

**ECONOMIC AND TRADE ASPECTS OF  
FISHERIES AND COASTAL AND MARINE  
ENVIRONMENTAL SERVICES SECTORS  
IN BARBADOS**

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## Acronyms and abbreviations

AHS	Effectively applied (tariff)
BFD	Barbados Fisheries Division
BARNUFO	Barbados National Union of Fisherfolk Organisations
BoP	Balance of payments
CARICOM	Caribbean Community
CARIFORUM	Caribbean Forum
CRFM	Caribbean Regional Fisheries Mechanism
CPC	Central Product Classification
CZMU	Coastal Zone Management Unit [Barbados]
DOALOS	Division for Ocean Affairs and the Law of the Sea
EEZ	Exclusive economic zone
EPA	Economic Partnership Agreement
FAC	Fisheries Advisory Committee [Barbados]
FTA	Free trade agreement
GATS	General Agreement on Trade in Services
GDP	Gross domestic product
MFN	Most-favoured-nation (tariff)
ICCAT	International Commission for the Conservation of Atlantic Tunas
MMABE	Ministry of Maritime Affairs and the Blue Economy [Barbados]
MSY	Maximum sustainable yield
NTM	Non-tariff measure
OECD	Organisation for Economic Co-operation and Development
SPS	Sanitary and phytosanitary measures
TBT	Technical barrier to trade
UNCLOS	United Nations Convention on the Law of the Sea
UNFSA	United Nations Fish Stocks Agreement
UNCTAD	United Nations Conference on Trade and Development
WTO	World Trade Organization

### Note

Reference to “dollar” and “\$” indicate United States dollars, unless otherwise stated. BBD means Barbados dollars. Use of a dash (–) between dates representing years, e.g. 2015–2017, signifies the full period involved, including the initial and final years. Data, decimals and percentages are rounded off, sometimes altering real totals.

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## 1. OVERVIEW

### 1.1. Introduction

The project “Evidence-based and policy coherent Oceans Economy and Trade Strategies” aims to support developing countries such as Barbados in realizing trade and economic benefits from the sustainable use of their marine resources within the framework of the 1982 United Nations Convention on the Law of the Sea (UNCLOS). This document presents detailed sectoral information on four ocean sectors in Barbados to facilitate the identification and informed selection of key sectors to be considered for the next phase of the project.

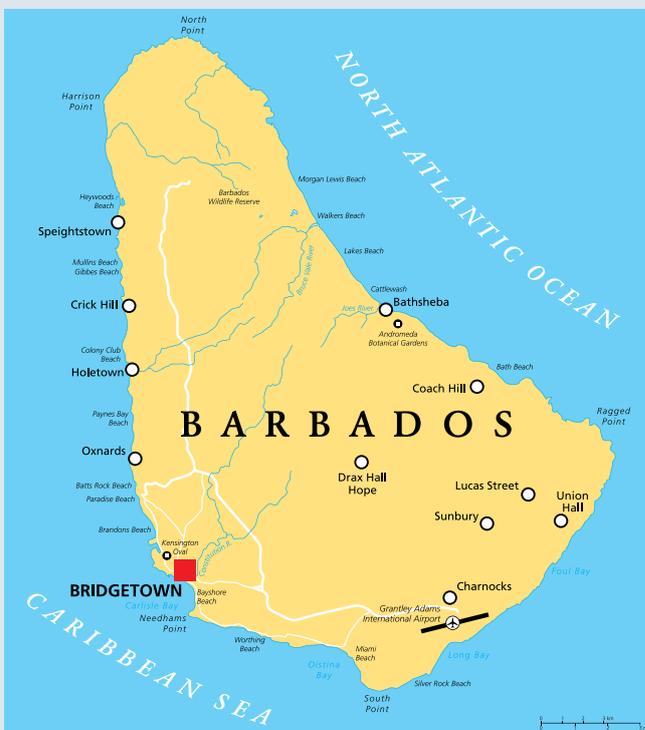
### 1.2. At a glance: Barbados fisheries and coastal and marine environmental services sectors

Previously, the now defunct Ministry of Agriculture, Food, Fisheries and Water Resource Management (MAFFW) of Barbados had primary responsibility for

fisheries. Over the years, the country’s economic and environmental challenges, and the emergence of new and more potent threats related to climate change have made policy and regulatory changes more compelling. Barbados turned to the immense potential of its maritime space in providing opportunities that can be sustainably used to advance the economic interest of the country while at the same time protecting the environment. In 2018, the Ministry of Maritime Affairs and the Blue Economy (MMABE) was created with a view to consolidate the government’s approach in prioritizing the strategic and sustainable use of its EEZ (Humphrey, 2018) including, inter alia, managing the fisheries sector through the Barbados Fisheries Division (BFD). The MMABE Minister deals with issues such as management and technical measures for the fisheries sector of Barbados, legislation, vessel and fisher registration systems among other things through the advice of the Fisheries Advisory Committee (FAC), a formal, national multistakeholder body established by the CARICOM Member States in the eastern Caribbean.

The Fisheries Act, 1993 (Cap 391) and the Fisheries

**Box 1: Barbados political map**



Source: Photo Credit: © Adobe Stock/ Peter Hermes Furian<sup>1</sup>

Barbados is the eastern most Caribbean island surrounded by a very high exclusive economic zone (EEZ) to land territory ratio of 434:1.

The local fishing industry is one of an open access, multi-species, multi-gear nature (FAO, 2016).

It is comprised of six main fisheries:

- shallow shelf reef,
- deep slope,
- coastal pelagic,
- large pelagic,
- flying fish, and
- sea urchins.

Lobsters and conchs are of minimal importance and a fishing moratorium has been in effect for the sea turtle capture since 1998. In recent years, the sea urchin (sea egg) fishery has operated under a semi-permanent closed season.

(Management) Regulations, 1998 are the key legal authorities for the management and development of fisheries in the waters of Barbados. Updated draft management plans and draft fisheries policy which prescribes the development and implementation of individual fishery management plans for each fishery are currently under review.

At the industry level, the promotion of sustainable fisheries, proper governance, fisherfolk development and sanitary and phytosanitary standards are promoted by the Barbados National Union of Fisherfolk Organisations (BARNUFO).<sup>2</sup> As the umbrella fishing industry organization established in 1999, it serves as an alliance platform for the primary members which include five fisherfolk associations as well as two boat owners' associations, some members of which are presently inactive.

### 1.3. Fisheries sector

Fish and seafood are one of the most traded food items. Some 35 to 38 per cent of the world production enters international trade generating \$152 billion in 2017. Over 50 per cent of this trade originates in developing countries whose net trade income (export – import), valued at \$37 billion in 2013, is greater than the net income of most other agricultural commodities combined (UNCTAD-FAO-UNEP, 2018). CARICOM exports of fish and seafood have been estimated at \$400 million with a potential to get a bigger piece of the global export share, if appropriate food safety measures were put in place. (Jamaica Observer, 29 May 2016).

The word “fishery” may refer to the occupation, industry, or season for catching fish. It may also refer to the area of ocean where fish are caught, or the business of catching the fish. Generally, fishery is an activity leading to harvesting of fish. It may involve capture of wild fish or raising of fish through aquaculture (NOAA Fisheries Glossary, 2006<sup>3</sup>). For the purposes of this document, marine fisheries do not cover inland or lakes fishing.

There is no internationally agreed definition of “sustainable fisheries”. One common understanding of this term refers to fishing activities that can be continued on a sustained or indefinite basis due to the renewable nature of the resource. On an institutional basis, ‘sustainable fisheries’ can be perceived to be fishing practices and actions that follow, and effectively apply, relevant international agreements, guidelines

#### Box 2: Barbados economic overview

Shelf area:  
320 km<sup>2</sup>

Coastline:  
95 km

Territorial land/EEZ ratio:  
1/434

Marine water area (including EEZ):  
estimated between 183'500 - 187'500 km<sup>2</sup>

GDP at current price:  
\$4.355 billion

GDP per capita:  
\$14,300

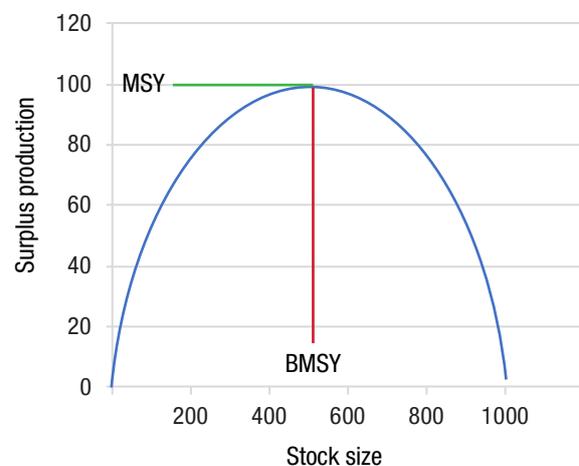
Agriculture value added:  
\$ 5.8 per cent of GDP

Fisheries value added:  
\$ 8 per cent of agriculture GDP

Source: FMP, Barbados Economic and Social Report, 2017

and best practices agreed.<sup>4</sup> A more methodological approach refers to the application of the maximum sustainable yield (MSY) that integrates economic and social considerations (Figure 1). The United Nations Fish Stock Agreement (UNFSA), 1995 prescribes its States Parties to establish limit reference points within the context of Articles 61 (3) and 119 (1)(a) of UNCLOS, 1982 that ensure “proper conservation

**Figure 1: The maximum sustainable yield (MSY) concept based on Schaefer model of surplus production as a function of stock size**



Source: FAO, 2002

and management measures to maintain or restore harvested species” at levels based on MSY and best scientific evidence<sup>5</sup> available to them.

### 1.3.1. Seafood processing

Seafood processing refers to the activity that occurs post-harvest but pre-purchase, more specifically, the creation of value-added goods from aquatic life. Processing is the receiving and preparation of fish, including, but not limited to, cleaning, cooking, canning, smoking, salting, drying, or freezing (FAO, 2016).

Several seafood processing facilities which produce a variety of products for export and local consumption exist across the island. Despite this, specific information on domestic production is unavailable and when it exists, is limited and aggregated with other types of processed food (see Section 2, Marine Fisheries and Seafood Processing Sectors and Figure 14, Section 2.6.2).

### 1.3.2. Landings, licenses and fleets

Fish landings are defined as the catches of marine fish landed in foreign or domestic ports. Marine capture fisheries landings are subject to changes in market demand and prices as well as the need to rebuild stocks to MSY levels in order to achieve long-term sustainable use of marine resources (OECD, n.d.).

For the purpose of this document, the reported annual landings from FAO FishStat<sup>6</sup> will be used. It must be noted that these reported landings and those presented by BFD may vary due to different adjustments/conversions being made.<sup>7</sup>

The vast majority of fish production in Barbados originates from marine fisheries, with landings ranging from 1.4 (thousand tons) to 3.2 (thousand tons) over the period 2000–2016.

Estimates (BFD, 2004) indicate that 53 per cent of all fish landed is distributed by vendors (already cleaned) and 30 per cent via the processor (purchases made directly from boats or otherwise imports raw products), while nine per cent is purchased either directly from boat (whole) or vendor (cleaned) and two per cent of whole fish is purchased from the landing site by the hospitality sector (hotels, restaurant and other places of business). The remaining six per cent is utilised by exporters (large fish such as tuna and sword fish) and catches from long line vessels are mainly found here.

Per data gathered on harvest sector by the authors

from the fisheries management plan of Barbados from 2004 to 2006, there are over a thousand registered fishing vessels in the commercial capture fisheries sector (BFD, 2004). There are approximately 30 fish landing sites around the island, categorized according to type of physical infrastructure and facilities as primary (markets), secondary (sheds) and tertiary (beaches). The majority of catches are landed at the primary sites and are often sold by the boat captain or owner directly to fish vendors (predominantly women), processors and consumers. The primary fish landing sites are at Bridgetown, Oistins, Consett Bay, Paynes Bay, Weston and Speightstown (BFD, 2004).

## 1.4. Coastal and marine environmental services sector

The coastal and marine environment includes biologically diverse ecosystems such as coral reefs and mangroves that provide a range of goods and services such as seafood, coastline protection, and production by coral reefs and tourism (Moore et al. 2014).

### Sustainable tourism

*Sustainable tourism refers to tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment and host communities (UNWTO-UNEP, 2005).*

Ecosystem services sustain biodiversity and produce goods and services. As processes, they provide conditions and species interactions within a naturally functioning ecosystem that support human life and societies. As services, they benefit humans (Alcamo et al., 2003) through products such as food and water, regulation of flood and control of disease outbreaks, cultural services, such as spiritual and cultural benefits; and supporting services, such as nutrient cycling or waste degradation, that maintain the conditions for life on Earth (Adapted from FAO and based on Alcamo et al. 2003).

While ecosystem services are essential to sustain life and have huge economic value, many of them are not tradable per se but only become so when they take the form of raw materials or goods derived from them

### Box 3: What is sustainable aquaculture?

Although no internationally agreed definition exists, there are soft law obligations on “responsible aquaculture” in the FAO’s Code of Conduct for Responsible Fisheries that can provide detailed guidance based on the development of the ecological, economic and social development pillars. Some of the key aspects of a responsible aquaculture development according to the Code of Conduct include:

- a. Existence of an appropriate legal and administrative framework. In this regard, States should protect transboundary aquatic ecosystems by supporting responsible aquaculture practices within their national jurisdiction and by cooperation;
- b. Availability of an advanced evaluation of the effects of aquaculture development on genetic diversity and ecosystem integrity, based on the best available scientific information;
- c. Development of strategies and plans, as required, to ensure that the activity is ecologically sustainable and to allow the rational use of resources shared;
- d. Ensure that the livelihoods of local communities, and their access to fishing grounds, are not negatively affected by aquaculture developments;
- e. Set appropriate mechanisms, when required, to monitor the impacts of inputs used in aquaculture. Moreover, States should establish effective procedures specific to aquaculture to undertake appropriate environmental assessment and monitoring with the aim of minimizing adverse ecological changes and related economic and social consequences resulting from water extraction, land use, discharge of effluents, use of drugs and chemicals, and other aquaculture activities; and
- f. Introduce appropriate mechanisms, such as databases and information networks to collect, share and disseminate data related to their aquaculture activities.

The above points are adapted from Articles 9 and 10 of the FAO Code of Conduct for Responsible Fisheries, 1995.

(e.g. harvested fish or extracted corals) or services activities based on those services (e.g. tourism and recreation services).

In this document, the focus will be on “tradable environmental services” (environmental activities performed on someone’s behalf for a price) and not on ecosystem services (natural capital). While the environmental services build on the existence of healthy ecosystem services, the former also contribute to sustainable use, management and restoration of the later through human intervention.

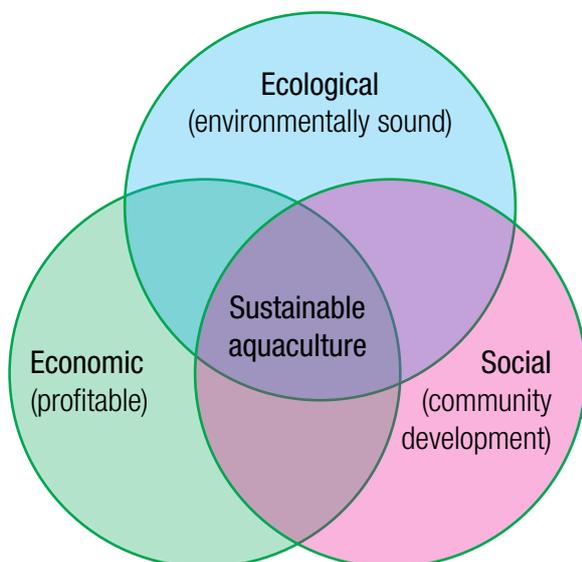
## 1.5. Aquaculture sector

Aquaculture is the farming of aquatic organisms, such as fish, molluscs, crustaceans and aquatic plants (FAO, 1998). Farming implies some form of intervention in the rearing process to enhance production, as well as individual or corporate ownership of the stock being cultivated in the planning, development and operation of aquaculture systems, sites, facilities and practices, and the production and transport (FAO World Fisheries and Aquaculture Atlas, 2003).

In the case of Barbados, production remains extremely limited. The strong domestic demand has yet to create strong incentives to scale up aquaculture production and constraints are strong along several crucial dimensions – one of which is sustainability which needs to be considered as a major challenge. Aquaculture could be a water, land and feeds (e.g. fishmeal) intensive industry and requires labour and ecosystem services as primary inputs, which threaten sustainability if not undertaken responsibly. In addition, competing property interests which highlight the lack of land against the backdrop of a growing population<sup>8</sup> may also be a hindering factor for the development a large-scale aquaculture sector.

Sustainable aquaculture should be interpreted as a dynamic concept. Although there is no internationally agreed definition, it should be based on an integrated approach encompassing ecological, economic and social aspects of development as shown in Figure 2. White et al. (2004), recommended that sustainable aquaculture should in practice:

- Have in place a setting, methodology, and practices that do not create significant disruptions to the

**Figure 2: Sustainable aquaculture and its components**

ecosystem, cause the loss of biodiversity, or lead to substantial pollution;

- Should yield sufficient food with little costs, little energy consumption, and little risks for the facility, fish, the environment, and the general population;
- Address the needs of the community in a socially responsible manner.

