipment + Service	Y/N	Status	Specification	Usage
Wharf / Jetty	N	None – There is a jetty some 200 meters away from the market, but it is not usable for the fishers	Needed	A jetty would increase ice revenues and working conditions
Fuel pump	Y	Privately owned (rebate possibility)	Could increase with jetty construction	Medium
Ice machine	Y	Two machines with a capacity of 4 and 6 tonnes per day	Recently repaired	Could increase production
Blast freezer	N	None		
Freezer	Y	Working and in use	5c/lb 1st day, 3 c/lb after	Medium
Cold storage	N	There is no cold storage room for fishers, but ice boxes are used on site		
Lockers	N	None	Needed; up to 12	
Security	N	None	Needed	
Processing	N	None		

[27] The information presented in this annex was collected at each site from interviews with fishers, fish vendors, and government fisheries staff. Following the site visits in November 2018 each site profile was filled and information presented herein was validated at a Stakeholder meeting held on the 26th of November 2018 at Melville Street. Spaces/gaps in the data presented indicate unknowns.



Average annual landings (2014-2016): 199 tonnes (Carriacou and Petite Martinique)
Average Price per lb: EC$ 6-7
Ex-vessel Revenue annual average 2014-2016: EC$ 3.4 million or USD 1.1 million

Product destinations:

Personal consumption __5__ %
Local sales ___10-20__ %
Exports __80-90___ %

Investment opportunities:

Fishers and staff points of view: There is a need for a jetty for fish landings and ice transfer in front of the fish market, to make the most of existing facilities and ice production capacity. A vocational training, particularly for health and safety, is a priority for staff and fishers, preferably to be organized on Carriacou for use also for fishers from Petite Martinique. There is a potential to double the ice sales to local fishers if a jetty is built. A fuel pump would be very useful on the sites, as would be secure lockers – particularly to secure outboard engines.

Site name: DuQuesne

Port Statistics
Number of vessels: 39
Type I: 23
Type II: 8
14 = (seine)
Type III: 8

Number of fishers:
Men: 100
Women: 3

Building staff
Number of fisheries staff:
Men: 1
Women: 0

Number of market vendor spaces: 1

Number of vendors:
Men: (fishers directly sell)
Women: 0

Market
Fishers sell directly to other boats (bait) and to local home buyers

Equipment + Service	Y/N	Status	Specification	Usage
Wharf / Jetty	N	None	Beach launched	NA
Fuel pump	N	Get fuel from Victoria		Low
Ice machine	N	Fishers purchase ice private – Victoria.	Private purchase	Medium
Blast freezer	N	None		
Freezer	Y	Available on site; Sometimes used for bait	2 000 lbs capacity	Medium
Cold storage	N			
Lockers	Y	Not enough for current use	6 lockers	high
Security	N	Daytime Government staff		
Processing	N	None		

Landings (annual average 2014-2016)

Total recorded average annual landings are low, some 17 tonnes, and mainly include round scad, red snapper, red hind and jacks.

Total landings (2016): 17 tonnes
Average Price per lb: EC$ 6 ($100-200 per bait dip)
Total off-vessel Revenue 2016: EC$ 180 000 USD 67 000

Product destinations*:
Personal consumption __50__ %
Local sales ___50____ %
Exports ____0____ %

Investment opportunities:

Fisher opinions: Drainage around the landings building and more lockers are needed. Processing equipment and training in drying and smoking is desired. The office needs a computer and internet, but the workers in the office would also need training in the use of the computer.

Site name: Gouyave

Port Statistics
Number of vessels: 45
Type I: 15
Type II: 15-20
Type III: 10*
*Selling in Grand Mal

Number of fishers:
Men: 175
Women: 0

Building staff
Number of fisheries staff:
Men: 7
Women: 2

Number of market vendor spaces: 10

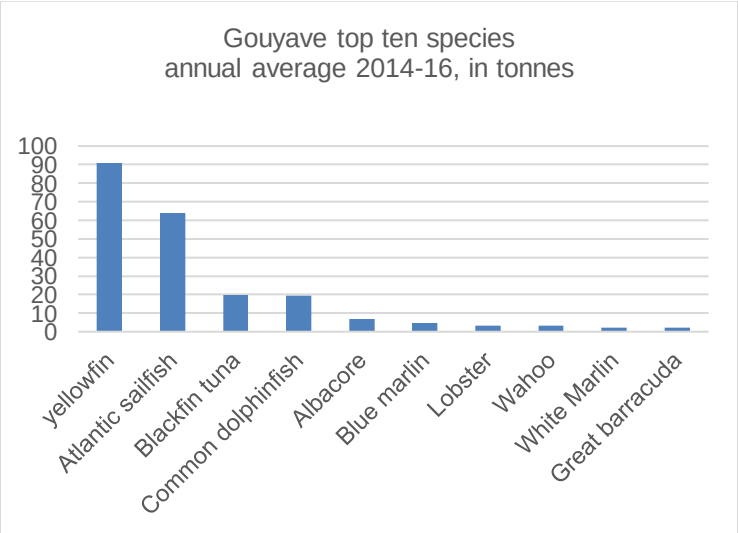
Number of vendors:
Men: 0
Women: 2

Market
Gouyave has a market with two private companies – Nordom, which is focused on yellowfin tuna and Vineyard ltd focused on spiny lobster, exporting to the USA & China respectively.

A conference room above the market is also available for Fisheries Division's work, fishers associations, or external hire.

Equipment + Service	Y/N	Status	Specification	Usage
Wharf / Jetty	Y	Govt. built – but too high	Concrete	High
Fuel pump	Y	Private but fishers get rebate		High
Ice machine	Y	Two 6 tonne machines	Used daily	High
Blast freezer	Y	1 blast freezer		Medium
Freezer	Y	Yes. 1 slow freezer room; 1 freezing room;	Rental of space	Medium
Cold storage	Y	One cold storage room; one bait room		Medium
Lockers	Y	Currently have 25	Approx. 6' x 4'	High
Security	Y	Private paid by ministry	One man	High
Processing	Y	Salting and some cold smoking		Low

Landings:



Total annual average landings (2014-2016): 227 tonnes
Average Price per lb: EC$ 5.00 – 8.00
Total off-vessel Revenue 2016:
EC$ 2.9 million, USD 1.06 million

Product destination:
Personal consumption _10__ %
Local sales __90_____ %
Exports _____ %

Investment opportunities:

Fisher opinions: Lower the jetty to make loading easier or add a crane to the jetty. Improve drainage in and around the fisheries building. Provide training for the use and repair of the forklift and for the maintenance of ice machine and boat engines.