#### **1.5.1. Geographical and historical context**

There is currently no mariculture being practiced in Barbados but there are limited inland aquaculture production operations with a number of private individuals carrying out small-scale freshwater culture.

Like many other countries within the Lesser Antilles of the Caribbean, aquaculture development in Barbados is constrained by the following major factors: (1) limited availability of physical resources such as land, freshwater and soil suitability; (2) suitable coastal

areas for both freshwater aquaculture and mariculture operations; and (3) competition for limited space particularly with tourism related activities.

#### **1.5.2. Historical overview of aquaculture development in Barbados**

Before 2000, there were a few attempts at aquaculture production such as an inland government pilot tilapia farming project, a small-scale freshwater culture carried out by private individuals which carried out activities such as: rearing of dolphinfish, from both imported and captured local dolphinfish to spawn; and rearing of red drum using imported cultured eggs from the island of Martinique. The Greenland pilot tilapia farm was set-up by the BFD with support from USAID in the early 1980s to rear the Nile tilapia, *Oreochromis niloticus*. The idea was to assist interested farmers to start their own operation but the project was closed in 1989 due to inadequate water supply, frequent fish thefts and poor commitment of the participants to the management of the project.

Since 2000, inland aquaculture has been slightly more successful with tilapia being reared from 2006–2015 at an inland location which has also unfortunately ceased due to the owner having to give back the land. There are currently three privately-owned and operated farms in Barbados that produce and sell fish crop, one being a commercial tilapia production, while the other two are aquaponics farms, growing a mixture of vegetables alongside tilapia, red-bellied pacu and koi.

There have also been relatively successful private and government (BFD) marine aquaculture attempts to culture *Gracilaria* seaweeds (*Gracilaria spp.*), locally known as “seamoss”, which was imported from St. Lucia (by a private sector individual). However, operations ceased due to theft and lack of interest by fisherfolk.

## 2. MARINE FISHERIES AND SEAFOOD PROCESSING SECTORS

### 2.1. Introduction

Fish and seafood are one of the most traded food commodities in the world. Some 35 to 38 per cent of the world production enters international trade generating \$152 billion in 2017. Over 50 per cent of this trade originates in developing countries whose net trade income (export–import), valued at \$37 billion in 2013, is greater than the net income of most other agricultural commodities combined (UNCTAD-FAO-UNEP 2018). Caribbean Community (CARICOM) exports of fish and seafood have an estimated value of \$400 million with a potential for additional \$130 million if appropriate food safety measures were in place (Jamaica Observer, May 29, 2016).

Marine fisheries and seafood processing closely relate to each other. Fish as well as other marine species are direct inputs for the seafood value chains which transforms them in a great variety of consumer goods. However, links may not necessarily exist based on domestic fish production exclusively. Imports may also play an important role in framing their relationship.

Upstream and downstream activities along the fish and seafood value chain provide significant employment and economic benefits to countries and local coastal communities. In 2016, around 59.6 million people were employed in fisheries and aquaculture and some 200 million direct and indirect employment opportunities occur along the fish and seafood value chain (UNCTAD-FAO-UNEP 2018). The number of persons employed in direct production in commercial marine capture fisheries and aquaculture sub-sectors in the Caribbean Regional Fisheries Mechanism (CRFM) region in 2013 was approximately 116,265

persons—97.5 per cent of whom were employed in direct production in the marine capture fisheries and 2.5 per cent in direct production in aquaculture. The total number of persons employed in the CRFM region fisheries sector was estimated at 341,668 in 2013/2014 which was approximately 4.3 per cent of the workforce of the region.

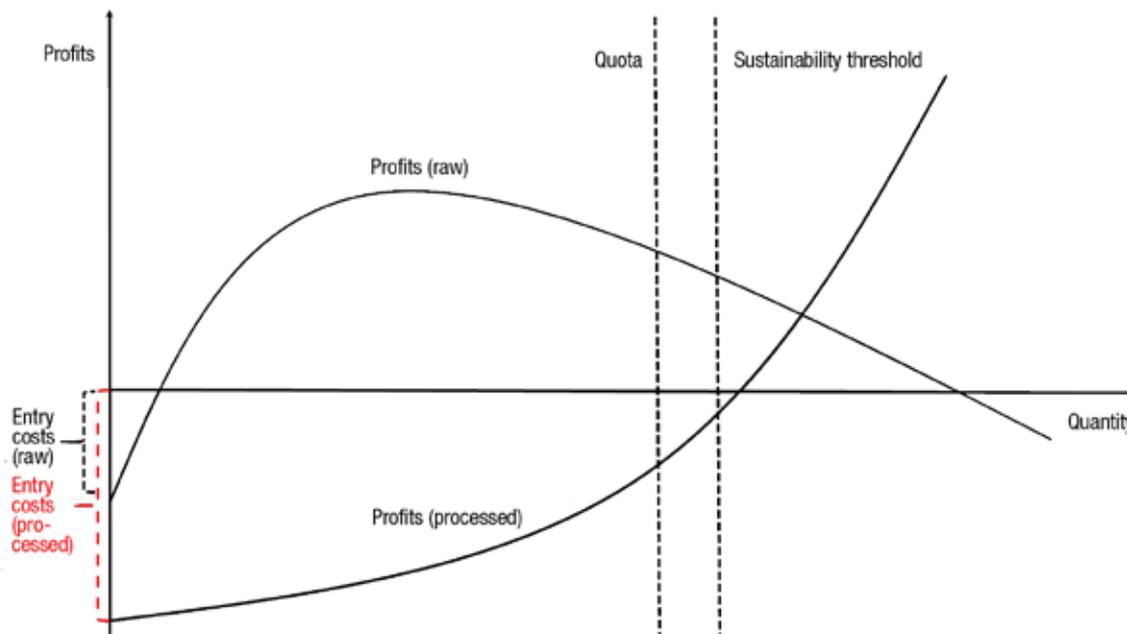
An important aspect of the seafood value chains is that it uses inputs from both the fisheries extractive sector and the aquaculture one to develop intermediate and consumer products. The seafood value chain can be disaggregated in the following activities: (i) harvesting: catching, cleaning, sorting, grading, and weighing; (ii) landing: cold storage, and icing, distribution to manufacturing point; (iii) cleaning: de-heading, slime removal, and meat/bone separation, and discarding waste; (iv) processing: salting, canning, packaging, branding; and (v) services and marketing: certification, transportation, marketing, wholesaling, and retailing (Figure 3). Post harvesting is the manufacturing sector related to the phase onwards and includes cleaning, processing, services and marketing. At each stage of the seafood value chain, added value is expressed in terms of sale prices at landing, transportation fees, marketing fees, wholesale margins, retailer margins, profits by different intermediaries, final consumer prices, and taxes levied at various stages of the process.

Although value addition is generated by the transformation of the raw product into a more processed product, the price per unit of weight of the raw product may be lower when processed than when sold in its raw form as a fresh/chilled product. Production costs are expected to be larger for processed products as they may require costly technology and specific inputs such as aluminum in the case of canned products. Distribution and transportation costs however may be much higher for fresh and chilled products characterized by extremely constraining storage requisites. Based on this set of basic considerations

**Figure 3: A simplified representation of the seafood value chain**



Source: UNCTAD-FAO-UNEP, 2018.

**Figure 4: Profit trajectory of raw and processed fish products**

Source: UNCTAD-UNDOALOS, 2018.

that would necessarily require refinement, a very rough conjecture would suggest that the profitability of raw production relative to that of processed production varies with the level of production itself. In other words, small production levels may make raw products more profitable while higher levels may make processed products more profitable. A hypothetical situation is represented in Figure 4. The evolution of profits for raw products (fresh or chilled) aims to reflect the fact that transportation of larger quantities of fresh or chilled products may become more expensive as more distant markets have to be reached. Moreover, the cost of infrastructure to preserve the freshness of the products may increase non-linearly with the quantity to be stored. The evolution of prepared products profits reflects the possible existence of increasing returns to scale. As the size of the plant increases, the average cost of production falls and overall profits increase proportionally more. The level of capture could be constrained by either a quota or some sustainability threshold. In Figure 4, they are both located to the left of the crossing point of the two profit curves. This configuration would suggest that producing essentially raw products (everything else remaining the same) is a better strategy at least from a static point of view. The graph can be re-interpreted at different level of aggregation (i.e. plant, firm, cooperative, regional, national, international).

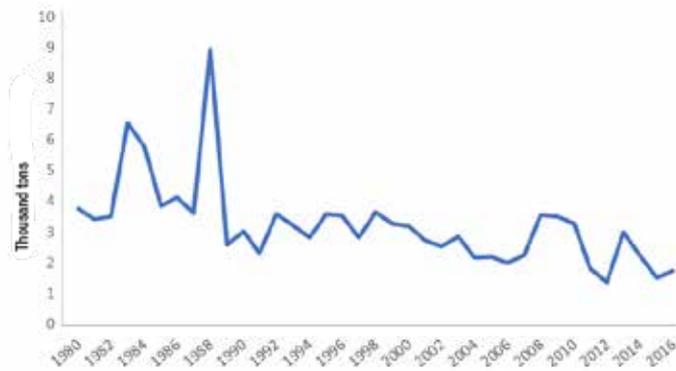
Figure 4 may be over simplistic but could be used as a basis for conceptualizing sectoral development strategies.

## 2.2. Barbados fisheries–sector analysis

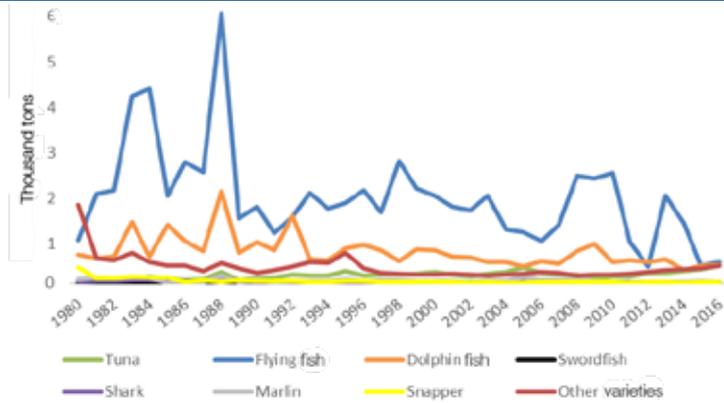
In 2016, within the traded sector, the contribution of non-sugar agriculture and fisheries to real GDP was estimated to be \$19.8 million, an annual increase of 0.5 per cent (Barbados Economic and Social Report, 2017). Percentage contribution to GDP by the fishing industry is estimated at 0.15 per cent. In 2016, the value of marine capture fish production was \$7,910,852.

The contribution of fishing to the Barbados Gross Domestic Product (GDP) is currently undervalued and is usually cited as ranging between \$12-16 million per annum. In terms of overall value, flying fish and dolphinfish account for more than 80 per cent of the total value of fisheries. The GDP for agriculture and fishing industry for 2017 was BBD 129.3 million (at current market prices) and BBD 105.5 million (using constant 2010 prices). Per capita GDP was BBD 28.6 thousand (Barbados Ministry of Finance and Economic Affairs, 2017). Total value added at basic prices: BBD 8.5 billion and GDP at market prices: BBD 10 billion (Barbados Statistical Service, 2017). Seafood processing<sup>9</sup> directly occupies approximately

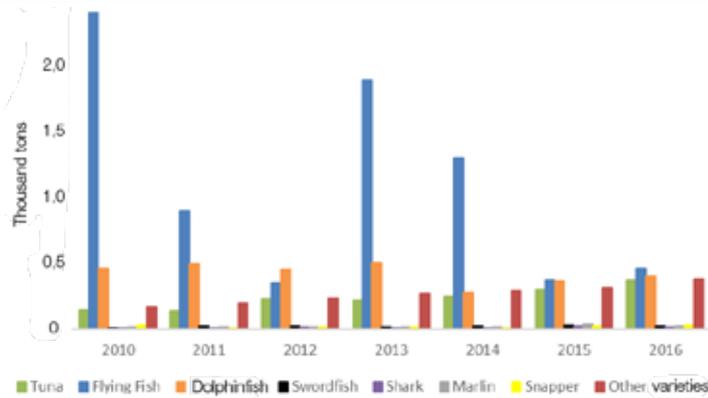
**Figure 5: Total capture production for Barbados, 1980–2016**



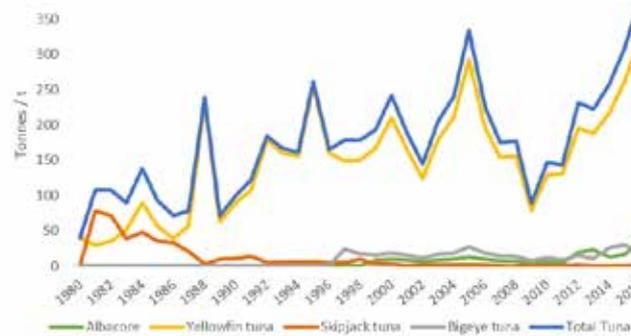
**Figure 6: Fish landings by species for Barbados, 1980–2016**



**Figure 7: Fish landings by species for Barbados, 2010–2016**



**Figure 8: Tuna landings for Barbados, 1980–2016**



Source: FAO FishStatJ, 2018.

six per cent of total contribution of the fishing industry. Processing and export of fish and fish products accounts for two per cent of total use of fish.

## 2.3. Production

### 2.3.1. Species composition

In 2016, while flying fish remained the major contributor to the island's fish catch, it has shown some level of decline. Among the large pelagic species, catches of dolphinfish increased from 2015 to 2016 but are still below the average annual catch reported over the past ten-year period (Figures 6 and 7).

The recorded landings of tunas showed an increase from 309 tons in 2015 to 383 tons in 2016 (Figure 8). Most of these were comprised of yellowfin tuna while other tuna species landings appeared to be marginal. However, skipjack has recorded an increase in landings over the past two years.

Landings for most species have remained relatively stable over the past five-year period with slight fluctuations. Of worthy note is the increase in almaco jacks (local name: amber fish) observed during the periods of sargassum seaweed influx.

### 2.3.2. Seafood processing

Seafood processing occurs at several sites across the island including at Lashley and Waithe, Morgan's Fish House, Shorelinez, Atlantis Sea Food Inc. and Ocean Fisheries being some of the more common seafood processing facilities producing products for both export and domestic consumption such as fish burgers and fingers. There is an interesting variety of seafood processed products in Barbados including those that are frozen, filleted, fish fingers, sausages, and hamburgers among others.

Unfortunately, there is no readily available and comprehensive information about domestic production. International data sources such as UNIDO datasets on manufacture production are not based on a classification disaggregated enough to isolate seafood production from other type of processed food. The only figures that could be related to production will be export figures discussed in 2.6.2.

### 2.3.3. Fisheries services

The current fishing fleet consists of over a thousand registered vessels including four main types of vessels: moses, day boats, ice boats and longliners with all boat types increasing in numbers over the past five years.

There appears to be potential expansion in the wooden boat building and repair area. However, this may require development of infrastructure in boatyards which are not only in need of upgrade but also maintenance. Repair and expansion of the current port infrastructure could lead to a larger supply of incidental fisheries services such as repairs and maintenance and improvements in the capacity and security of the fleet and crews.

## 2.4. Socioeconomic context

### 2.4.1. Employment

Employment in the fisheries sector has remained relatively stable over the last few years.

An estimated total of 6,000 individuals are employed (directly and indirectly) in the fishing industry with 3,000 of these being active fishers (Barbados Fisheries Division, 2004). Approximately half of this total figure is officially registered and is therefore captured in the Fisheries Information System (FIS) database held at the BFD. An estimate conducted by CRFM in 2013 stated that employment was closer to 8,800 or 6.2 per cent of the labour force (CRFM, 2014a). It appears figures have not changed much over time.

Flying fish account for a large percentage of the production of the processing plants. The fishery sector is economically important with over 2,000 fishermen and 500 vendors seasonally employed in the sector. In addition, over 200 persons are employed as scalers or deboners at fish markets and approximately 125 are employed at fish processing plants. A significant share of the vendors and employees in processing plants are women.

The harvest sector is made up of fishers and boat owners. Fishers make up 63 per cent of the harvest sector and boat owners 37 per cent. Overall, 78 per cent of the primary stakeholders (including boat owners) are active fishers. The majority of fishermen and boat owners are males. Ninety-nine per cent of fishermen and 91 per cent of boat owners are also males. Recently, the post-harvest sector has grown, attracting both young women and men in considerable numbers. Vendors and fish deboners make up the majority of the primary post-harvest stakeholders (37 per cent and 39 per cent, respectively).

### 2.4.2. Earnings/relative earnings

Historically, there appeared to be a trend on the income earning ability placing processors over vendors, boat

owners and fishers in that order (McConney, P., et al., 2003).

Fish catches are typically sold by the boat captain, owner or an agent directly to consumers or to fish vendors and processors. From recent informal discussions in the island's primary fish market, some vendors stated that they make approximately \$1,000 in one working day during the pelagic season and some captains could come home with a maximum of \$5,000 in one 14-day trip on a longline vessel. For individuals that undertake two fishing trips per month for eight months, they can earn \$80,000.

In a three-part economic valuation of the fisheries of Barbados study for the longline fishery, total fleet profit (before wages are paid) varied substantially from year to year, ranging from just over \$200,000 in 2002 to nearly \$1.6 million in 2005. Profit after payment of wages varied from just over \$70,000 (in 2002) to well over \$700,000 per year (in 2005). Average profit earned per trip follows a similar pattern, ranging from roughly \$2,000 to over \$6,000 respectively (Schumann et al 2010; Schuhmann et al. 2008).

For the trap fishery, annual gross fleet revenues likely range between \$389,883 and \$748,575. Total net income earned by all fish trap vessel owners can be between \$47,386 and \$125,662, while total crew net incomes are between \$262,421 and \$528,591 per year. A vessel deploying nine traps operating six months (26 weeks) per year making two trips per week, can therefore be expected to earn between \$6,498 and \$11,696 per year. Vessels operating year-round would earn roughly double that amount, or up to \$23,393. (Schuhmann et al., 2008).

Assuming the vessel and crew each earn one-third share of net proceeds after variable costs, vessel profit per trip (crew income per trip) likely ranges between \$34 and \$45. Crew members on typical vessel fishing year-round, twice per week can be expected to earn between \$3,499 and \$4,699 per year from trap fishing. Nine-month fishers would earn between \$2,624 and \$3,524 annually.

The minimum wage in Barbados is BBD 6.25 per hour that is about \$3.1.<sup>10</sup>

### **2.4.3. Contribution to GDP**

In 2016, within the traded sector, the contribution of non – sugar agriculture and fisheries to real GDP was estimated to be \$19.8 million, an increase of 0.5 per cent from 2015 (Barbados Economic and Social

Report, 2017). Percentage contribution to GDP by the fishing industry is estimated at 0.15 per cent. In 2016, the value of marine capture fish production was \$7,910,852.

The contribution of fishing to the Barbados GDP is currently undervalued and is usually cited as ranging between \$6-8 million per annum. This is based on ex-vessel and retail prices collected at major markets. The value of fish from vessel to plate nor the market pathway is not taken into account for this calculation.

In a market pathway study conducted by Mahon et al. (2007), the total value of local fisheries was estimated at about \$25 million in 2006 (about 0.5 per cent of the GDP in 2006). This includes both the ex-vessel value (the value of landed raw fish) and the on-shore value-added components such as deboning, filleting and processing into fish fingers and other processed products. However, it does not include income generated by the sector nor the value of infrastructure in the fishery.

## **2.5. Ecological context**

### **2.5.1. Status of local fisheries**

There have been few stock assessments carried out locally for Barbados' fishery resources. The status of the commercially exploited fish stocks varies from a relative level of stability with some decline in the case of flying fish and dolphinfish, to overexploited in the case of sea eggs (a species of sea urchin). The status of a number of stocks is unknown (Barbados' Fisheries Sector Management and Development Policy Draft, forthcoming).

Much of the data collection includes collecting information on fishing effort and landings which is then used to estimate fisheries production. Catch per unit effort is calculated but there is not enough information to determine stock size or fishing mortality rates. However, there are local (e.g. sea eggs) and regional (e.g. flying fish and dolphin fish) stock assessments and monitoring work being conducted, for example, by the CRFM.

The sea egg fishery had about 2-week fishing season for October 2016 but was closed in both October 2017 and 2018. There appears to be a limited scope to increase capture production in the Barbados fishery sector. However, there is expansion potential for tunas and swordfish and potentially a small deep-sea crab fishery. However, research must be conducted on the deep-sea crab fishery (such as the Atlantic deep-sea

red crab and the Atlantic Golden crab) to determine if this could be sustainable.

Under the International Commission for the Conservation of Atlantic Tunas (ICCAT), of which Barbados is a contracting party, the allocated annual quotas for Barbados are: 45 tons for swordfish, 10 tons for white marlin, and the default catch limits are 10 tons for blue marlin, 200 tons for albacore (for 2017-2018) and 215 tons (for 2019-2020) and 3500 tons for bigeye tuna. There is no catch limit at present for yellowfin tuna. In most cases, there are calculations based on base years that allow underages and overages to be calculated.<sup>11</sup>

**2.5.2. Expansion potential of capture production**

Barbados is presently under the quota set by the International Commission for the Conservation of Atlantic Tunas (ICCAT) for tunas and swordfish. This provides the potential to increase production from tunas and swordfish without overfishing of stocks, destruction of their habitats or adversely affecting the other users of the marine space. In addition, it provides the opportunity to expand the trade in tunas and swordfish products and value-added products by developing existing markets and identifying new markets.

On the contrary, limited information exists on the deep-sea crab and squid fisheries. There is a need for preliminary assessment to determine the potential of developing a market and a sustainable minor fishery.

Both deep-sea crab and squid have the potential as inputs for seafood processed products.

**2.5.3. Losses/waste**

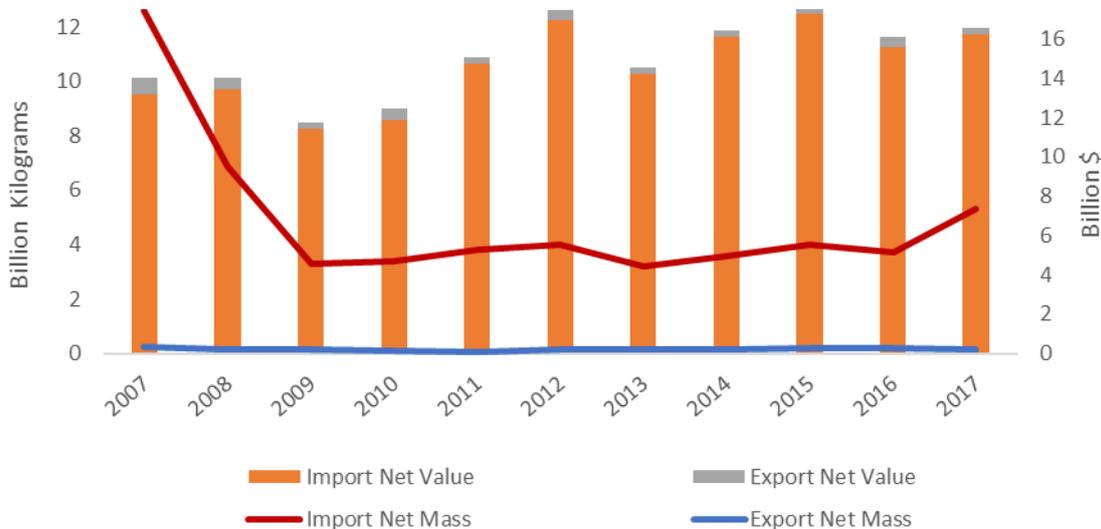
At the major market, the Bridgetown Fisheries Complex, approximately two to three tons of fish are discarded daily. This offal could be used to supply the poultry industry with feed (known as fodder), agribusiness with fertiliser or can be composted. At the time of writing, a rendering plant which collects and processes waste is having difficulty with its machinery.

**2.6. Trade**

Over the past years, imports of fish and fish products for Barbados (net mass and value) are increasing and exports are decreasing as shown in Figure 9. In 2017, Barbados imported fish and fishery products for a total value of \$16.2 million (BBD 32.4 million) and exported a total value at \$0.3 million (BBD 0.67 million) (Figure 9). Such patterns may be due to a combination of factors including a decline in overall catch, higher internal consumption as well as a high number of tourists consuming fish.

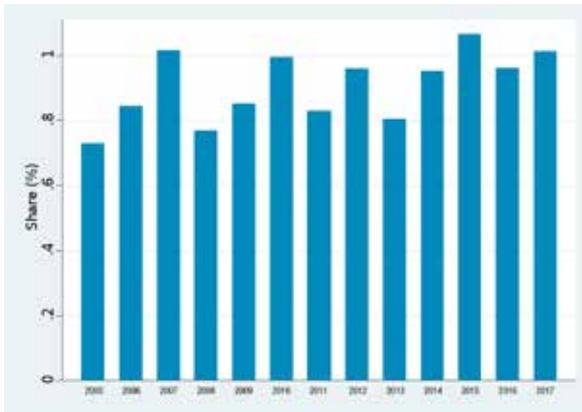
Fish is seen by Barbadians as a crucial source of proteins. Barbadians consume 5, 000 to 6,000 tons of fish annually, of which 3,000 tons are landed by Barbadian vessels. The total fish supply per capita has been estimated by the CRFM to be about 26 kilograms in 2016 assuming all fish imported are consumed by the local population.<sup>12</sup> This figure is only slightly above the regional average.

**Figure 9. Import and export weight and value for fish and fish products for Barbados, 2007–2017**



Source: Data provided to the author, Simpson. N. by Barbados Statistical Service, 2018.

**Figure 10: Fish and fisheries products imports share in total imports, 2005–2017**



Source: Extracted data from UN COMTRADE via WITS (Import declaration), 21 February 2019.

### 2.6.1. Imports

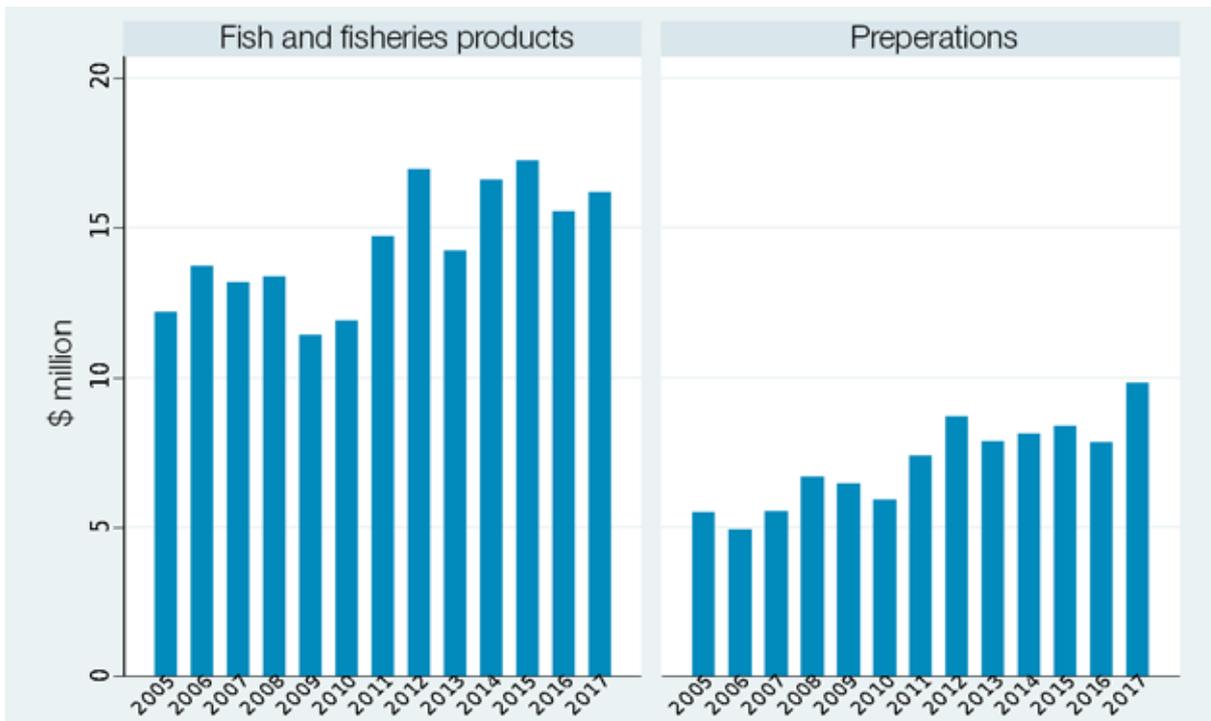
As mentioned, Barbados is a net importer of fisheries and fish products. Domestic consumption is relatively high and demand from the tourism industry may further increase internal pressure on such products. Most recent estimates (CRFM, 2016) indicate that about 86 per cent of internal consumptions are covered by imports. Nevertheless, imports of fish and

fisheries products represent about one per cent of total imports in Barbados as can be seen from Figure 10. This share has remained relatively stable during the last fifteen years. While this number could be considered negligible, the importance of food imports goes far beyond their value as they could significantly impact food security especially in confined territories such as Barbados.

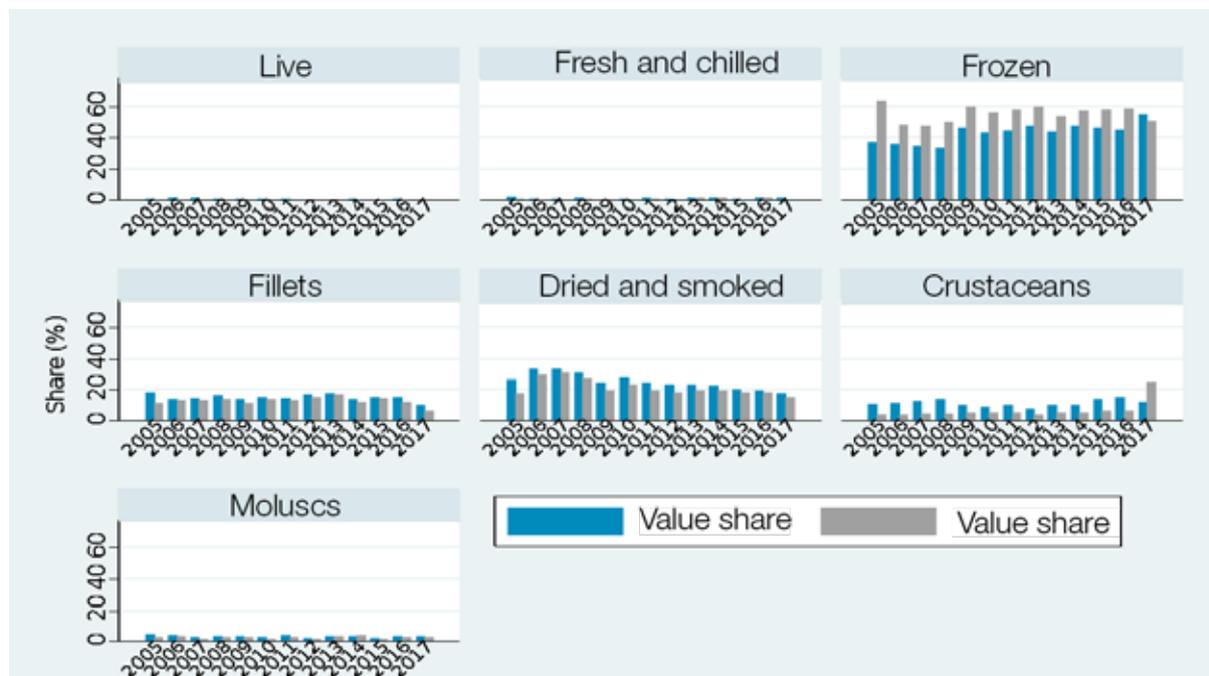
Figure 11 reports the value of imports of fish and fisheries products as well as that of preparations. During the last five years, imports of fish and fisheries products have oscillated between \$14 and \$17 million. The figure shows that the value of preparations either of fish or crustaceans represents on average about half of that recorded for imports of fish and fisheries products. This can only accentuate the dependency of the country on foreign products. In 2017, about 5,300 tons of fish and fisheries products and about 3,400 tons of prepared (processed) products were imported. The corresponding figures five years before were 4,000 tons and 2,100 tons respectively.

Figure 12 helps to easily identify the major category of imported products, namely frozen fishes followed by dried and smoked products and fillets. The ranking is verified both in terms of value and quantity. The value of imports of frozen fish is comparable to that

**Figure 11: Fish and fisheries products and preparations imports in value (million \$), 2005–2017**



Source: Extracted data from UN COMTRADE via WITS (Import declarations), 21 February 2019.

**Figure 12: Imports of fish products (HS 4-digit categories), 2005–2017**

Source: Extracted data from UN COMTRADE via WITS (Import declaration), 21 February 2019.

of preparations.

Tables 1 to 3 focus on the largest categories of products imported in Barbados shown in Figure 13 and identifies the most important exporter-product pairs within each of them. More precisely, the tables show countries whose export share in value is larger than one per cent (average during the 2013-2017 period) of Barbados fish imports in their respective category (4-digit in the HS 2002 classification). As the underlying classification is the HS 2002 version, several products are not specified (whereas use of HS classification in its 2017 version allows the analysis to become more precise). For instance, product code 0303.79 (Other fish, other) has been disaggregated into 15 different products (species) in the 2017 version. These species could be of different families: from tilapias, catfish and carps, to jack and horse mackerel, cobia and swordfish or rays and skates. These unspecified products are imported from Suriname (49 per cent overall on average during the 2013-2017 period of the category imports), Trinidad and Tobago, and Panama. The only specified species imported frozen is yellowfin tunas from Suriname, Trinidad and Tobago, and Panama.

As to fillets, the only possible distinction using the 2002 version of the HS classification is mostly between fresh or chilled and frozen. “Other” product refers to

frozen fillets of unspecified species in the HS 2002 version. Largest exporters of frozen fillets to Barbados are Guyana, China, Chile, Suriname and Viet Nam. As to fresh or chilled fillets, largest exporters are the United States, the United Kingdom of Great Britain and Northern Ireland, and Suriname.