Site name: Grenville

Port Statistics
Number of vessels: 204
Type I: 200
Type II: 2
Type III: 2
(170 of 200 working)
Number of fishers:
Men: 420
Women: 1

Building staff
Number of fisheries staff:
Men: 7
Women: 8

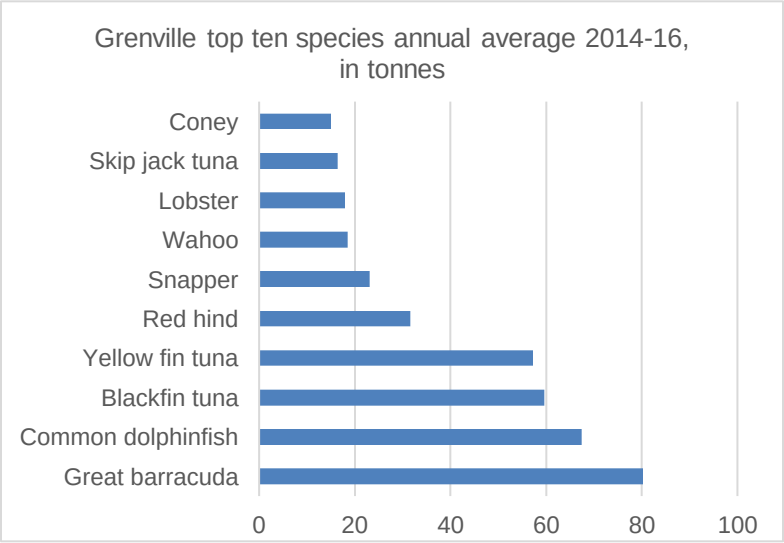
Number of market vendor spaces: 8

Number of vendors:
Men: 5
Women: 2

Market
Biggest market (gov. Owned) – well maintained, ice use at the market is good.

Equipment + Service	Y/N	Status	Specification	Usage
Wharf / Jetty	Y	Good, but could do with water supply	Gov. owned	High
Fuel pump	Y	Good, rebate if dues are paid	Coop owned	High
Ice machine	Y	Good condition	2 x 2.5 t / day	Medium
Blast freezer	N	None		
Freezer	Y	Good but need 3x more	3,000 lbs Max	High
Cold storage	Y	Cold storage room and chill room (including external container)	15ft container and two rooms	High
Lockers	Y	Good but need more (approx. 10)	30; each 6x4ft	High
Security	Y	Full time, but poor capability	1 night, 1 day	Full time
Processing	Y	Casual salting of fish outside the market		Low (mainly shark and angelfish)

Annual Average Landings (2014-16), top ten species in tonnes



Annual average landings (2014-16): 448 tonnes
Average Price per lb: EC$ 6-7
Total off-vessel average annual Revenue 2014-16: EC$ 6 165 665 USD 2 283 580

Product destinations*:
Personal consumption __25__ %
Local sales _70___ %
Exports ___5____ %

Investment opportunities:

Fisher opinions: Better training for the routine maintenance of the ice machine and provision of the correct safety equipment for maintenance of the ice machine are essential. The capacity of the water pump for the cleaning hoses should be increased. New computers (installation) and internet access would be beneficial for data collection and management purposes, including collection of dues and fees, and this should be supported with training. Security fencing around the whole property is needed. Space for processing, salting and drying would enable value addition and increase of revenues. A forklift truck would be useful for the facility. Additional ice machine capacity and more freezers would improve the on-site capacity to deal with increasing landings from FAD fisheries. Capacity building and training for staff should accompany any investment.

Site name: Melville Street

Port Statistics
Number of vessels: 30
Type I: 20
Type II: 10
Type III: 0
(65% daily operation)
Number of fishers:
Men: 80
Women: 0

Building staff
Number of fisheries staff:
Men: 7
Women: 2

Number of market vendor spaces: 15

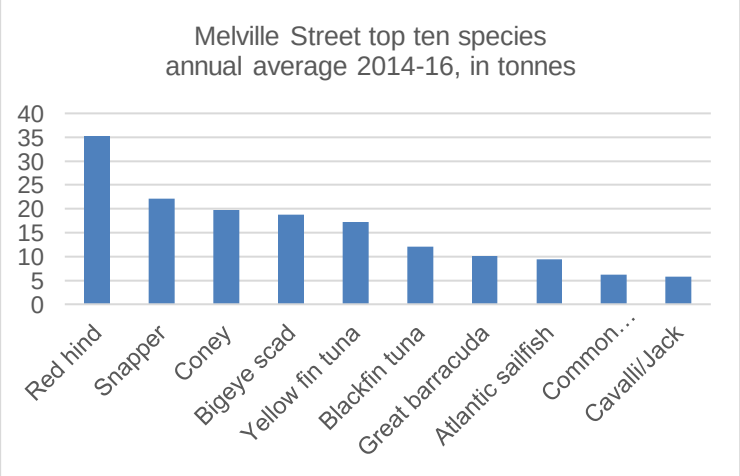
Number of vendors:
Men:4-6
Women: 10-12

Market
The Gov. owned market is heavily used. It needs some general repair of the vendor stalls and work area. The ice machines require repair and increased capacity.

Within the Fisheries Division above the market there is a conference room facility and offices

Equipment + Service	Y/N	Status	Specification	Usage
Wharf / Jetty	Y	Gov. built – but small (needs dredging)	Concrete	High
Fuel pump	Y	Private - fishers get rebate		High
Ice machine	Y	Currently not able to work at full capacity – repair needed	6 tonnes x 2	High
Blast freezer	N	None		
Freezer	Y	Currently very full	6' x 10' approx.	High
Cold storage	Y	One chiller room and one cold storage room; however most cold storage is in fish boxes with ice		Medium
Lockers	Y	Currently have 28 (need 5 more)	28. Approx. 6' x 4'	High
Security	Y	Private paid by ministry	One guard	High
Processing	N	None		

Landings:



Annual average landings (2014-16):
192 tonnes
Average Price per lb: EC$ 6-7
Total off-vessel average annual Revenue 2014-16: EC$ 2.4 million US$ 0.9 million

Product destinations*:
Personal consumption 10-15_ %
Local sales __80-85____ %
Exports _2-5__ %
(*Please estimate how much fish go to each)

Investment opportunities:

Fisher opinions: The fish vendors at the market need more ice. Proper maintenance of the ice machines is needed and staff need training for this maintenance and better access to spare parts. The maintenance of the fish market facility needs to be better done, with installation of new hanging scales, repair of broken tiles etc. There is a need for some ice boxes in the vending areas to hold fish ready for sale.

Site name: Petite Martinique

Port Statistics
Number of vessels: 130
Type I: 30-40
Type II: 90
Type III:

Number of fishers:
Men: 180-210
Women: 0

Building staff
Number of fisheries staff:
Men: 0
Women: 0

Number of market vendor spaces: 0

Number of vendors:
Men: (fishers are only vendors)
Women: 0

Market
There is no market

Equipment + Service	Y/N	Status	Specification	Usage
Wharf / Jetty	Y	Public jetty, not just for fishing vessels		High
Fuel pump	Y	Not functioning	Broken	Nil
Ice machine	Y	Privately owned	2,8,10 t per day	Medium
Blast freezer	N	None		
Freezer	Y	Yes	Used daily but not at capacity	Medium
Cold storage	N	None, but use ice boxes on site		Med
Lockers	Y	15	More lockers needed	High
Security	N	None	Not on site	
Processing	N	None	Not on site	

Landings:
See information of Carriacou landing site

Product destinations*:
Personal consumption __5__ %
Local sales _5_____ %
Exports _90_____ %
(*Please estimate how much fish go to each)

Investment opportunities:

Fisher opinions: It would be good to develop a VMS system for the fishing fleet. A fuel pump and wharf renovation is needed, alongside a cold storage facility. Training is needed for diesel mechanics, as well as ice machine technicians. Additional secure lockers are also needed for the safe storage of fishing gear.