Table 3 refers to Barbados’ imports of dried and smoked products. As in other categories of products, few species are identified in the 2002 version of the HS classification. Largest exporting countries are Canada, China, Norway. Unsurprisingly, Canada and Norway are the largest exporters of cod followed by the United Kingdom, China and the United States.

When looking at fish preparations imports (Table 4), these are essentially tunas, sardines, mackerel and salmon products. The Barbados market is dominated by Thailand (55 per cent overall), Canada (20 per cent overall) and the United States (13 per cent overall). From the region, only Costa Rica exports some tuna products.

As regards crustaceans preparations (Table 5), major exporters are the United States (33 per cent overall), Viet Nam and China. The three countries cover more than 50 per cent of total exports of crustacean preparations.

## 2.6.2. Exports

**Table 1: Major exporters of frozen fish to Barbados (average value and quantity), 2013–2017**

Code HS-2002	Country	Product description	Imports (\$)	Quantity (tons)	Share (%) in total product group value
0303.79	Suriname	Other	3.80E+06	1104.58	46
0303.79	Trinidad and Tobago	Other	935,677	220.69	11
0303.79	Panama	Other	741,882	257.28	9
0303.79	Organization of American States	Other	554,989	122.49	7
0303.79	Viet Nam	Other	364,105	151.98	4
0303.79	Fiji	Other	293,048	74.49	4
0303.42	Suriname	Yellowfin tunas ( <i>Thunnus albacares</i> )	249,861	102.92	3
0303.79	Guyana	Other	196,884	56.60	2
0303.79	Costa Rica	Other	125,500	20.00	2
0303.42	Trinidad and Tobago	Yellowfin tunas ( <i>Thunnus albacares</i> )	118,345	30.06	1
0303.79	Peru	Other	104,296	28.72	1
0303.79	Ghana	Other	99,982	50.16	1
0303.79	China	Other	70,668	26.03	1
0303.79	United States	Other	61,235	13.90	1
0303.79	Saint Vincent and the Grenadines	Other	56,242	16.90	1
0303.42	Panama	Yellowfin tunas ( <i>Thunnus albacares</i> )	45,580	15.03	1

Source: Extracted data from UN COMTRADE via WITS (Import declaration), 21 February 2019.

**Table 2: Major exporters of fillets to Barbados (average value and quantity), 2013–2017**

Code HS-2002	Country	Product description	Imports (\$)	Quantity (tons)	Share (%) in total product group value
0304.20	Guyana	Frozen fillets	371,851	91.26	15
0304.20	China	Frozen fillets	248,264	52.48	10
0304.20	Chile	Frozen fillets	231,859	17.75	9
0304.20	Suriname	Frozen fillets	174,587	54.75	7
0304.20	Viet Nam	Frozen fillets	167,351	52.37	7
0304.20	United States	Frozen fillets	133,976	23.98	5
0304.90	Viet Nam	Other	109,856	40.73	4
0304.10	United States	Fresh or chilled	102,259	13.98	4
0304.20	Trinidad and Tobago	Frozen fillets	88,165	23.73	4
0304.20	Organization of American States	Frozen fillets	87,477	12.92	4
0304.10	United Kingdom	Fresh or chilled	85,759	7.65	3
0304.10	Suriname	Fresh or chilled	77,151	17.95	3
0304.90	Guyana	Other	72,324	12.70	3
0304.20	Norway	Frozen fillets	70,696	6.37	3
0304.90	Trinidad and Tobago	Other	56,687	12.75	2
0304.90	Canada	Other	55,649	9.56	2
0304.90	United States	Other	49,075	9.14	2
0304.10	Trinidad and Tobago	Fresh or chilled	40,149	5.66	2
0304.90	China	Other	37,345	6.98	2
0304.10	Guyana	Fresh or chilled	34,744	6.05	1
0304.10	Norway	Fresh or chilled	26,731	2.89	1
0304.10	Viet Nam	Fresh or chilled	20,219	8.01	1

Source: Extracted data from UN COMTRADE via WITS (Import declaration), 21 February 2019.

**Table 3: Major exporters of dried and smoked products to Barbados (average value and quantity), 2013–2017**

Code HS-2002	Country	Product description	Imports (\$)	Quantity (tons)	Share (%) in total product group value
0305.59	Canada	Other	632,241	129.80	16
0305.30	China	Fish fillets, dried, salted or in brine	521,350	129.51	13
0305.59	Norway	Other	444,578	93.42	11
0305.30	Canada	Fish fillets, dried, salted or in brine	349,120	75.21	9
0305.51	Canada	Dried cod ( <i>Gadus morhua</i> , <i>Gadus ogac</i> , <i>Gadus macrocephalus</i> )	306,657	66.94	8
0305.59	China	Other	250,787	75.75	6
0305.51	Norway	Dried cod ( <i>Gadus morhua</i> , <i>Gadus ogac</i> , <i>Gadus macrocephalus</i> )	235,290	45.56	6
0305.41	United Kingdom	Pacific salmon, Atlantic salmon and Danube salmon	197,499	19.39	5
0305.59	Brazil	Other	132,352	28.00	3
0305.30	United Kingdom	Fish fillets, dried, salted or in brine	96,744	15.33	2
0305.59	United States	Other	92,125	31.14	2
0305.41	United States	Pacific salmon, Atlantic salmon and Danube salmon	89,230	11.49	2
0305.69	Canada	Other	83,359	21.48	2
0305.51	United Kingdom	Dried cod ( <i>Gadus morhua</i> , <i>Gadus ogac</i> , <i>Gadus macrocephalus</i> )	78,745	13.67	2
0305.51	China	Dried cod ( <i>Gadus morhua</i> , <i>Gadus ogac</i> , <i>Gadus macrocephalus</i> )	60,720	11.43	2
0305.42	Canada	Herrings ( <i>Clupea harengus</i> , <i>Clupea pallasii</i> )	55,175	22.80	1
0305.51	United States	Dried cod ( <i>Gadus morhua</i> , <i>Gadus ogac</i> , <i>Gadus macrocephalus</i> )	46,135	8.75	1
0305.62	United Kingdom	Salted cod ( <i>Gadus morhua</i> , <i>Gadus ogac</i> , <i>Gadus macrocephalus</i> )	25,806	4.02	1
0305.30	United States	Fish fillets, dried, salted or in brine	25,204	6.97	1

Source: Extracted data from UN COMTRADE via WITS (Import declarations), 21 February 2019.

**Table 4: Major exporters of fish preparations to Barbados (average value and quantity), 2013–2017**

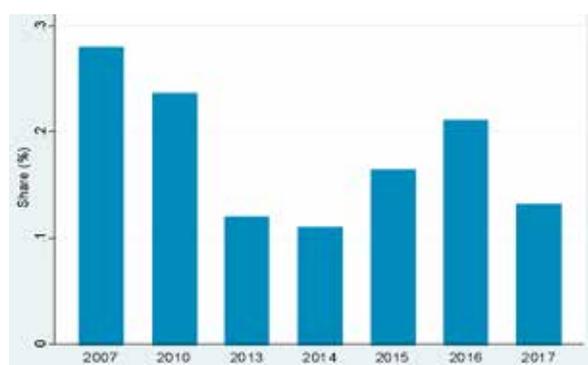
Code HS-2002	Country	Product description	Imports (\$)	Quantity (tons)	Share (%) in total product group value
1604.14	Thailand	Tunas, skipjack and bonito ( <i>Sarda</i> spp)	3.90E+06	992.73	49
1604.13	Canada	Sardines, sardinella and brisling or sprats	1.50E+06	353.73	19
1604.14	United States	Tunas, skipjack and bonito ( <i>Sarda</i> spp)	553,519	418.27	7
1604.15	Thailand	Mackerel	364,262	196.03	5
1604.11	United States	Salmon	349,306	73.49	4
1604.13	Thailand	Sardines, sardinella and brisling or sprats	182,734	54.99	2
1604.14	Costa Rica	Tunas, skipjack and bonito ( <i>Sarda</i> spp)	165,712	35.86	2
1604.19	United States	Other	101,258	10.44	1
1604.14	Canada	Tunas, skipjack and bonito ( <i>Sarda</i> spp)	90,736	18.98	1
1604.20	United States	Other prepared or preserved fish	72,537	14.69	1
1604.14	Philippines	Tunas, skipjack and bonito ( <i>Sarda</i> spp)	72,000	19.48	1
1604.15	Canada	Mackerel	70,506	32.24	1
1604.15	China	Mackerel	63,068	28.42	1
1604.15	Chile	Mackerel	56,255	23.42	1
1604.14	United Kingdom	Tunas, skipjack and bonito ( <i>Sarda</i> spp)	40,065	62.28	1

Source: Extracted data from UN COMTRADE via WITS (Import declarations), 21 February 2019.

**Table 5: Major exporters of crustacean preparations to Barbados (average value and quantity), 2013–2017**

Code HS-2002	Country	Product description	Imports (\$)	Quantity (tons)	Share (%) in total product group value
1605.10	United States	Crab	155,931	17.46	16
1605.20	United States	Shrimps and prawns	123,148	15.36	11
1605.20	Viet Nam	Shrimps and prawns	81,250	6.48	10
1605.90	United States	Other	75,849	14.01	6
1605.30	Grenada	Lobster	45,394	1.23	4
1605.40	United States	Other crustaceans	28,946	3.44	4
1605.20	China	Shrimps and prawns	27,052	2.80	3
1605.20	Thailand	Shrimps and prawns	26,043	3.35	2
1605.40	China	Other crustaceans	16,697	1.99	2
1605.30	United States	Lobster	13,099	1.06	2
1605.20	Indonesia	Shrimps and prawns	11,660	1.38	1
1605.20	India	Shrimps and prawns	11,024	1.25	1
1605.20	Canada	Shrimps and prawns	10,428	0.71	1
1605.10	St Vincent and the Grenadines	Crab	10,064	0.46	1
1605.30	St Vincent and the Grenadines	Lobster	9,657	0.26	1
1605.10	India	Crab	7,740	0.51	1
1605.10	Russia	Crab	7,570	0.72	1
1605.30	Bahamas	Lobster	7,471	0.17	1
1605.10	Korea	Crab	6,061	0.39	1
1605.20	Jamaica	Shrimps and prawns	5,249	0.63	1
1605.30	Jamaica	Lobster	4,817	1.12	1
1605.10	China	Crab	4,314	0.56	1
1605.20	European Union	Shrimps and prawns	4,160	0.16	1

Source: Extracted data from UN COMTRADE via WITS (Import declarations), 21 February 2019.

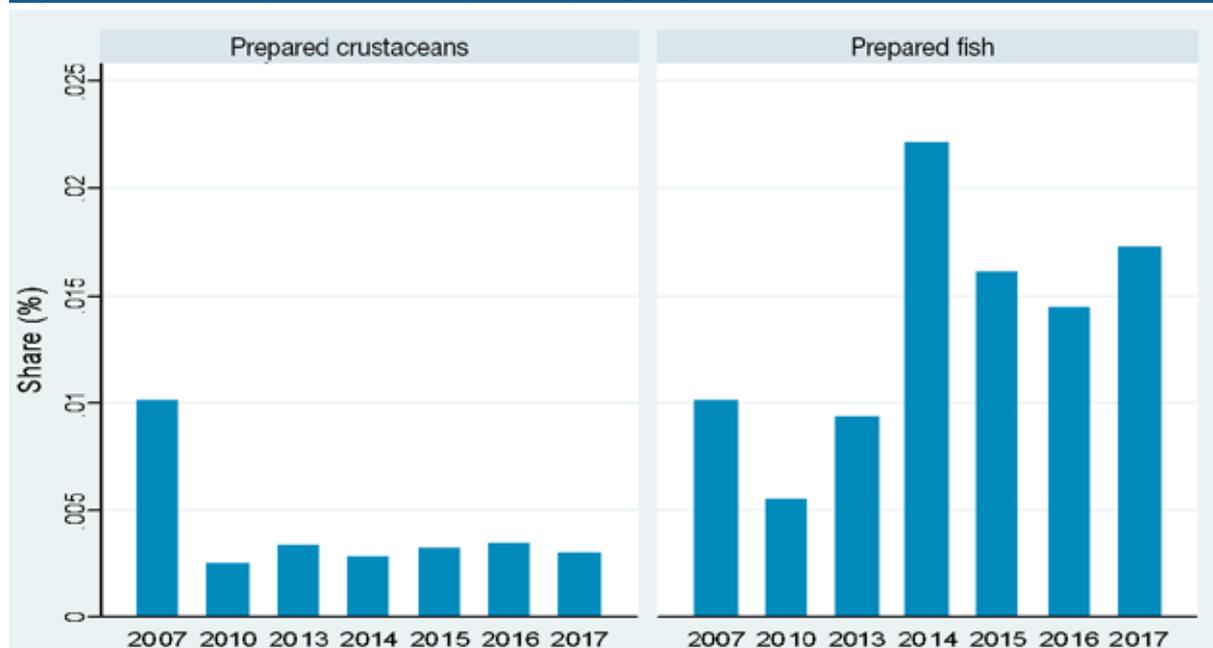
**Figure 13: Share of fisheries and fish exports in total exports, 2007, 2010 and 2013–2017**

Source: Extracted data from UN COMTRADE via WITS (Export declarations), 21 February 2019.

Exports of fisheries and fish products represent only a small share in value terms of total exports in Barbados. Figure 13 indicates that for non-processed or semi-processed products, their share has varied between

0.28 percentage points at its highest in 2007 and about 0.11 percentage points at its lowest in 2014. In 2017, it was slightly more than 0.13 percentage points. As to processed products, value shares are even smaller especially for preparations of crustaceans as shown in Figure 14. However, exports of fish preparations have increased steadily over the last five years with a peak met in 2014 showing an increase of their share of about 50 per cent in five years between 2013 and 2017.

Table 6 reports the evolution of the number of fisheries and fish products exported (re-exported products are excluded [at least in principle]) during the last decade. The number of non-processed (or semi-processed if we consider freezing or cutting in fillets “semi processing”) products has varied between seven in 2014 and 2015 and 18 in 2016. Products exported during most of the period under consideration include yellowfin tunas (HS 0302.32) some frozen fish species (HS 0303.79), fresh or chilled fish fillets (HS 0304.10),

**Figure 14: Total share of processed seafood product exports, 2007, 2010 and 2013–2017**

Source: Extracted data from UN COMTRADE via WITS (Export declarations), 21 February 2019.

and frozen fish fillets (HS 0304.20). More recently, products such as ornamental fish (HS 0301.10) and bigeye tunas (HS 0302.34) have had stable export records.

**Table 6: Number of products exported by level of processing, 2007 and 2013–2017**

Year	Raw / semi-processed	Preparations
2007	12	8
2013	6	5
2014	7	5
2015	7	3
2016	18	5
2017	11	8

Source: Extracted data from UN COMTRADE via WITS (Export declarations), 21 February 2019.

Value wise, yellowfin tuna has been the leading product during the last five informed years with a clear flexion in 2017. Fillets of unspecified fish but different from traditional species including tunas have been representing (on average) about 20 per cent of fish exports between 2013 and 2017 to jump to 40 per cent in 2017. The major reason for such share transfer is the collapse of yellowfin tuna exports (from \$405,000 to \$145,000 thousand) more than the increase in the value of fish preparations value (from \$38, 000 to \$44,000).

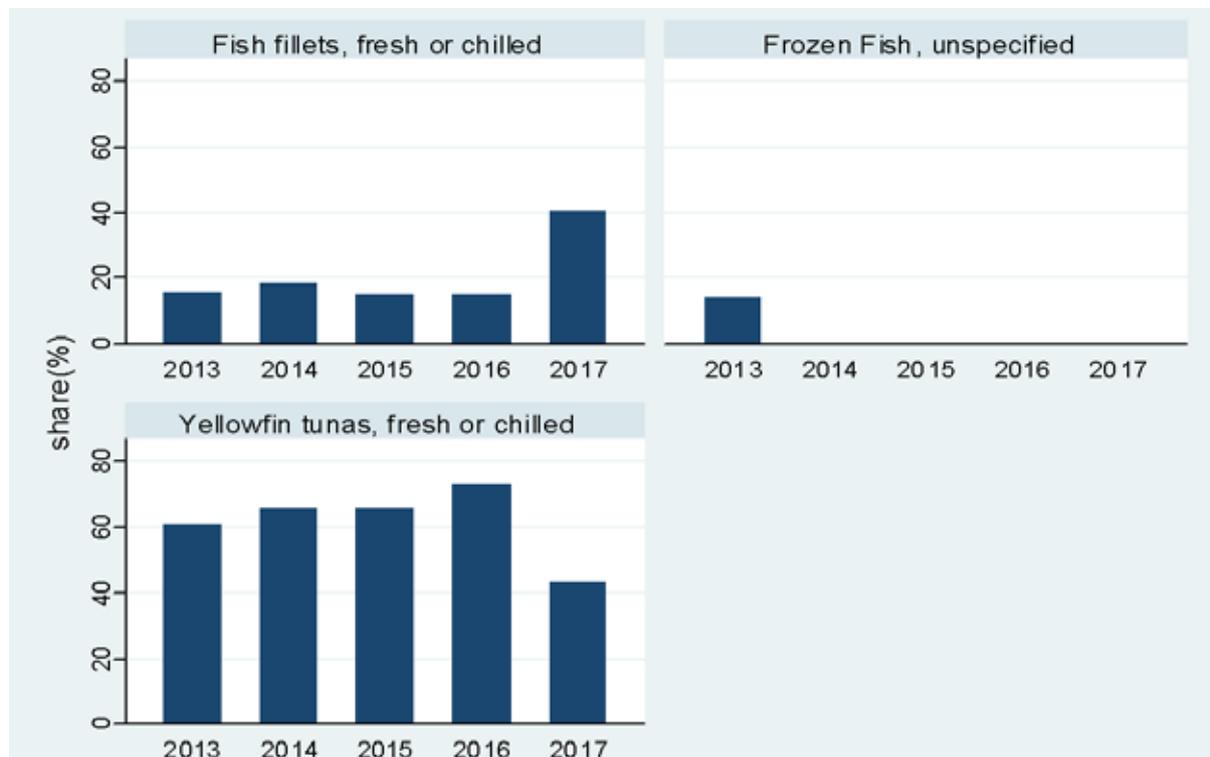
Other products with a share varying between one and ten per cent during the period are bigeye tunas (HS 0302.34) representing about ten per cent of total fish exports in 2017 and the group of newly exported products in 2017 cod (HS 0302.50), unspecified frozen fish HS (0303.79), Frozen fillets of unspecified fish (HS 0304.20) and smoked Pacific salmon (HS 0305.41) accounting for almost ten per cent of fish exports altogether.