Site name: Southern Fisherman Association (uses the government facility at Grand Mal)

Port Statistics
Number of vessels: 55
Type I: 0
Type II: 55
Type III: 0

Number of fishers:
Men: 220
Women: 0

Building staff
Number of staff:
Men: 7
Women: 8

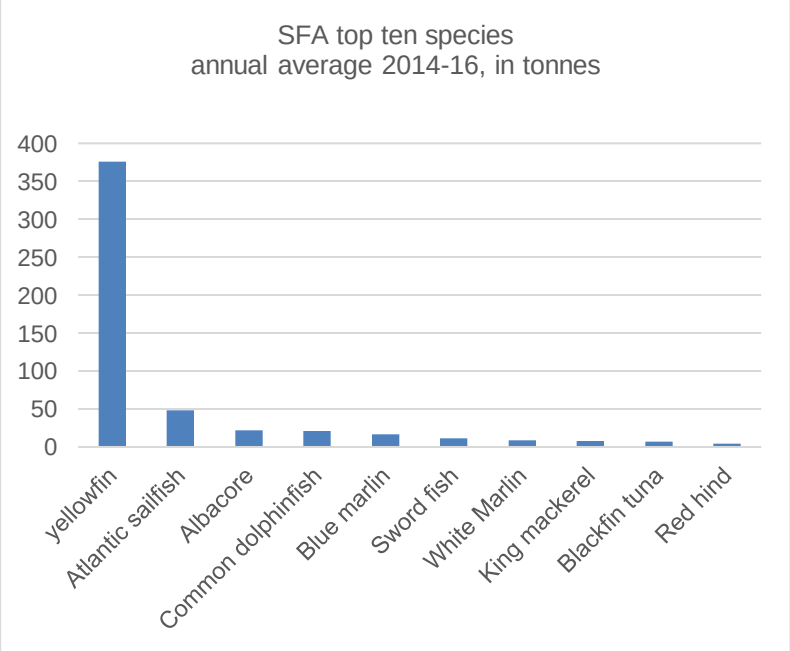
Number of market vendor spaces: fish shop

Number of vendors:
Men: 0
Women: 2

Market
SFA is a shareholder owned export company that trades mainly Yellowfin tuna.

Equipment + Service	Y/N	Status	Specification	Usage
Wharf / Jetty	Y	Needs repair and fencing	Gov. owned	High
Fuel pump	Y	Working		High
Ice machine	Y	Good working condition, but there is need for an additional 7 tonnes capacity	2t / day	High
Blast freezer	N	None	Fresh export	Low
Freezer	Y	6 cubic metres		High
Cold storage	N	None		
Lockers	N	None (shared with SIFH x 12)		High
Security	Y	For facility but needed for jetty		Low
Processing	Y	Not much processing is done	Smoking sailfish	Low

Landings:



Average annual landings (2014-2016): 543 tonnes
Average Price per lb: EC$ 6-7
Ex-vessel Revenue annual average 2014-2016: EC$ 7.42 million or USD 2.75 million

Product destinations*:
Personal consumption __0___ %
Local sales __25____ %
Exports ___75____ %
(*Please estimate how much fish go to each)

Investment opportunities:

Fisher opinions: Security and fencing for the jetty, including lighting for night time offloading is the key priority for the site. This would lead to better health and safety conditions on the jetty and also reduce the risk of contamination of fisheries products. There is a general lack of space for any form of spatial expansion.

Site name: Spice Island Fish House (uses a government owned facility at Grand Mal)

Port Statistics
Number of vessels: 20
Type I: 0
Type II: 15-20
Type III: 0

Number of fishers:
Men: 175
Women: 0

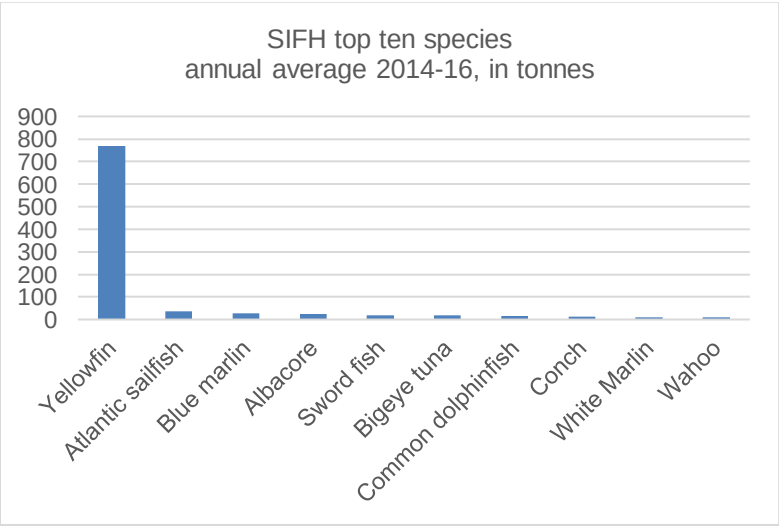
Building staff
Number of staff:
Men: 20
Women: 10

Number of market vendor spaces: 0
Number of vendors:
Men: 0
Women: 0

Market
Private shareholder owned (from Barbados) and a public-private partnership with the Grenadian government.

Equipment + Service	Y/N	Status	Specification	Usage
Wharf / Jetty	Y	Needs repair and fencing	Gov. owned	High
Fuel pump	Y	Working		High
Ice machine	Y	Good – meets demand	12t and 20t / day	High
Blast freezer	Y	Working	In daily use	Med
Freezer	Y	3 freezers	In daily use	High
Cold storage	Y	At airport (ref. container)	20 ft nearly at capacity	High
Lockers	Y	12 (Shared with SFA)		High
Security	Y	For facility, but a fence is needed for the jetty	Shared with SFA	High
Processing	Y	Conch, mahi-mahi + other	Local markets	Medium

Landings (2016):



Average annual landings (2014-2016): 962 tonnes
Average Price per lb: EC$ 6-7
Ex-vessel Revenue annual average 2014-2016: EC$ 14 million or USD 5.17 million

Product destinations*:
Personal consumption __0_ %
Local sales __25____ %
Exports ___75____ %
(*Please estimate how much fish go to each)

Investment opportunities: See SFA

Site name: Sauteurs

Port Statistics
Number of vessels: 25
Type I: 24
Type II: 1
Type III: 0

Number of fishers:
Men: 30
Women: 1

Building staff
Number of fisheries staff:
Men: 2
Women: 2

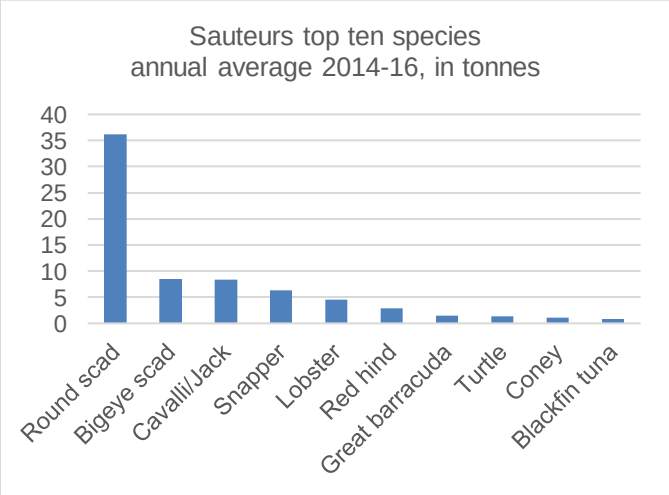
Number of market vendor spaces: 6

Number of vendors:
Men: 0
Women: 3

Market
Gov. owned and has an actual harbor with a large number of inactive vessels.

Equipment + Service	Y/N	Status	Specification	Usage
Wharf / Jetty	Y	Good	Gov. owned	Low
Fuel pump	Y	Private (get rebate on price)	Local gas station	Low
Ice machine	Y	Owned by fishers coop (80% gov.)	2t per day	Low
Blast freezer	N	None	Daily landings are low	
Freezer	Y	Not used to full capacity	Daily landings are low	Low
Cold storage	N	None		
Lockers	Y	23 lockers in a poor state – need repair	6x4 feet	High
Security	N	None		
Processing	N	None		

Landings:



Average annual landings (2014-2016): 74 tonnes
Average Price per lb: EC$ 6-7
Ex-vessel Revenue annual average 2014-2016: EC$ 743 000 or USD 275 000

Product destinations*:
Personal consumption __20__ %
Local sales __80__ %
Exports ___0____ %

Investment opportunities:

Fisher opinions: Repair of the lockers is needed as they are in a poor state. A compressor for local scuba divers to reduce costs of tank fills was also suggested as necessary. Training for safety at sea, hygiene and maintenance of vessels (and engines etc) would be needed. The current cooperative owned ice machine was funded by 80% grant from MAREP, but greater ice machine capacity is required. Access to a fuel pump is very important (in close proximity to the dock / vessels).

Site name: Victoria

Port Statistics
Number of vessels: 15
Type I: 15
Type II: 0
Type III: 0

Number of fishers:
Men: 40
Women: 0

Building staff
Number of fisheries staff:
Men: 1
Women: 1

Number of market vendor spaces: 3

Number of vendors:
Men: (fishers sell)
Women: 0

Market
Government owned but not frequently used as a landing site. The market has an ice machine, which is functioning, but no vendors.

Equipment + Service	Y/N	Status	Specification	Usage
Wharf / Jetty	N	None		
Fuel pump	N	None		Low
Ice machine	Y	Used by fishers who do not land at site	Not used to full capacity	Medium
Blast freezer	N	None		
Freezer	Y	Not used	No landings at site	Low
Cold storage	Y	Not used	No landings at site	Low
Lockers	Y	16. Not used		Low
Security	N	None		
Processing	N	None		

Landings

Total landings (2016): 0 lbs (landings not recorded)
Average Price per lb: EC$ 5-6
Total off-vessel Revenue 2016: EC$ NA
US$ 0

Product destinations*:
Personal consumption __NA__ %
Local sales ___NA____ %
Exports ____NA____ %

Investment opportunities:

Fisher opinions: The foundation of the fish market building may be a future concern due to erosion, the impacts of which are visible at the neighboring building, which is close to collapse. There is a need for more buyers and a better market for the bycatch species. Having internet access and a computer would be beneficial as well.

Site name: Waltham

Port Statistics
Number of vessels: 25
Type I: 20
Type II: 4
Type III: 1
(III not in commission)

Number of fishers:
Men: 175
Women: 0

Building staff
Number of fisheries staff:
Men: 0
Women:1

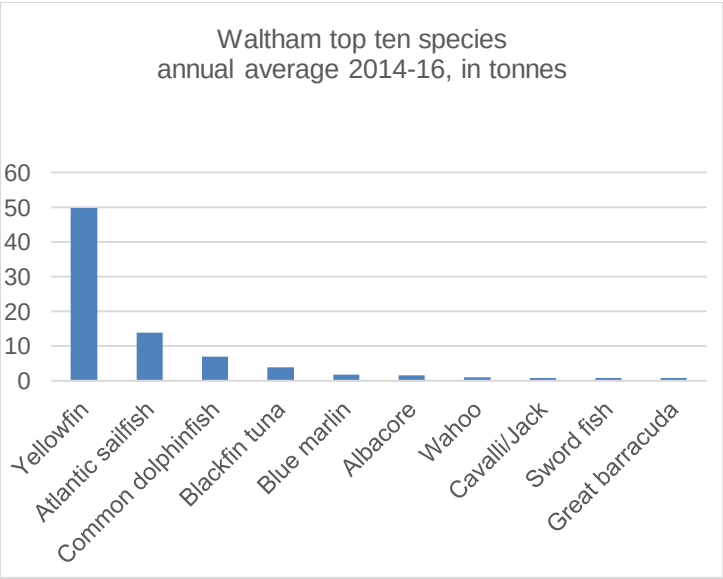
Number of market vendor spaces: 2

Number of vendors:
Men: 0
Women: 0

Market
Gov. owned; not used fequently

Equipment + Service	Y/N	Status	Specification	Usage
Wharf / Jetty	N	None		
Fuel pump	N	Get fuel from Victoria (EC$18 / gallon)	No rebate given	
Ice machine	N	Get ice from Victoria or Gouyave	Used daily	Medium
Blast freezer	N	None		
Freezer	Y	Yes, 3 small freezers	Not used to full capacity	Medium
Cold storage	Y	Not working (use ice boxes)	10,000 lbs	Too small
Lockers	Y	16 lockers in good state, but need 16 more	6' x 4'	High
Security	N	None		
Processing	N	None		

Landings (2016):



Annual average landings (2014-16):
83 tonnes
Average Price per lb: EC$ 6-7
Total ex-vessel average annual Revenue 2014-16: EC$ 1.05 million US$ 387 000

Product destinations*:
Personal consumption __15__ %
Local sales ___15____ %
Exports ____70____ %

Investment opportunities:

Fisher opinions: The construction of a jetty to facilitate off loading and new lockers were highlighted as the main needs. Repair of the slipway and a platform to store small boats during storms are needed. There are currently 16 lockers, all shared so an additional 16 would satisfy demand. The current office space for fisheries staff is very small and lacks a computer and internet access in order to input data directly instead of recording on paper.

Site name: Windward

Port Statistics
Number of vessels: 30
Type I: 22
Type II: 8
Type III: 0

Number of fishers:
Men: 30
Women: 0

Building staff
Number of fisheries staff:
Men: 1
Women:1

Number of market vendor spaces: 2

Number of vendors:
Men: (fishers sell direct)
Women: 0

Market
Gov. owned, very small facility.

Equipment + Service	Y/N	Status	Specification	Usage
Wharf / Jetty	Y	Fairly good, but needs repair	Wooden	Medium
Fuel pump	N	None	Purchase privately	
Ice machine	N	None	Ice delivered to site	Low
Blast freezer	N	None		
Freezer	N	None		
Cold storage	N	Used ice and fish		Low
Lockers	Y	Ok condition	12 total	High
Security	N	None		Low
Processing	N	None		Low

Landings:

Annual average landings (2014-16): 345 kg
Average Price per lb: EC$ 6-7
Total off-vessel average annual Revenue 2014-16: EC$ 3 400 US$ 1 200