Weight numbers reflect to a very large extent values as shown in Figure 17. Exports of yellowfin tunas fell from 152 tons in 2017 to about 53 tons in 2017.

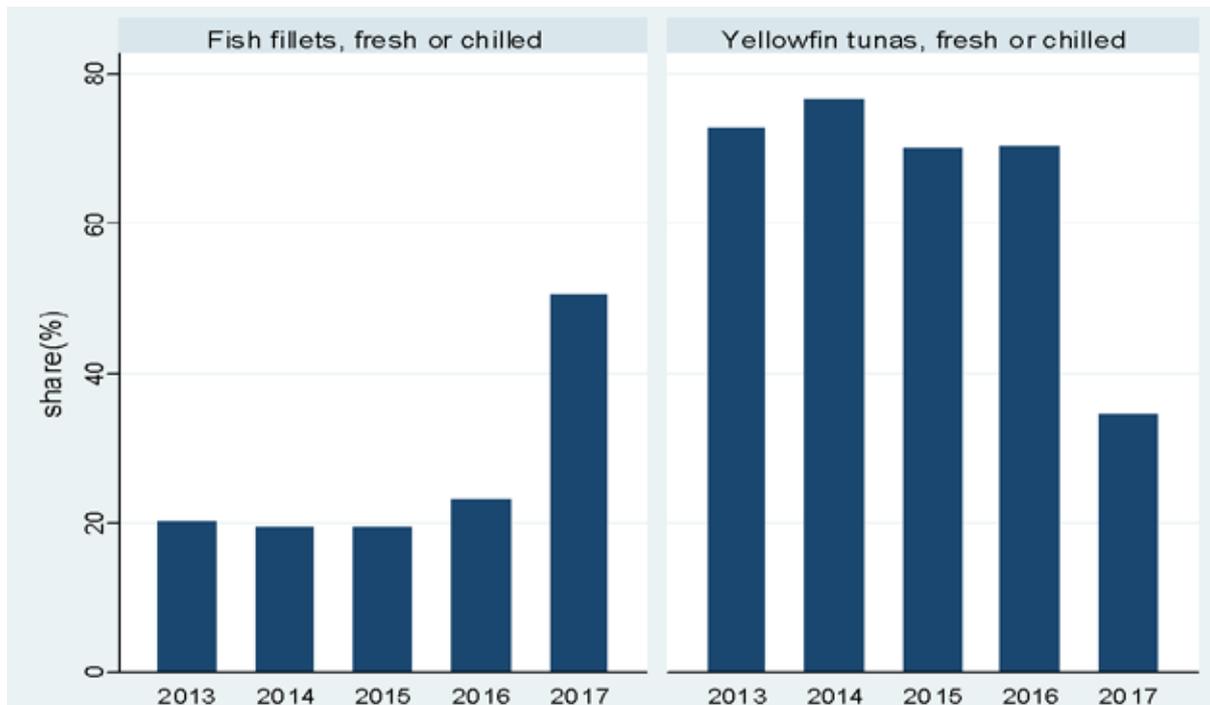
Other products with a share varying between one and ten per cent during the period are bigeye tunas (HS 0302.34), some unspecified fresh or chilled fish species (HS 0302.69), some unspecified frozen fish species (HS 0303.79) and some frozen fillets of unspecified fish species (HS 0304.20).

Preparations of fish (HS 1604.20) and shrimps/prawns (HS 1605.20) have also been exported on a regular basis during the last decade. In 2017, preparations of sardines, mackerel, tunas and anchovies have also been exported. Most of these products have not, most probably, been elaborated using domestic landings.

The United States has been the major destination market of Barbados exports absorbing the quasi

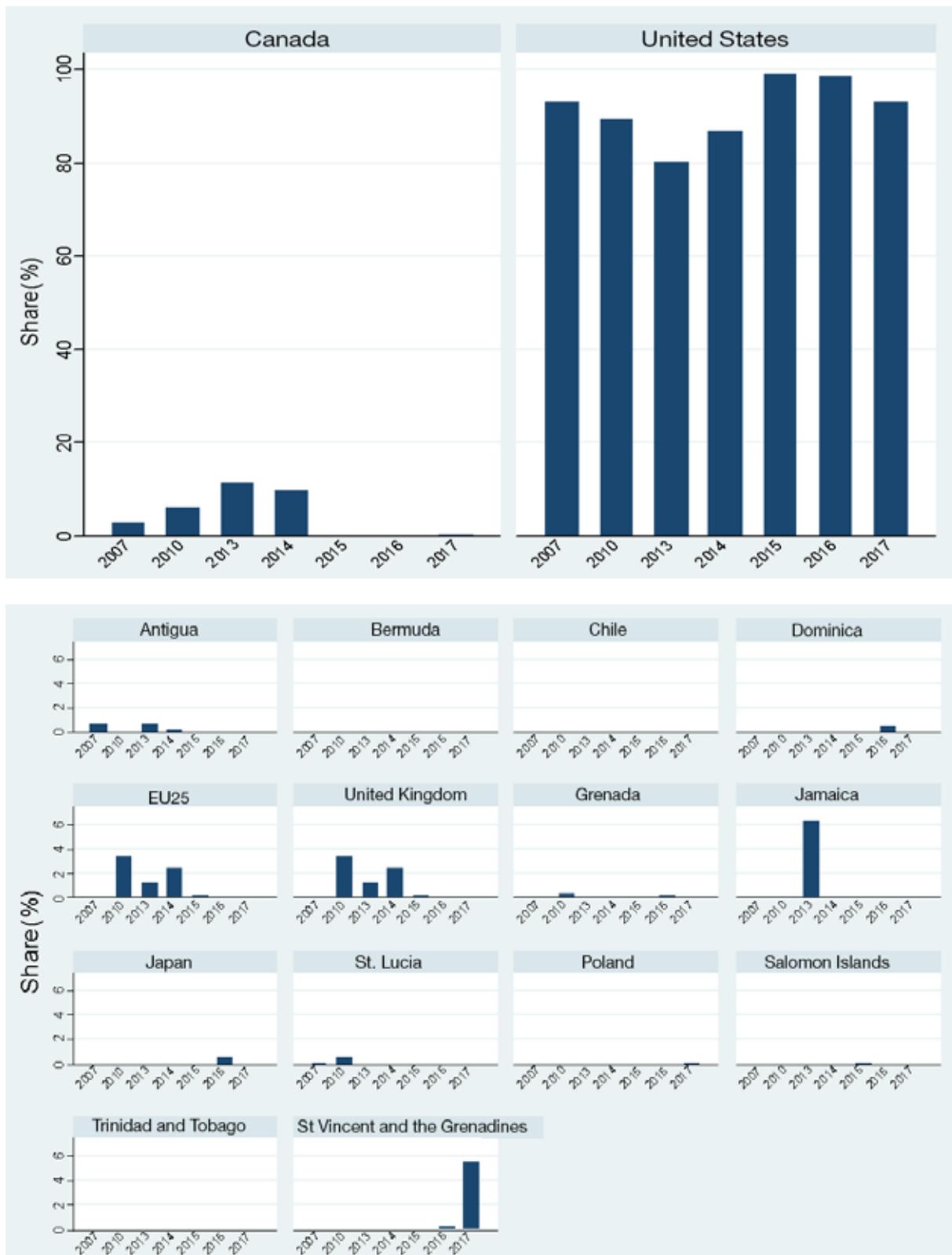
**Figure 15: Total share of major fish product exports (value), 2013-2017**

Source: Extracted data from UN COMTRADE via WITS (Export declarations), 21 February 2019.

**Figure 16: Total share of major fish product exports (quantity), 2013-2017**

Source: Extracted data from UN COMTRADE via WITS (Export declarations), 21 February 2019.

**Figure 17: Share in fisheries and fish products exports (by destination), 2007, 2010 and 2013-2017**



Source: Extracted data from UN COMTRADE via WITS (Import declarations), 21 February 2019.

totality of yellowfin tuna exports. Canada has remained the second largest destination market until 2014 with a share reaching a maximum of more than ten per cent in 2013 but collapsing afterwards. Jamaica appeared as a non-insignificant destination in 2013 and Saint-Vincent and the Grenadines in 2017.

While raw fish products are principally exported to the United States or Canada (Figure 17), preparations of fish and of crustaceans are sent to countries from the Caribbean region namely: St. Vincent and the Grenadines, St. Lucia, Trinidad and Tobago, Dominica, Antigua and Barbuda, and the Dominican Republic. The only exports to the European Union U25, which are not exports to the United Kingdom, are ornamental fishes and were sent to Poland. However, considering their almost insignificant value, this figure could simply refer to an operation between individuals. Some ornamental fishes are also exported to Switzerland. Exports to the United Kingdom collapsed in 2016 and were essentially of fillets of non-specified fish species whether fresh/chilled or frozen.

Barbadians living in the United States and the United Kingdom are big consumers of Barbadian fish exports. It is estimated that Barbados could export approximately 500 tons annually to the European Union.

## 2.7. Trade policy instruments

Only tariffs and non-tariff measures (NTMs) are assessed in their section. However, the set of instruments policy makers can use to affect trade flows is much broader and would certainly call for some more attention at a later stage of the project. While tariffs are usually seen as instruments used to regulate trade flows and in particular imports, NTMs, at least a subset of them, may be used for purposes that do not necessarily relate to some protectionist objective. In all cases, any trade-related instrument is expected to impact trade flows even though the sign of the impact is not systematically negative.

### 2.7.1. Tariffs

Figure 18 reports simple trade weighted averages of tariffs for several categories (4-digit in HS classification) of fish products. The latest year available is 2012. As figures would tend to suggest trade policy has remained relatively steady in the 2000s. Two types of tariffs are shown: (1) the most-favoured-nation applied tariff (denoted by MFN), which is the tariff applied to imports from WTO members. It is important to keep in

mind that for fish products (except for animal feed) no WTO bound tariff has been defined implying that the government would be in theory free to increase tariffs on imports of fish and fish products to any level; (2) the effectively applied tariff (denoted by AHS) reflecting the possible existence of preferential trade agreements. If some reciprocal preferential trade agreement exists and is active, then the reference tariff rate with preferential trade partners would be the preferential one and it would not in principle be affected by an increase in the applied MFN rate.

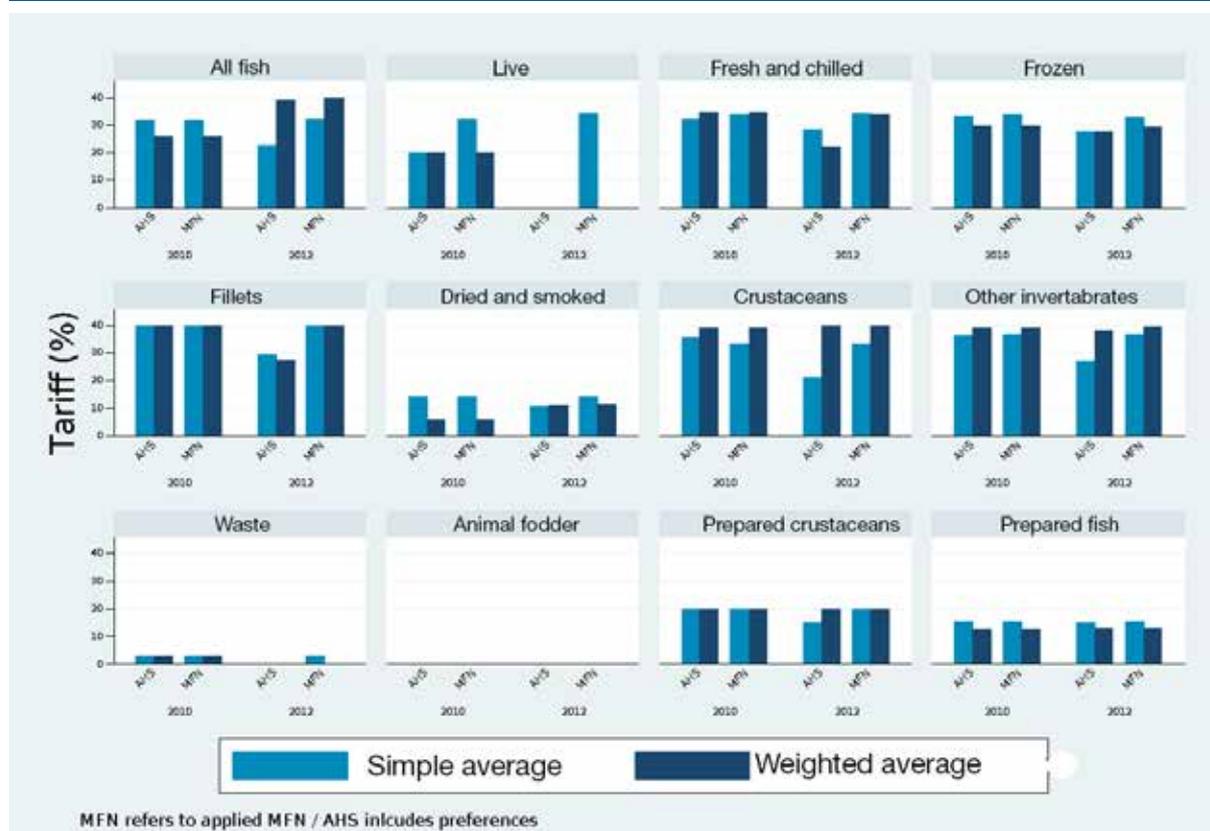
In general, the AHS tariff cannot be higher than the MFN one. However, this could be observed in the case of weighted averages. The difference between the two is sometimes referred to as the “preference margin”. A larger margin can be interpreted more advantageous market access conditions (at least on average) granted to partners in some preferential trade agreement.

Considering the simple averages reference, MFN tariffs are found to vary between 30 and 40 per cent for fish and fisheries products. There are zero or close to zero for fish products unfit for human consumption. Preparations of fish products face an MFN tariff of about 15 per cent and preparations of crustaceans face a tariff of 20 per cent. The tariff rate is set higher for some specific local species of significant importance to fisheries. For example, the tariff is set at 145 per cent for flying fish and dolphinfish. Some fish imports are duty free with some of the hotels receiving tax concessions.<sup>13</sup>

Preference margins observed in 2012 benefitted countries which are members of CARICOM. The highest preference margins are found for live fish fresh, fillets, crustaceans and molluscs.

### 2.7.2. International markets

Tariffs applied by Barbadian authorities essentially matter for competition in the domestic market and could potentially grant some artificial relative competitiveness to domestic firms selling locally. Firms willing to export some product on international markets have to pay tariffs when applied in the selected destination market. Figures 19 to 22 show such conditions in some significant international markets. Figures reported are for the years 2010, 2012, 2016 and 2017 except for China for which 2012 is missing. These also report that CARICOM countries have been preferential trade partners for Barbados. However, preference margins exporters in Barbados could enjoy

**Figure 18: Simple and trade weighted average tariffs imposed by Barbados: Effectively applied and applied MFN, 2010 and 2012**

Source: Authors' calculations based on extracted data from UNCTAD TRAINS, 21 February 2019.

Note: Exceptions granted to specific types of importers (e.g. hotels) are not considered in the calculations.

are significant only for live fish and to a lesser extent for fillets and dried and smoked products. This is not necessarily surprising considering that CARICOM countries are direct competitors for several fish and fisheries products.