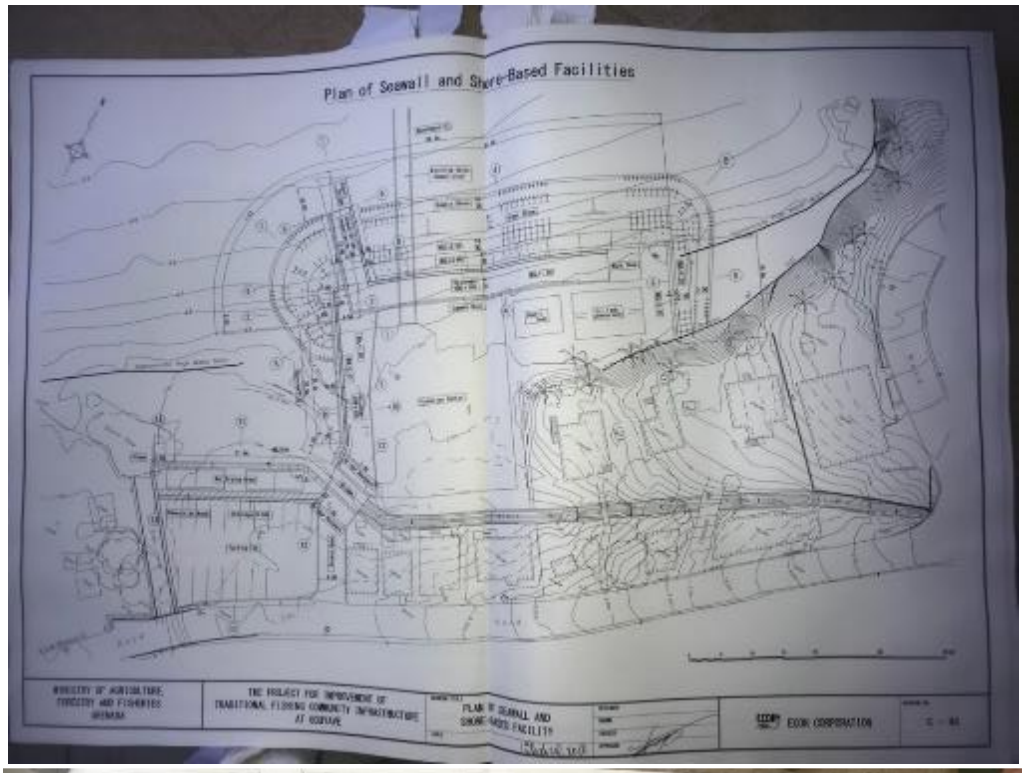
Product destinations*:
Personal consumption _50__ %
Local sales __50___ %
Exports ____0____ %

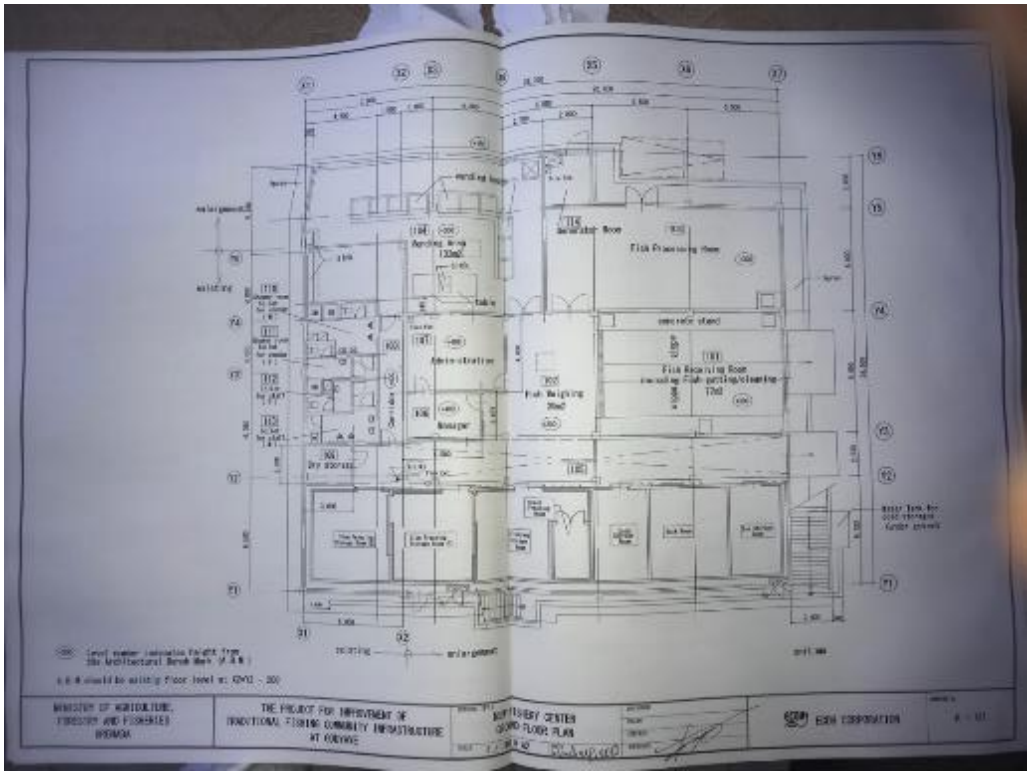
Investment opportunities:

Fisher opinions: Local staff were very supportive of a fisheries school for Carriacou and an on-site ice machine would be very useful for local fishers.

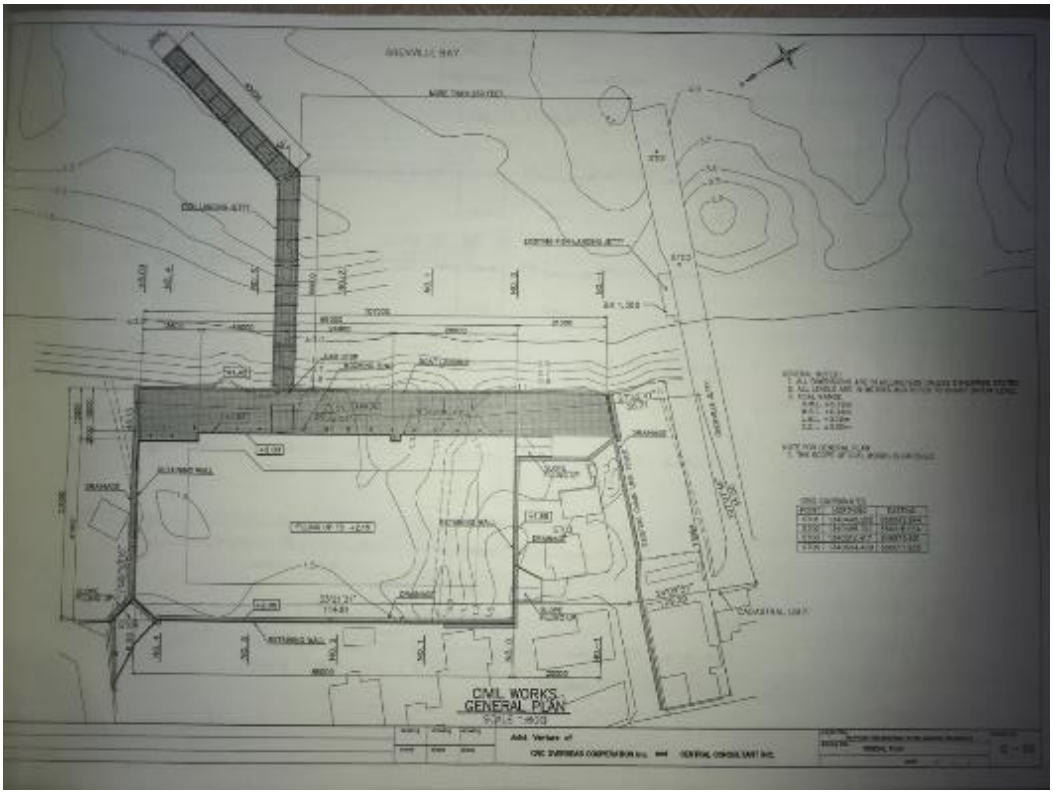
Annex 2: Site plans and layouts for major Government owned sites

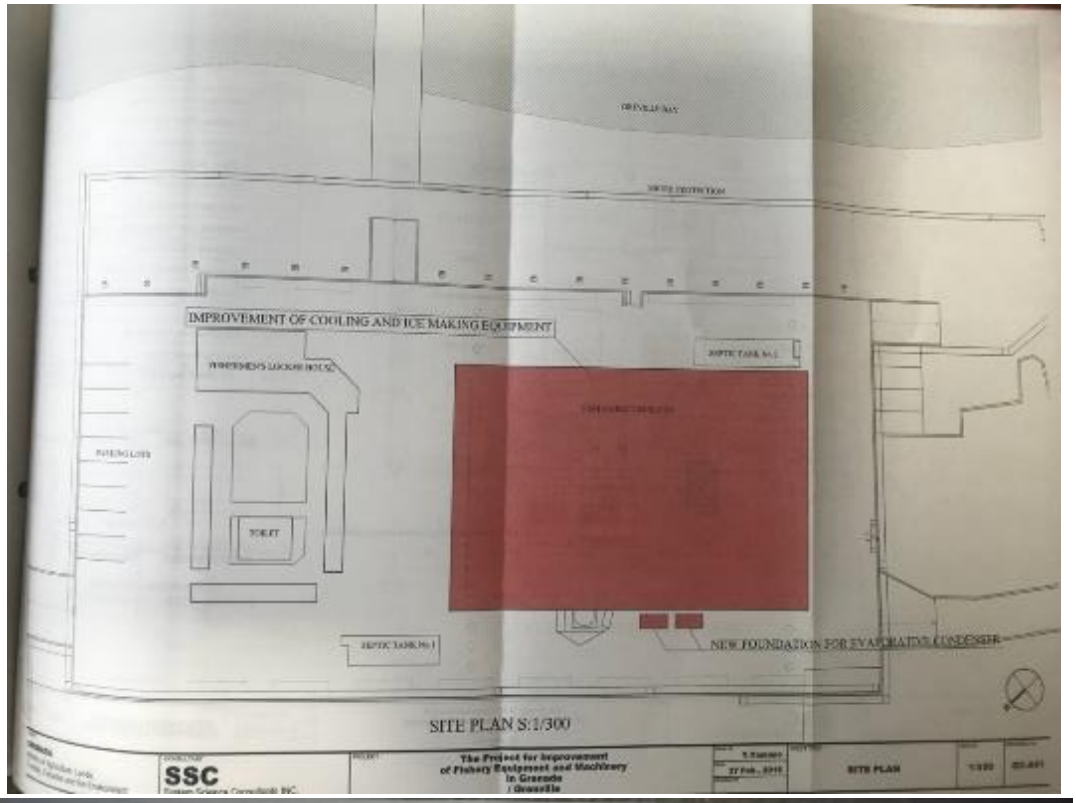
Gouyave

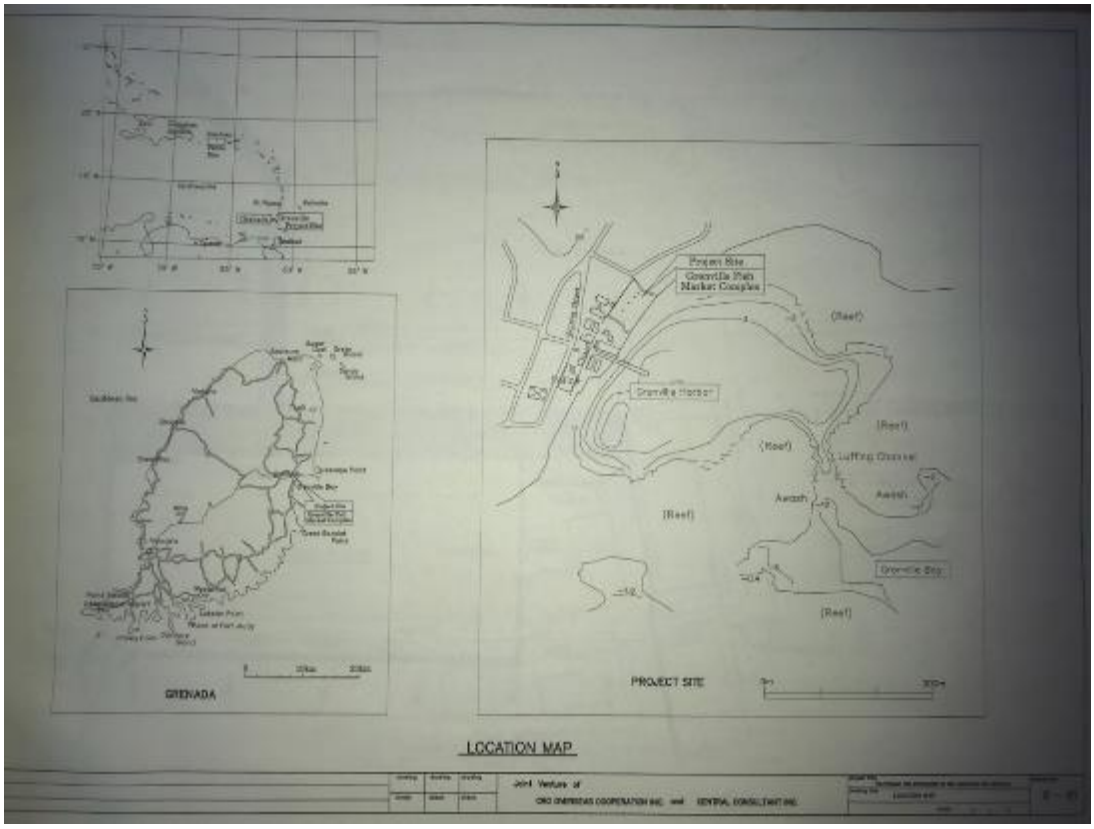




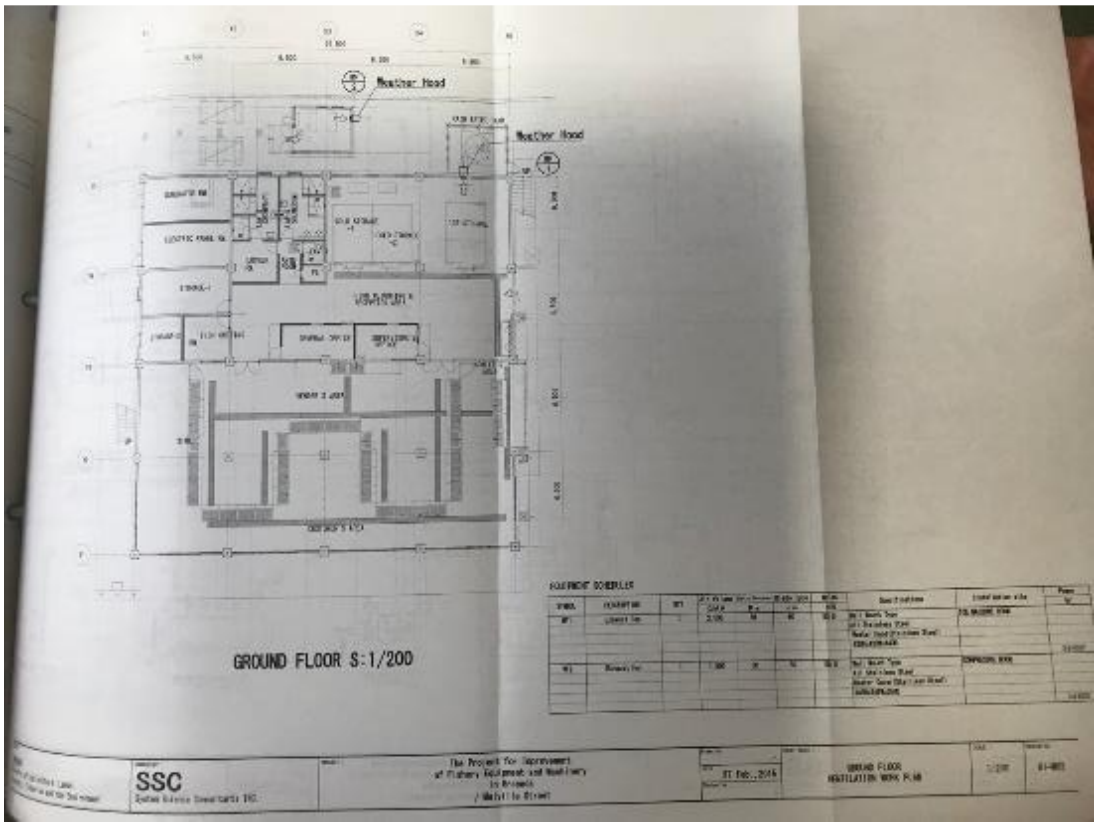
Grenville

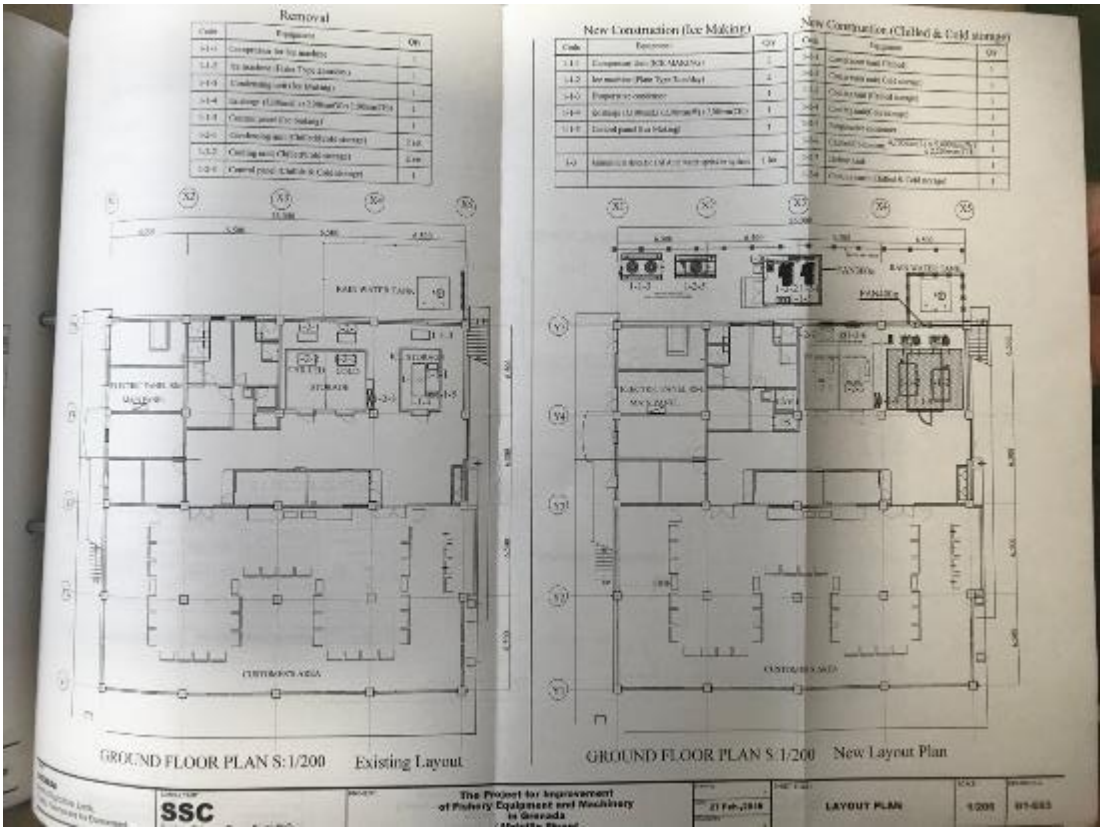


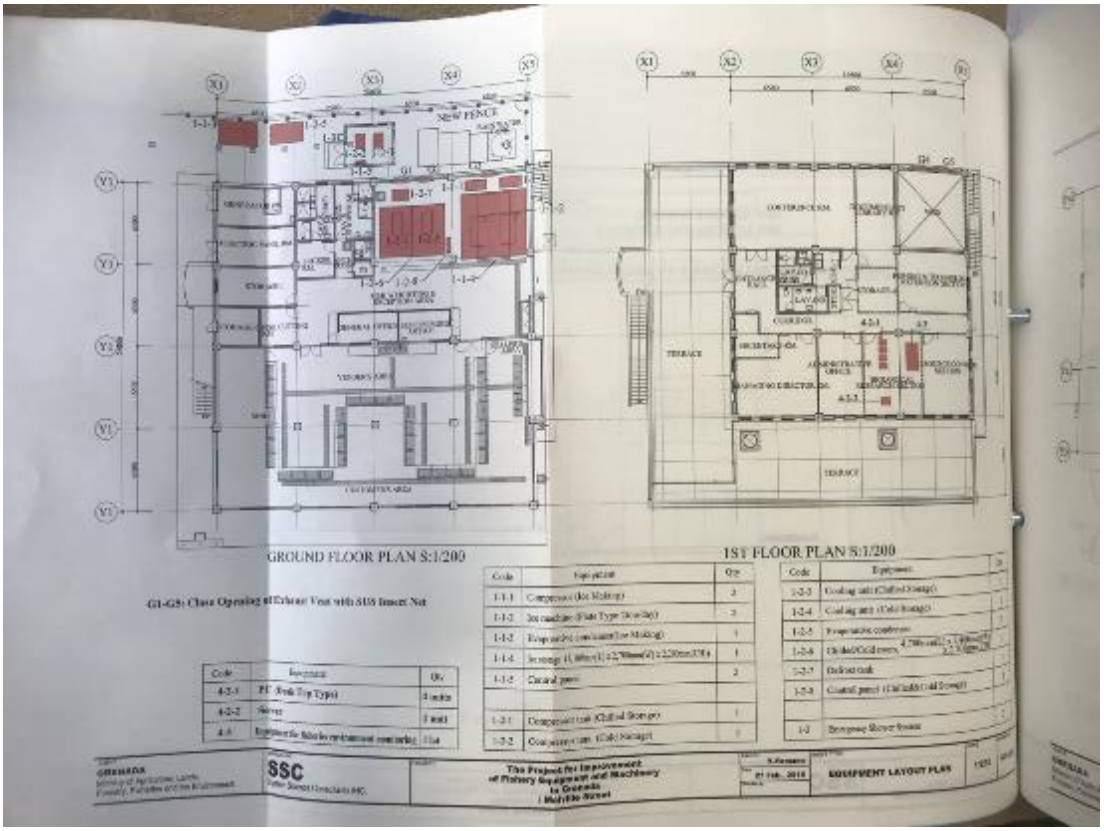

IMPROVEMENT OF COOLING AND ICE MAKING EQUIPMENT
TOILET
NEW FOUNDATION FOR EVAPORATIVE CONDENSER
SITE PLAN S:1/300
SSC
The Project for Improvement of Fishery Equipment and Machinery in Grenada / Grenville
SITE PLAN