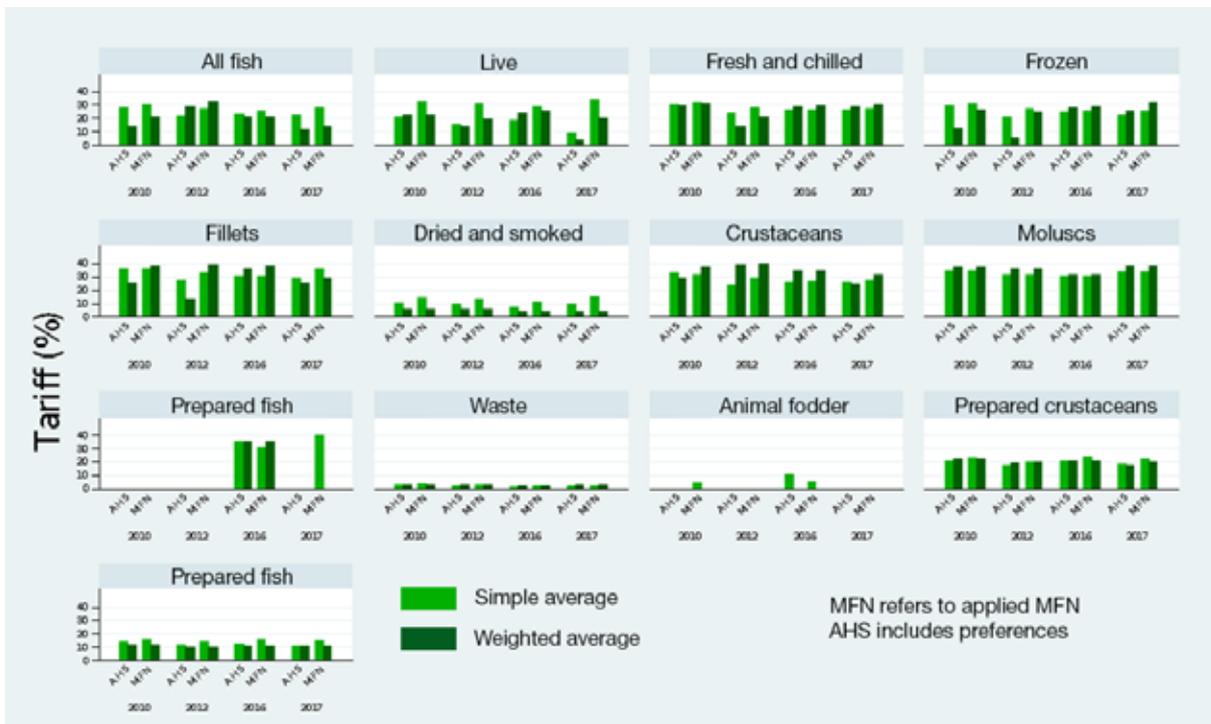
In the context of the European Partnership Agreement (EPA) with the European Union together with other CARICOM countries, duty free access is granted to most fish and fisheries products. However, as suggested by Figure 20, effective preference margins are no larger than five per cent except for dried and smoked fish products and preparations where it is about ten percentage points. Effective preference margins refer to the difference between the preferential rate granted to Barbados and that granted on average to other preferential trade partners, namely the AHS rate.

The analysis for the remaining two big international markets reveals two opposite situations. The United States market is almost completely open at least from

the view of tariffs for most products. Only preparations of fish are imposed a tariff of about eight per cent. This may imply competition from a larger number of exporters as compared to destinations with higher tariffs imposed. In the case of China, tariffs are applied to most products but are never higher than 12 per cent. Moreover, preference margins granted to preferential trade partners, essentially other Asian countries are not dramatically high. This is to say that for instance, competition may not be any fiercer than in the United States market or even the European Union.

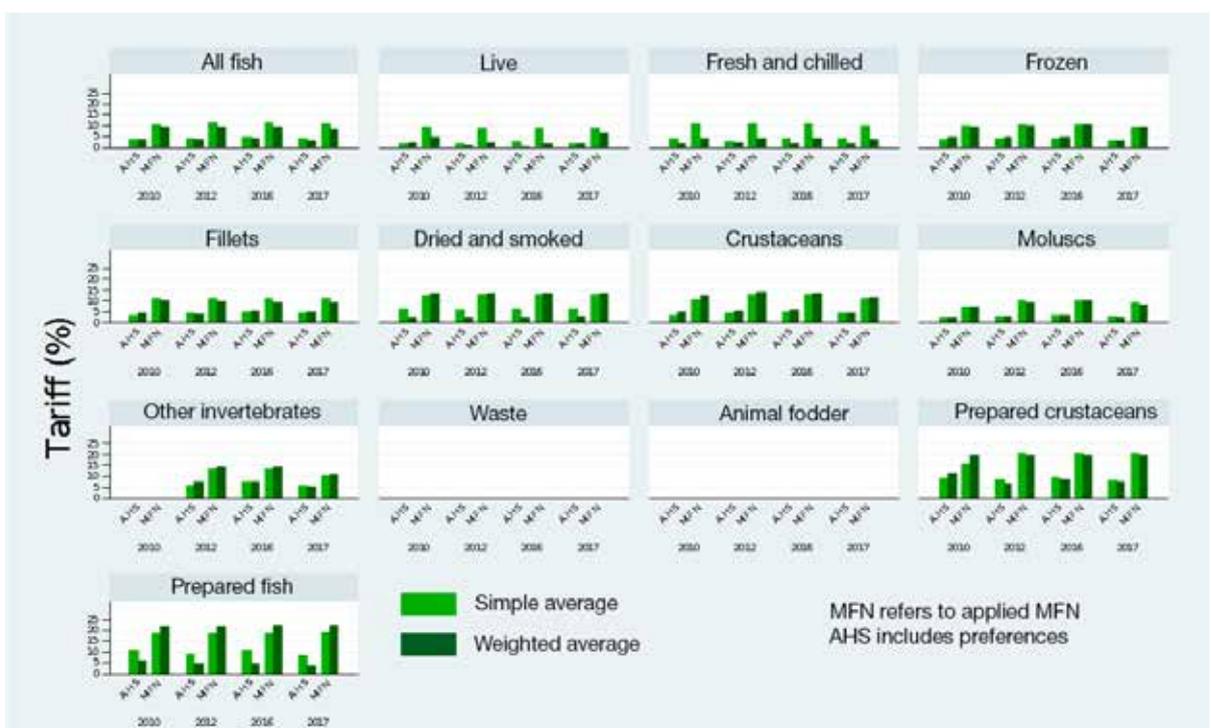
Some tariff escalation is observed in the European Union and the United States markets. Preparations clearly face higher tariffs than non/semi-processed goods. This is also the case but to a lesser extent in China. Though the contrary is true for CARICOM countries. These results are not surprising and are likely to reflect respective patterns of production in the fish sector in each country.

**Figure 19: Simple and trade weighted average tariffs imposed by CARICOM countries: Effectively applied and applied MFN, 2010, 2012 and 2016-2017**

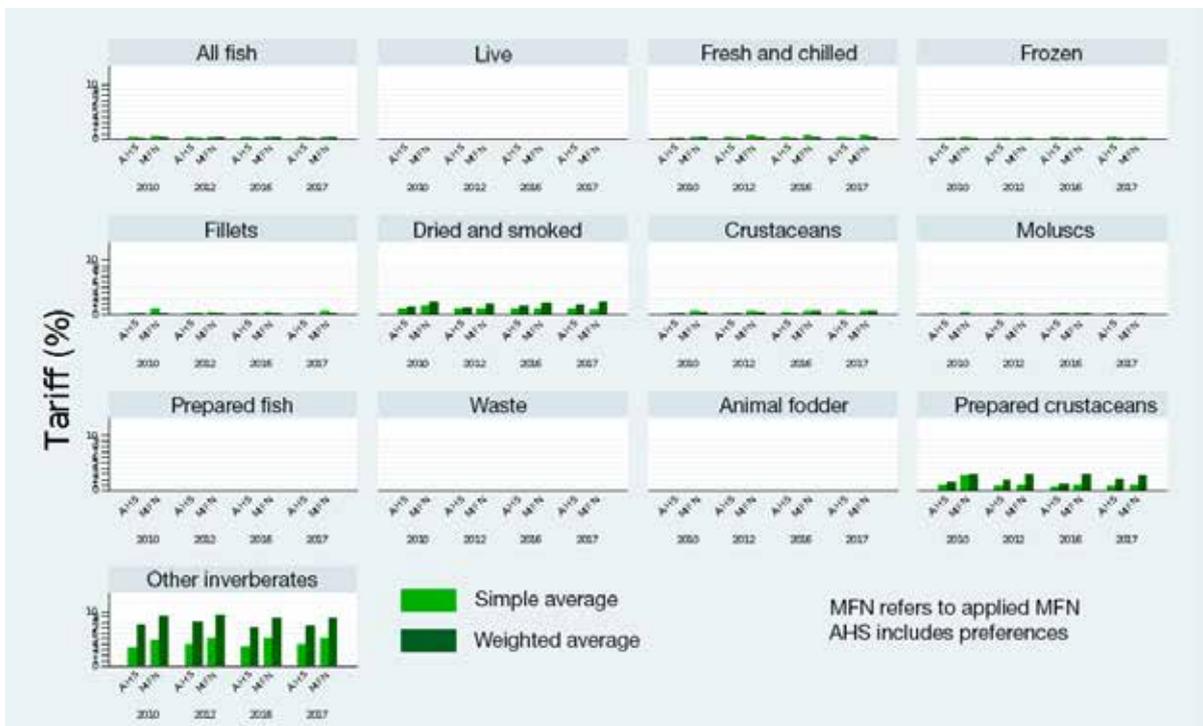


Source: Authors' calculations based on extracted data from UNCTAD TRAINS, 21 February 2019.

**Figure 20: Simple and trade weighted average tariffs imposed by the European Union: Effectively applied and applied MFN, 2010, 2012 and 2016-2017**

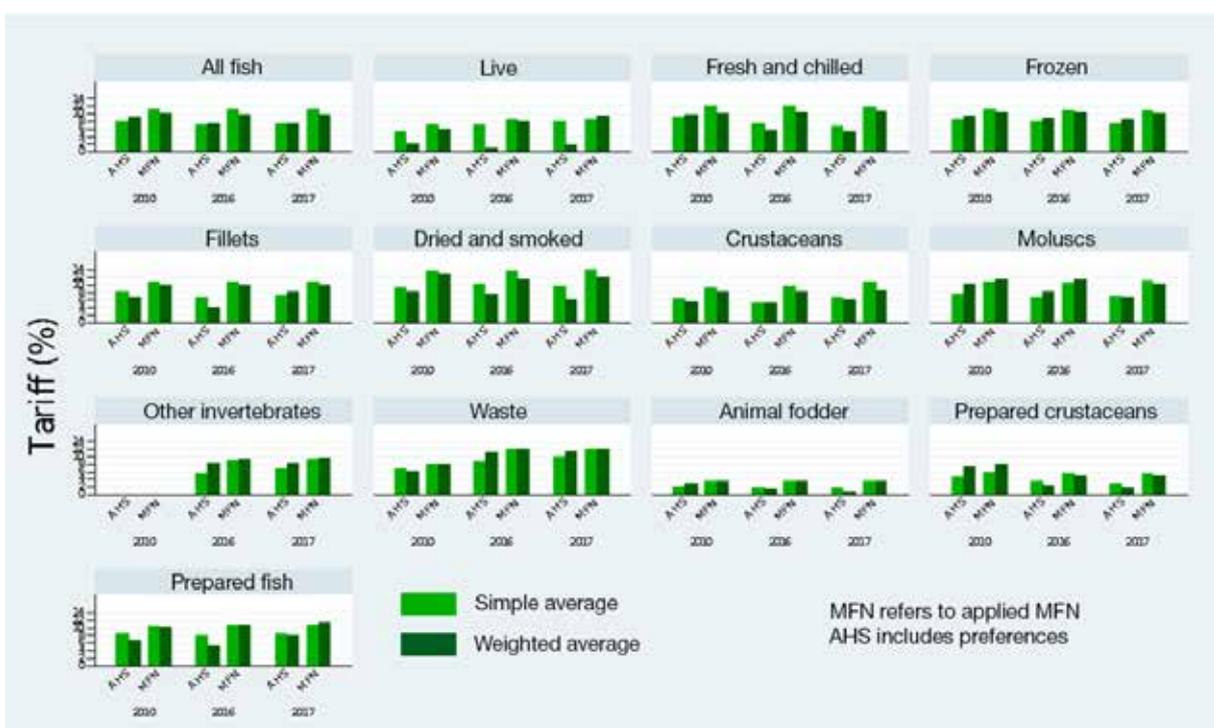


**Figure 21: Simple and trade weighted average tariffs imposed by the United States of America: Effectively applied and applied MFN, 2010, 2012 and 2016-2017**



Source: Authors' calculations based on extracted data from UNCTAD TRAINS, 21 February 2019.

**Figure 22: Simple and trade weighted average tariffs imposed by China: Effectively applied and applied MFN, 2010 and 2016-2017**



**Table 7: NTM types and implementation year in Barbados**

NTM Code	1961-01	1970-01	1982-11	1985-12	1993-10	1994-05	1998-07	2006-03	2006-06
A620					X				
B110		X							
B140								X	
B150								X	
B310									X
B410							X		
B700							X		X
B810	X								
B830								X	
B840			X	X					
B850								X	
P130								X	
P140								X	
P400								X	
P610			X						
P620			X						
P690						X		X (x2)	X

Source: Authors' calculations based on extracted data from UNCTAD TRAINS, 21 February 2019.

### 2.7.3. Non-tariff measures (NTMs)

Legislation on measures to improve fish handling techniques in line with Sanitary and phytosanitary measures (SPS Agreement) is currently under revision. This is a result of Barbados' participation in the European Development Fund's (EDF) Sanitary and Phytosanitary Measures (SPS) Project which aimed to strengthen the capacity of CARIFORUM States for international market access through compliance with Europe's SPS measures, as well as improve capacity for developing regionally harmonized SPS measures.

The information on Barbados NTMs reported below is based on regulations in place in 2015, the year of collection, and does not necessarily reflect the new set of regulations mentioned in the previous paragraph. However, it remains the most up to date set of available and comprehensive set of information. The reference HS classification is the 2012 version with 223 products included in the analysis.

About 55 per cent of them are affected by at least one NTM. Amongst these products, all of them are affected by at least one TBT and at least one export measure. About 90 per cent are affected by at least one SPS measure. There are 17 different types of measures according to the UNCTAD international NTM classification. Implemented measures are based on 22 distinct regulations. This is to say that

some measures are of the same type. This is the case of type B700 (product quality or performance requirement), B840 (inspection requirement) and P690 (export technical measures, n.e.s. – not an inspection or certification requirement). Table 7 presents the type of measures still enforced in 2015 and their year of implementation. Most TBTs and export measures have been implemented since 2006.

Table 8 reports the number of occurrences for the different types of measures, that is the number of measure-product pairs we observe for any given regulation. The counting includes cases of products affected several times by the same measure but coming from different regulatory texts. The highest figure is obtained for TBTs and the lowest for SPS measures. While the former accounts for about 50 per cent of all occurrences, the latter accounts for only ten per cent of them. Indeed, there more TBTs than SPS measures in place. A more detailed analysis based on Table 9 reveals that the SPS measure is the same for all affected products. According to the official NTM classification the measure belongs to sub-chapter A62 of the official classification and imposes some animal-raising or -catching processes requirements because of SPS concerns (e.g. the size of the fish caught). The measure was implemented in 1993. Table 9 figures further indicate that most prevalent TBTs involve some labelling and inspection requirement. There is also an important number of occurrences corresponding

to some prohibition for some TBT reasons. This prohibition relates to a regulation implemented in 1970 and applies to most products affected by some NTM regulation.

**Table 8: NTMs per chapter (all fish and fish products) in Barbados**

NTM chapter	Frequency	Per cent
A	106	10.24
B	519	50.14
P	410	39.61

Source: Authors' calculations based on extracted data from UNCTAD TRAINS, 21 February 2019.

Note: The number of occurrences refers to the number of times an NTM measure applies to some product. Several NTMs of the same type can apply to the same product but they are all governed by a distinct regulatory text.

Table 10 presents the prevalence of NTMs by chapter across groups of products defined at the 4-digit level of the HS classification. Except for fish fillets, more than 60 per cent of products in other groups are affected by some NTMs. Highest shares are found for live fish, frozen fish and prepared fish products. We also find that all products in the animal feed and flours

groups are affected by some NTM but essentially because these groups include a single product only at the 6-digit level.

Table 11 reports the average number of measures emanating from distinct regulations per product in each HS 4-digit product category. The highest incidence prevalence is found for dried and smoked products with an average of seven TBTs and six export measures per (HS 6-digit) product. We also find high incidence figures for products unfit for human consumption (0511)<sup>14</sup> and processed products.