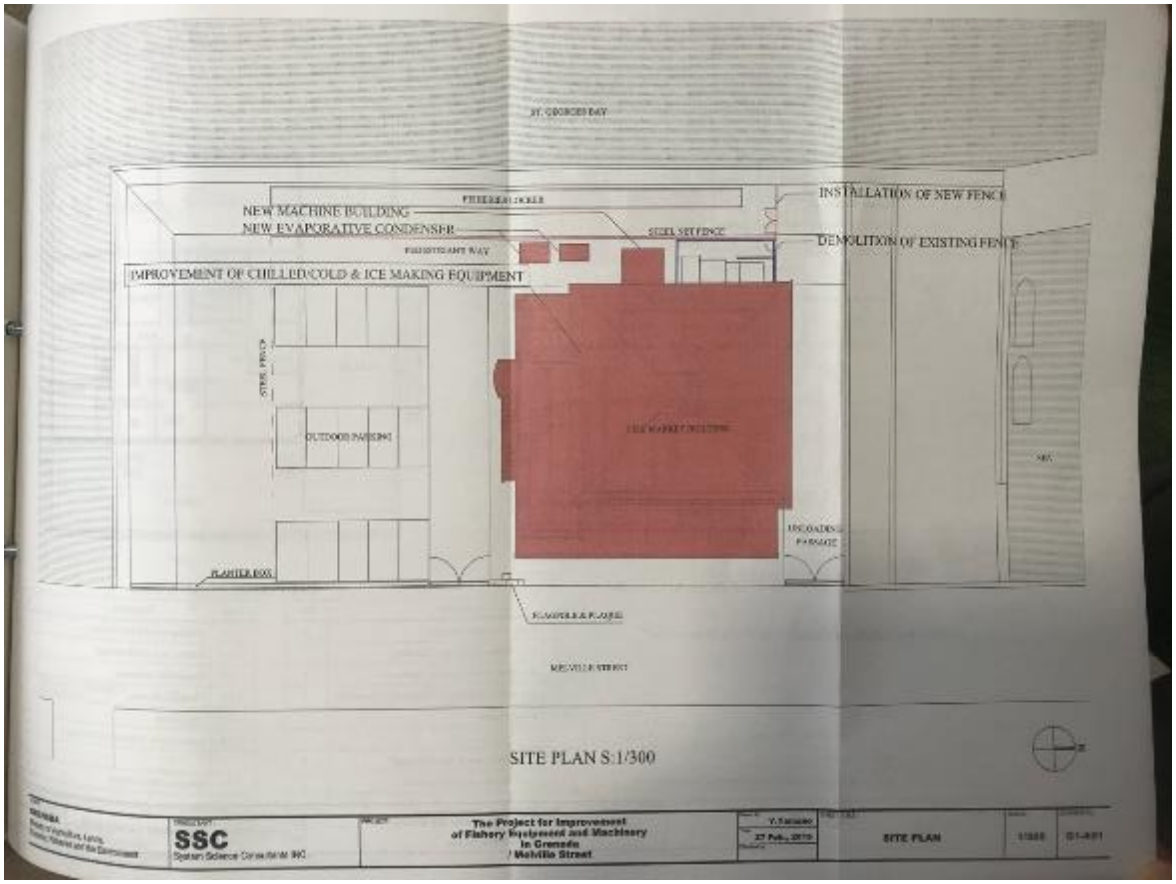

GRENADA
PROJECT SITE
LOCATION MAP

Melville St


Washer Head
Washer Head
GROUND FLOOR S:1/200
SSC


Removal
New Construction (Ice Making)
New Construction (Chilled & Cold storage)
GROUND FLOOR PLAN S:1/200 Existing Layout
GROUND FLOOR PLAN S:1/200 New Layout Plan
SSC
LAYOUT PLAN


NEW FENCE
GROUND FLOOR PLAN S:1/200
1ST FLOOR PLAN S:1/200
TERRACE
SSC
The Project for Improvement of Fishery Equipment and Machinery in Grenada / Melville Street
EQUIPMENT LAYOUT PLAN


ST. GEORGES BAY
NEW MACHINE BUILDING
NEW EVAPORATIVE CONDENSER
IMPROVEMENT OF CHILLED/COLD & ICE MAKING EQUIPMENT
INSTALLATION OF NEW FENCE
DEMOLITION OF EXISTING FENCE
STEEL SETFENCE
OUTDOOR PARKING
PLANTER BOX
MELVILLE STREET
SITE PLAN S:1/300
SSC
The Project for Improvement of Fishery Equipment and Machinery in Grenada / Melville Street
SITE PLAN

Annex 3: Government owned fish markets revenue rates

	MELVILLE STREET		GOUYAVE		VICTORIA		WALTHAM		DUQUESNE		SAUTEURS		GRENVILLE	
	COST (EC$)	UNIT	COST (EC$)	UNIT	COST (EC$)	UNIT	COST (EC$)	UNIT	COST (EC$)	UNIT	COST (EC$)	UNIT	COST (EC$)	UNIT
ICE SOLD (VENDORS)	$ 0.20	PER LB	$ 0.20	PER LB							$ 8.00	PER BUCKET	$ 0.20	PER LB
ICE SOLD (PUBLIC)	$ 0.30	PER LB	$ 0.30	PER LB							$ 10.00	PER BUCKET	$ 0.30	PER LB
FISH LANDING FEES	$ 0.10	PER LB	$ 0.15	PER LB	$ 0.10	PER LB	$ 0.10	PER LB	$ 0.10	PER LB	$ 0.05	PER LB	$ 0.05	PER LB
STALL RENT (REGULAR VENDORS)	$ 20.00	DAILY	$ 15.00	DAILY	$ 5.00	DAILY	$ 5.00	DAILY	$ 5.00	DAILY	$ 5.00	DAILY	$ 20.00	DAILY
STALL RENT (OFF & ON VENDORS)	$ 0.10	PER LB												
FISH COLD STORAGE	$ 0.10	PER LB	$ 0.20	PER LB	$ 0.10	PER LB	$ 0.10	PER LB	$ 0.10	PER LB	$ 0.10	PER LB	$ 0.10	PER LB
BAIT COLD STORAGE														
LOCKER RENT	$ 20.00	MONTHLY	$ 20.00	MONTHLY	$ 20.00	MONTHLY	$ 20.00	MONTHLY	$ 20.00	MONTHLY			$ 25.00	MONTHLY
CAR PARK (MONTHLY)	$ 75.00	MONTHLY												
CAR PARK (DAILY)	$ 5.00	DAILY												
WASHROOM													$ 1.00	PER USE
MACHINE ROOM													$ 500.00	MONTHLY
CURRENT USAGE (UTILITIES)	CONTRIBUTION		$ 20.00	DAILY							CONTRIBUTION		$ 20.00	PER DAY
BIN RENT	$ 30.00	WEEKLY									$ 10.00	DAILY		
CONFERENCE ROOM														
CLEANER RENT	$ 10.00	DAILY	$ 10.00	DAILY									$ 10.00	DAILY
WATER USAGE (UTILITIES)	$ 0.25	PER GAL	$ 20.00	DAILY									$ 1.00	PER BUCKET