## 2.8. Challenges

Some of the major constraints, gaps and needs of the fishery sector, related to institutional, harvest, post-harvest, stakeholder and environmental challenges include, but are not limited to:

- Weak data collection system;
- Unknown status of stocks of many of the marine fisheries resources. There is a need for further research to be conducted on fish stocks to understand the current status and inform on management with regards to overfishing, especially in targeted or potentially targeted commercial species;
- Suspected overfishing and overexploitation of

**Table 9: NTMs per sub-chapter (all fish and fish products) in Barbados**

NTM Code	Description	Number of occurrences	Share in total (%)
A620	Animal raising or catching processes requirements	106	10.24
B110	Prohibition for TBT reasons	119	11.5
B140	Authorization requirement for TBT reasons	33	3.19
B150	Registration requirement for importers for TBT reasons	33	3.19
B310	Labelling requirements	122	11.79
B410	TBT regulations on production processes	2	0.19
B700	Product quality or performance requirement	15	1.45
B810	Product registration requirement	1	0.1
B830	Certification requirement	33	3.19
B840	Inspection requirement	128	12.37
B850	Traceability information requirements	33	3.19
P130	Licensing or permit requirements to export	33	3.19
P140	Export registration requirements	33	3.19
P400	Measures on re-export	33	3.19
P610	Inspection requirement	14	1.35
P620	Certification required by the exporting country	14	1.35
P690	Export technical measures, n.e.s.	283	27.34

Source: Authors' calculations based on extracted data from UNCTAD TRAINS, 21 February 2019.

**Table 10: NTMs per chapter per HS 4-digit category in Barbados**

Group of products (HS-4 digit)	A	B	P	Total	Number of products affected	Total number of products per group	Share (%)
Live (03.01)	7	29	23	59	7	8	88
Fresh & chilled (03.02)	26	94	68	188	26	42	62
Frozen (03.03)	30	106	76	212	30	40	75
Fillets (03.04)	9	39	30	78	9	40	23
Dried & smoked (03.05)	12	84	72	168	12	20	60
Crustaceans (03.06)	10	31	20	61	10	14	71
Molluscs (03.07)	12	50	36	98	12	17	71
Other aquatic invertebrates (03.08)	0	0	0	0	0	6	0
Waste (05.11)	0	6	6	12	1	1	100
Prepared fish (16.04)	0	49	49	98	9	11	82
Prepared crustaceans (16.05)	0	29	29	58	5	18	28
Animal fodder (23.01)	0	2	1	3	1	1	100

Source: Authors' calculations based on extracted data from UNCTAD TRAINS, 21 February 2019.

**Table 11: Average number of NTMs types per product per HS 4-digit category in Barbados**

Group of products (HS-4 digit)	A	B	P	Share (%)
Live (03.01)	1	4.1	3.3	88
Fresh & chilled (03.02)	1	3.6	2.6	62
Frozen (03.03)	1	3.5	2.5	75
Fillets (03.04)	1	4.3	3.3	23
Dried & smoked (03.05)	1	7	6	60
Crustaceans (03.06)	1	3.1	2	71
Molluscs (03.07)	1	4.2	3	71
Other invertebrates (03.08)	0	0	0	0
Waste (05.11)	0	6	6	100
Prepared fish (16.04)	0	5.4	5.8	82
Prepared crustaceans (16.05)	0	5.4	5.8	28
Animal fodder (23.01)	0	2	1	100

Source: Authors' calculations based on extracted data from UNCTAD TRAINS, 21 February 2019.

Note: The proper content of each measure would require a detailed analysis of the text of the governing regulations and laws. This may also be relevant when considering stringency of NTMs in some destination markets.

- certain species and resources;
- Lack of legislation or updated legislation surrounding fisheries for example size limits and low enforcement capacity as well as legislation, particularly for the purposes of facilitating international trade;
- The influx of sargassum is a national issue that has affected the island for the past seven years;
- Additional constraints faced by the fishery sector include fluctuating catches of flying fish with a decline in recent years, possibly linked to an increase in sargassum;
- Imports should be substituted with local product through sector expansion, however, at present,

- Barbados as a SIDS lacks capacity (infrastructural, financial and technical), all of which are required to create a more sustainable fishing industry;
- Improving post-harvest procedure quality as well as reducing waste appears as a priority. At present, waste is dumped at the landfill but can instead be used to increase earnings through further processing into – Fish skin leather, can also be used to create animal feed, organs can be used for food (melts and roe), waste can be used to create biofuels and fertilisers. Suggestions have been put forward to install infrared sensors at the Bridgetown Public Market in the first instance and

then in all other markets to reduce water wastage. This both conserve a scarce resource and improve the economic efficiency at the markets. A fish silage waste pilot project funded by the government of Argentina and the FAO was announced in February 2019 (Barbados Today, 9 February 2019). This project aims to convert the parts of the fish that typically go unutilized into safe and nutritious products for the consumption of livestock and aquaculture;

- Make use of unutilized or underutilized fishing quotas;
- Update of the version of the HS classification used to publish trade flows data.

However, with these challenges comes opportunity. There is a high demand for fish and fisheries products and thus still a need to sustainably develop the sector, investigate production of value-added products including utilization of fish waste.

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### 3. COASTAL AND MARINE ENVIRONMENTAL SERVICES SECTOR

#### 3.1. Introduction

Owing to growing understanding of environmental issues globally and the development of technology, strict standards and regulations in respect of such awareness, the environmental services sector has developed exponentially in the last couple of decades. This has posed challenges to policy makers as promoting economic sustainability jointly with preserving and protecting the environment would require the engagement of different policy domains. Such a challenge is particularly precarious for developing economies such as Barbados.

Despite years of negotiations at the international level (e.g. at the WTO), the scope of the definition of environmental services remains rather comprehensive, if not, uncertain. At its core, ecosystem services are such activities that are not only essential to sustain life but also those that have significant economic, environmental and cultural value, that are not tradable per se. Over time, the evolution of this industry has only expanded to include other economic activities such as business or consulting services that are environmentally related.

The Sectoral Classification List (W/120) of the World Trade Organization (WTO) is an attempt to harmonize and ensure cross-country comparability and consistency of the commitments undertaken in the General Agreement on Trade in Services (GATS) (which is one of the outcomes of the Uruguay Round negotiations), as well as aggregate the more detailed categories identified in the United Nations' Central Product Classification (CPC). The CPC which has been revised five times<sup>15</sup> since 1991 reflects the evolution of environmental services sector and demonstrates progress in the efforts to provide more clarity to the definition of this dynamic sector.

From this perspective, this document will focus on "tradable environmental services" i.e. environmental activities performed on someone's behalf for a price and not on ecosystem services (natural capital). While the environmental services build on the existence of healthy ecosystem services, the former also contribute to sustainable use, management and restoration of

the later through human intervention.

#### 3.2. Coastal and marine environment services–sector analysis

As mentioned, there is no internationally agreed definition of "coastal and marine environmental services". In the context of the WTO the term used is "environmental services", which include various tradable services such as sewage services, refuse disposal, sanitation and similar services, reducing vehicle emissions, noise abatement services, nature and landscape protection services and "other" environmental services.

The WTO General Agreement on Trade in Services (GATS) applies in principle to all service sectors, with two exceptions: services supplied in the exercise of governmental authority<sup>16</sup> and measures affecting air traffic rights or services directly related to the exercise of such rights (See Article I (3) (b) and para. 2 of the Annex on Air Transport Services of the GATS respectively<sup>17</sup>). The former exception is very important in the oceans context as services directly provided by the government such as coastguard, policing and customs control will not be covered by the GATS. In addition, the GATS does not cover government procurement activities in services but calls for multilateral negotiations on the matter (Article XIII). These negotiations have not achieved any specific outcome so far. In the WTO context, government procurement is regulated in parallel with a plurilateral agreement called "Government Procurement", but its membership<sup>18</sup> is mostly limited to developed countries. Barbados is neither part of the (GPA) nor an observer.

UNCTAD tends to use "Environmentally Preferable Products (EPP) [and services]", meaning those that generate lower environmental harm, lower natural resource use, no or minimum negative impact on human, animal or plant health and level of contribution to the preservation of the environment (UNCTAD, 1995). In the oceans context, this concept focuses more on the environmental performance of a good or a service and is fully consistent with UNCTAD's oceans pillars (UNCTAD, 2016) and UNEP green economy principles. There are also other proposals that have been made to use a list approach to define both environmental goods and services or some seeking only to focus on climate friendly one within WTO Doha Round negotiations on environmental goods and services.

### 3.3. Mapping environmental and environment-related services

The following tables (Tables 12 and 13) provide a comprehensive mapping and comparison of environmental services and environment-related services under the WTO Services Sectoral Classification List (W/120) and the United Nations Central Product Classification (CPC).<sup>19</sup> These classification schemes aim at reflecting the “perishable, intangible, heterogeneous (variable quality), and sometimes non-storable” nature of services.

The term “services” usually refer to activities undertaken on behalf of someone else for a price or a fee. They can be traded through four modes (see Box 3):

#### Box 4: Definition of Services Trade and Modes of Supply pursuant to Article I:2 of the GATS

Mode of supply	Definition	Example*
Mode 1: Cross-border trade	Services supplied from the territory of one Member into the territory of any other Member	A United States firm provides environmental consulting services (provision of blueprints of a new coastal protection system via the internet) to a research centre in Bridgetown.
Mode 2: Consumption abroad	Services supplied in the territory of one Member to the service consumer of any other Member	A postgraduate Barbadian student enrolls in an environmental law programme at a university in Jamaica.
Mode 3: Commercial presence	Services supplied by a service supplier of one Member, through commercial presence, in the territory of any other Member	A Barbados-based affiliate of a Brazilian water and wastewater treatment company provides its services to a luxury hotel in the west coast.
Mode 4: Presence of natural persons	Services supplied by a service supplier of one Member, through the presence of natural persons of a Member in the territory of any other Member	A British national expert on monitoring and surveillance of marine wildlife is hired by a National Park Authority to travel to Barbados and provide advice in the setting of a new marine protected area for a couple of months.

\*Note: Examples are from the perspective of an importing country (e.g. Barbados).

There is no classification specific to coastal and marine environmental services, so in principle, the classifications for environmental services would apply when delivered for the coastal and marine environment (for example, beach cleaning services could be considered as remediation services).

Table 12 includes environmental services as provided in the W/120 classification. This classification was compiled by the World Trade Organization (WTO) in July 1991 to facilitate the Uruguay Round of negotiations and is so far the main reference in negotiations and the deposit of liberalization commitments by Member States under the WTO General Agreement on Trade in Services (GATS).

Table 13 provides a selection of environment-related services as proposed by the WTO in its most recent available definition of environment-related services (WTO Council for Trade in Services, 2010). For each W/120 item, correspondence is provided with the first and the most recent version of the United Nations Central Product Classification (CPC) i.e. the Provisional CPC version and Version 2.1 respectively. Member States can also use the CPC system to deposit liberalization commitments or to make more specific commitments not only under the GATS but also under other free trade agreement (FTA) or integration schemes.

All the services reported in Table 13 may be provided with an environmental purpose. In some cases, they are used to introduce exceptions within a set of commitments under the GATS or an FTA. For example, “all remediation services” may be considered as “bound” except those related to “remediation consulting services” in a Member’s schedule of commitments under the GATS. Under this example, the Member in question would have to grant to all Members of the WTO national treatment and full market access under the GATS for all remediation services (e.g. clean-up of oil pollution in a coastal area) except for remediation consulting services where the Member may establish limitations.

A Member who undertakes to deposit “bound” commitments in its own services schedule is usually interested in attracting foreign investment-increasing the supply of services that may not be available locally or to increase the level of competition and quality of supply in the sector.

**Table 12: Environmental services**

WTO Services Sectoral Classification WII 1991	United Nations Central Product Classification provisional 1991	United Nations Central Product Classification version 2.11 2015
6. Environmental services	940. Sewage and refuse disposal, sanitation	94. Sewage and waste collection, treatment and disposal and other environmental protection services
A. Sewage services	9401. Sewage services	941. Sewerage, sewage treatment and septic tank cleaning services
B. Refuse disposal	9402. Refuse disposal services	942. Waste collection services 943. Waste treatment and disposal services"
C. Sanitation and similar services	9403. Sanitation and similar services 9404. Cleaning services of exhaust gases 9405. Noise abatement services	945. Sanitation and similar services 944. Remediation services
D. Other	9406. Nature and landscape protection services" 9409. Other environmental protection services n.e.c.	949. Other environmental protection services n.e.c.

Source: UNCTAD analysis based on United Nations Statistics Division and WTO product classifications and correspondence tables (WTO Council for Trade in Services, 2010).

Note: Selected items and product groups reflect the most recent available definition of "environmental services" from the WTO.

### 3.4. MFN and specific services commitments by Barbados

Under the GATS and pursuant to its MFN clause, the principle is that "with respect to any measure covered by the Agreement, each Member shall accord immediately and unconditionally to services and service suppliers of any other Member treatment no less favourable than that it accords to comparable services and service suppliers of any other country" (Article II:1 of the GATS). Notwithstanding, WTO Members "may maintain a measure inconsistent with paragraph 1, provided that such a measure is listed in, and meets the conditions of the Annex on Article II Exemptions". Barbados has not deposited a list to the Annex MFN exceptions under the GATS. In consequence, the MFN obligation applies to all other environmental services under any mode, unless they are a part of a liberalization or integration process under a regional trade or an economic agreement that complies with the GATS requirements (Article V).

In terms of specific commitments under the GATS (national treatment, market access or additional commitments), Barbados has listed two general limitations applicable to all sectors: (See document GATS/SC/9 of 15 April 1994)<sup>20</sup>:

- a. On national treatment: A foreign investor interested in the purchase or sale of land or shares/stocks is subject to a specific tax on the value of settlement

(applicable to Mode 3);

- b. On market access: Prior to a natural person working in Barbados a work permit must be obtained. Labour market tests (LMTs) are conducted (applicable to Mode 4).

These limitations (exceptions to national treatment and market access) apply to all environmental services and other related services. Barbados has not deposited any bound commitment for national treatment, market access or additional commitment on environmental services under the GATS so in principle, the country has ample policy space to design any policy it may need to develop or regulate the sector.

On the other hand, trade in environmental goods and services was deeply liberalised under the EPA for European Union-CARIFORUM. Under Mode 1 (cross border supply of services), the European Union lists Environmental services as a "bound" commitment with only one reservation: consulting services. Under Mode 3 (commercial presence), the European Union listed all environmental services as "bound" with no reservation by using a more detailed classification scheme under the CPC. The list of sector specific commitments on the CARIFORUM side is quite disaggregated per sub-sector and commitments differ from country to country. Barbados' bound commitments tend to be more common in Modes 1, 2 and 3 and are usually unbound in Mode 4.

**Table 13. Environment-related services**

WTO Services Sectoral Classification List WI20,1991	United Nations Central Product Classification provisional, 1991	United Nations Central Product Classification version 2.1, 2015
1. Business Services	8. Business services; agricultural, mining and manufacturing services	8. Business and production services
A. Professional services	86711. Advisory and pre-design architectural services	83211. Architectural advisory services
	86721. Advisory and consultative engineering services	8331. Engineering advisory services
	86724. Engineering design services for the construction of civil engineering works"	8332. Engineering services for specific projects
	86729. Other engineering services	833. Engineeringservices
	86732. Integrated engineering and project management services forwater supptt and sanitation workstum key projects	8331. Engineering advisory services
C. Research and Development Services	86733. Integrated engineering services for the construction of manufacturing turnkey projects	
	85. Research and development services	81. Research and development services
F. Other business services		881. Food, beverage and tobacco manufacturing services
	884. Services incidental to manufacturing, except to the manufacture of metal products, machinery and equipment	891. Publishing, printing and reproduction services
		892. Moulding, pressing, stamping, extruding and similar plastic manufacturing services
		894. Materials recovery (recycling) services, on a fee or contract basis
	88493. Recycling on a fee or contract basis	89410. Metal waste and scrap recyclingservices, on a fee or contract basis
		89420. Non-metal waste and scrap recovery (recycling) services, on a fee or contract basis"
E. Other services	51. Construction iwork	54. Construction services;ffl.Maintenance, repairand installation (exceptconstruction) services
3. Construction and related engineering services	5133. Construction work for civil engineering; for waterways, harbours, dams and otherwaterworks"	5423. General construction services of harbours, waterways, dams, water mains and lines, irrigation and other waterworks"
	5135. Construction work for civil engineering; for local pipelines and cables	5425. General construction services of local pipelines and cables pipelines and cables; ancillary works and related works
		5434. Waterwell drillingand septic system installation services
	5152. Water welldrilling	8715. Maintenance and repair services of other machinery and equipment"
	51620. Water plumbing and drain layingwork	54341. Water well drilling services
	51650. Insulation work (electrical wiring, water, heat,	54650. Insulation services sound)"
	5123. Construction work for buildings; for warehouses and industrial buildings"	5412. General construction services of non-residential buildings
	5136. Construction work for civil engineering; for constructions for mining and manufacturing"	"5426. General construction services of mines and industrialolants"

continued on next page/ ...

Source: UNCTAD analysis based on United Nations Statistics Division and WTO product classifications and correspondence tables. Selected items and product groups reflect the most-recent available definition of environment-related services (WTO Council for Trade in Services, 2010).

Note: (a) Items marked with asterisk (\*) are UNCTAD proposed matchings in the absence of official correspondence. (b) The symbol \*\*\* may stand for 610 and 620 or 611, 612, 621, 622, 623, 624 and 625, depending on the user's needs. However, not all combinations may be applicable.

E. Other services	62 Commission agents and "Wholesale trade services, except of motor vehicles and motorcycles"	Multiple applicable
4. Distribution services	62278. Wholesale trade services of waste and scrap and materials for recycling	<p>****92Wholesale trade services, except on a fee or contract basis, of metal ores and metal in primary forms</p> <p>***95Wholesale trade services, except on a fee or contract basis, of waste and scrap and materials"</p>

According to the Organization of American States (OAS),<sup>21</sup> the environmental provisions in the EPA call for promoting capacity building and cooperation to improve environmental management, eco-innovation, and the production of environmental goods and services. More precisely, Art. 117 of the European Union-Cariforum Agreement<sup>22</sup> lists specifically environmental management, especially when linked to tourism, as a key aspect of development cooperation and technical assistance. Barbados could use these provisions, to request specific support from the European Union on data gathering and the voluntary e-register proposals discussed in the next sub-sections.

### 3.5. The case of the local response to coastal and marine protection in Barbados

The coastal zone is, for the purpose of this report, the transitional zone where the land meets water extending offshore to the continental shelf break and onshore to the first major change in topography (Scruggs and Bassett, 2013). It is managed by the Coastal Zone Management Unit (CZMU) (see Box 4).

Other laws which affect the work of the CZMU include the Fisheries Act (Cap. 391) Barbados Territorial Waters Act (Cap. 386), the Marine Boundaries and Jurisdiction Act (Cap. 387), the Defence Act (Cap. 159), the Shipping Act (Cap. 296), and the Town and Country Planning Act (Cap. 240) which defines coastal setback lines for construction purposes and establishes all planning requirements for development.

The CZMU regulates, makes recommendations and educates the public on coastal management. In addition, it oversees coral reef monitoring and all coastal engineering projects around the island as well as consultations with the Town and Country Development Planning Office (TCDPO) for onshore and offshore coastal development. The CZMU does the planning assessments and then advances them to TCDPO for final decisions. This process helps to ensure coastline protection and prevents beach erosion (Scruggs and Bassett, 2013).

The CZMU's efforts in integrated coastal zone management as well as the team's technical expertise are lauded as best practices at both regional and international level.

Barbados currently has one marine protected reserve along the island's west coast: the Folkestone Park and Marine Reserve, also known as Barbados Marine Reserve which was established in 1981. The Marine Areas (Preservation and Enhancement) (Barbados Marine Reserve) Regulations, 1981 provide for the management of the Reserve. It is a no fishing area with four zones for (i) scientific research, (ii) northern water sports, (iii) recreational, and (iv) southern water sports. There are plans to extend the existing boundaries of this managed marine area. There are also plans to establish a new marine management area on the south coast through the designation of Carlisle Bay with extended boundaries.

Generally, all major coastal works performed on the island's coastline have been implemented by the government. Most projects and activities are carried

#### Box 4. The coastal zone management unit

The Coastal Zone Management Unit (CZMU) was formed in 1996 to manage the coastal zone of Barbados. In 1998, the CZMU implemented the Coastal Zone Management Act and Marine Pollution Control Act to preserve the marine areas within the country (Moore et al. 2014; Government of Barbados). The elements of these Acts are designed to ensure the integrity and sustainability of the marine habitat and resource and provide the basis and foundation of the coastal and marine environmental services sector.

out under a standard public sector procurement model. Some work conducted on the coastal and marine environment in Barbados is implemented by both the public and private sector. For example, the construction of the Richard Haynes Boardwalk on the south coast of Barbados was funded by the government and the Inter-American Development Bank with the design and construction supervision being implemented by an international consulting firm in collaboration with the CZMU. It provides environmental services such as ground water filtration into the nearshore, shoreline stabilization, storm wave protection to properties, beach erosion control, and is utilized by locals and tourists alike for recreation. Private coastal property owners develop their independent property protection designs for implementation that must be reviewed by the CZMU, through the town and country development planning process, to ensure that the proposed work does not negatively impact adjacent properties or sediment distribution pathways along the coast.

With regards to implementation of work, very few public-private partnerships (PPP) between governments and consultants exist worldwide. One example of PPP approach in the coastal and marine sector is the work of Blue Finance,<sup>23</sup> an NGO which promotes and facilitates co-management of marine protected areas, including developing sustainable financing mechanisms. They have been successful in their approach in the Dominican Republic through their PPP agreement for the co-management of a protected area. Blue Finance has also held stakeholder consultations in Barbados but the progress has been slow due to previous lack of stakeholder buy in.

### 3.6. Measurement challenges and economic implications

Only a few, mainly OECD countries routinely gather statistics on trade in environmental services at a

highly-disaggregated level. This is not only due to limited country effort, but also a lack of specification or detail in international reporting frameworks. Not surprisingly, this trend also applies to other countries in the Caribbean region and ultimately reduces the scope and quality of sector analysis.<sup>24</sup>

In terms of public sector expenditure, the United Nations Framework for the Development of Environment Statistics (FDES 2013) recommends that basic national environmental statistics should include information about how much government is spending on environmental protection (Basic Set of Environment Statistics of the FDES<sup>25</sup>). Although in practice, most countries do not generate this data.

Two major conclusions regarding the trade in environmental services in CARICOM are that: (1) there is limited appreciation of the existence of an environment industry and (2) there is a dearth of hard data in relation to the environment industry, particularly so in the area of valuation studies on environmental services in Barbados. However, there is no systematic record of environmental services required locally, produced locally or imported (Griffith, 2009).

In line with these trends, officially-reported statistics on services related to the environment in Barbados is limited. A single balance of payment (BoP) record of 2014 reveals the existence of cross-border exchanges in “waste treatment and depollution, agricultural, and mining services”.<sup>26</sup> Total receipts (to exports) and payments (from imports) Barbados amounted to \$10 million and \$16 million respectively. Yet, the broad perimeter of the item – which also includes services incidental to agriculture (including fishing) and mining – does not allow drawing conclusions on the type and nature of traded services. One main (and only) finding is perhaps the existence of domestic demand (and a trade balance deficit) for services related to the environment.

**Figure 23: Drivers of growth of the environmental services sector in Barbados**

	Enironment-related	Neutral
Cross-border	<ul style="list-style-type: none"> <li>• SDGs/green demand</li> <li>• Climate and oceans action (oceans clean-up, sargassum)</li> <li>• Business sustainability/circularity</li> </ul>	<ul style="list-style-type: none"> <li>• Regional demand (hubbing)</li> <li>• Cultural/geographic proximity</li> <li>• Relatively high tradeability</li> </ul>
Domestic	<ul style="list-style-type: none"> <li>• Coastal assets</li> <li>• Transition to renewables</li> <li>• Ratification of MEAs</li> <li>• Green capital inflows (GEF)</li> </ul>	<ul style="list-style-type: none"> <li>• Large tourism sector</li> <li>• Competitiveness (ICT readiness, education)</li> <li>• Public-private momentum</li> </ul>

Source: UNCTAD secretariat analysis, 21 February 2019.

**Table 14: List of engineering companies and the coastal and environmental services provided in Barbados and the Caribbean region**

Engineering consultancies	Local	Regional	International	Services
W.F. Baird & Associates Coastal Engineers Ltd.	x	x	x	<ul style="list-style-type: none"> <li>• Ports &amp; harbours</li> <li>• Waterfronts</li> <li>• Water quality solutions</li> <li>• Hydropower &amp; renewables</li> <li>• Watersheds &amp; coastal management</li> <li>• Hydraulics &amp; hydrology</li> </ul>
Consulting Engineers Partnership (CEP) Ltd.	x	x		<ul style="list-style-type: none"> <li>• Structural &amp; civil engineering</li> <li>• Project &amp; construction management</li> <li>• Land use planning, studies &amp; investigation/assessments</li> <li>• Damage assessments after natural hazards</li> </ul>
Adams Consulting International	x	x	x	<ul style="list-style-type: none"> <li>• Structural &amp; civil engineering</li> <li>• Project &amp; construction management</li> <li>• Flooding &amp; storm water management</li> <li>• EIA investigation/assessments</li> <li>• Drainage, hydrology, &amp; other specialised services</li> </ul>
Smith Warner International	x	x		<ul style="list-style-type: none"> <li>• Beach &amp; shoreline protection</li> <li>• Climate resilience &amp; hazard mitigation</li> <li>• Coastal process investigation</li> <li>• Marinas &amp; ports</li> <li>• EIA &amp; Coastal zone management</li> <li>• Flooding &amp; storm water management</li> <li>• Data collection &amp; monitoring</li> </ul>
Stantec Consulting Caribbean Ltd	x	x	x	<ul style="list-style-type: none"> <li>• Planning</li> <li>• Engineering, architecture, interior design, landscape architecture surveying</li> <li>• Environmental sciences, project management &amp; project economics for infrastructure and facilities projects</li> </ul>

On a different note, BoP records may help detecting some (exogenous) drivers of growth of the environmental services industry. For instance, exports of travel services—whose majority is made of tourism—amounted to over \$1 billion in 2017, corresponding to 54 per cent of Barbadian exports. This signals an important weight of the tourism sector, a primary purchaser of environmental services, in the national economy. A selection of drivers of the environmental services sector, classified according to their nature (environmental and non-environmental) and geography (cross-border versus domestic), is provided in Figure 23.

### Services offered in the coastal and marine environmental sector

A wide range of coastal and marine environmental services are offered in Barbados, the region and internationally. The surveyed companies are based in,

have offices or are operational in Barbados with some retaining operations abroad (Tables 14 and 15).

### 3.7. Challenges in sustainable management

Pressures on coastal and marine resources as a result of tourism, pollution, coastal development, overfishing and coastal erosion in addition to climate-related factors affecting the decline on coral reefs may have a significant impact on ecosystem services and the tourism product for the island (Schuhmann, Skeete and Waithe, 2017).

The sustainable management, protection and restoration of coastal and marine environmental services is important to maintain ecosystems' health and resilience so that it can adequately provide economic, social, cultural and environmental services. The provision and increased supply of environmental services could contribute to respond to increase

**Table 15: List of coastal and environmental consulting companies and their services in Barbados**

Consultancies	Local	Regional	International	Services
Acclimatise Group Ltd.	x		x	<ul style="list-style-type: none"> <li>• Advises private and public sector on building climate resilience</li> <li>• Advisory services: climate risk assessment and adaptation, climate finance, communication &amp; knowledge management, research and innovation and learning services</li> <li>• Analytical services: application, spatial analysis, indicators &amp; indices and Earth observation &amp; space data</li> </ul>
Blue Green Initiative	x	x		<ul style="list-style-type: none"> <li>• Developing sustainable solutions for challenges faced socially, economically and environmentally</li> <li>• Projects range from coastal erosion, water access to social and economic monitoring</li> </ul>
Caribbean Sustainability Collective	x	x		<ul style="list-style-type: none"> <li>• Sustainability &amp; resilience</li> <li>• Idea, people &amp; resource mobilization</li> <li>• Practical learning</li> </ul>
The Caribbean Environmental Management Bureau	x	x	x	<ul style="list-style-type: none"> <li>• Corporate social responsibility partner</li> <li>• Innovation project development</li> <li>• Accredited course development/ training</li> <li>• Research and data analysis</li> </ul>
East Coast Conservation Organisation	x			<ul style="list-style-type: none"> <li>• Provision of consulting services in marine and terrestrial ecosystems on:</li> <li>• Invasive species research, national campaigns, environmental monitoring, histological processing, biodiversity tracking/mapping and habitat mapping</li> </ul>
Ecoisle Consulting Inc.	x	x		<ul style="list-style-type: none"> <li>• Specializes in physical planning and natural resources management</li> <li>• Assists governments, companies, organizations and other individuals</li> <li>• Offers services in the disciplinary fields of physical planning and natural resources management</li> <li>• Environmental planning, environmental policy analysis and design</li> <li>• Institutional analysis, environmental law</li> <li>• Land use planning, development planning, urban design</li> <li>• Project management, coastal areas management, tourism planning</li> <li>• Hazard mitigation planning, environmental assessments</li> <li>• Environmental education and training, workshop facilitation</li> </ul>
LNW Environmental	x			<ul style="list-style-type: none"> <li>• Water quality testing (small water quality lab) and environmental consulting</li> </ul>
Sustainable Caribbean	x	x		<ul style="list-style-type: none"> <li>• Environmental consulting on sustainable fisheries, environmental sustainability, climate change, ocean conservation, blue economy</li> </ul>

responsiveness and resilience.

Within the sector, there is a range of governance challenges. The knowledge to mitigate impacts exists but often there is a lack of financial resources and sometimes political will to make the necessary decisions. Another major challenge is the limited if not lack of public awareness of the value of the coastal and marine environments.

Greater collaboration of governmental agencies with private sector firms could be more efficient in implementing conservation strategies. The government could continue to lead and be responsible for

environmental policies, legislation and implementation process whereas private environmental services firms could continue to assist with providing technical expertise, and other related services. However, there are issues that speak to the propriety of information and its management. It has been proposed that there will be open access to data and information in the near future but that permission will still be required from the Cabinet of Barbados for the release of the information. There are precautions that have to be adhered to given the country's significant reliance on the tourism industry for foreign exchange.

As a government agency, the CZMU may not be able to trade their coastal zone management services and expertise as it is a government agency. However, Barbados could explore the option of creating an independent autonomous institute in addition to their exchange in expertise and technical assistance to other countries which would be a model to benefit from the capacity created through their best practice CZMU. This independent institute could also become a regional hub for best practices in the blue economy. Such an institute could be perhaps housed at the University of the West Indies to allow for institutional suitability.

Economy actors in the coastal and marine environmental services is a new area for the newly created Ministry of Maritime Affairs and the Blue Economy (MMABE). It is necessary for a focused approach to be developed to explore the areas where data may exist but have to be disaggregated from other existing data. Consideration must also be

given to the establishment of new data requirements that need to be collected and the manner in which it should be done. This would be an important area for a research section within the MMABE as it starts to formulate policies for determining blue economy contributions to the general economy.

The establishment of a voluntary e-register of companies and firms providing these services may contribute to have a better understanding of the coastal and marine environmental services providers. This voluntary e-register system could require and gather basic non-confidential data such as name, place of incorporation, legal representatives, type of services provided, number of employees, tax identification number, and participation in government procurement processes, among others. Incentives to join the register could be opportunities to participate in government procurement processes, visibility, transparency and inclusion in an export promotion catalogue. This could later be done in cooperation with the Caribbean Export Promotion Agency.

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## 4. AQUACULTURE SECTOR

### 4.1. Introduction

Recent years have seen the global share of aquaculture products in total fish and fisheries products soaring. Aquaculture represented about a quarter of overall fish production at the beginning of the century. In 2016, the figure was set at 47 per cent and the tendency remains an increasing one while that of marine production has been somewhat stagnating during the last 25 years. Competition on international markets is fierce and is often dominated by Asian countries such as China, Viet Nam or Thailand. The number of species that can be raised using aquaculture or mariculture techniques is limited, making competition even tougher.

Due to sustainable management, natural threats (hurricanes and tropical revolving storms) and substantial constraints e.g. lack of material resources, finances, trained human resources, and support services such as building construction and electrical repair, among others. Aquaculture sector has yet to reach its mature development<sup>27</sup> and benefit from greater capitalization, product/species diversification and expansion of key market destinations –the United States, Canada and other CARICOM markets.

### 4.2. Coastal aquaculture and mariculture

At present, no coastal aquaculture activities are being undertaken in the country. There was an interest by a number of individuals in culturing *Gracilaria* seaweeds (*Gracilaria spp.*) or “seamoss” as known locally in Martin’s Bay, Conset Bay and a West Coast location. Experimental cultivation was initially started by the Fisheries Division in 1989 with a local strain of the seamoss being cultured using floating rafts on the West Coast. Unfortunately, all rafts were eventually stolen but preliminary results indicated that the seaweed grew well under the prevailing conditions on the west coast of the island.

Furthermore, Conset Bay on the East coast was identified as a feasible location for cultivation of sea moss. In December 2017, there was a regional workshop on seamoss farming sponsored by Blue Revolution to improve production and marketing of seamoss, in which an individual from the local Conset Bay community attended and received training from.

There is currently no mariculture of seamoss as it competes with coastlines and nearshore that are filled with hotels and other tourist related activities. However, there were talks of a private pilot seamoss farming initiative being conducted on the west coast of

**Figure 24: Aquaculture production in Barbados, 2006 – 2016**



Source: FAO FishStatJ, 2018.

Note: Data are FAO estimates from available source of information or calculation based on FAO experts' specific assumptions.

Barbados in 2018 and there appears to be potential to develop mariculture in offshore cages. Under the FAO's Climate Change Adaptation in the Eastern Caribbean in the Fisheries Sector (CC4Fish) project, four manuals are being developed on seamoss farming.

### 4.3. Sector trends

The focus in this section is on production recorded officially and on respective figures sent to international organizations for publication. Consequently, only inland aquaculture production of freshwater species is informed.

#### 4.3.1. Production

FAO started producing statistics on inland freshwater aquaculture of Barbados in 2006, with the production of two species, red tilapia (first introduced in the 1980's) and red claw crayfish which supplied the local market.

Available data reveals a small but fast-growing sector. Yet, all production is sold and consumed locally with no export. As mentioned previously, there are currently three privately-owned and operated farms that produce and sell fish crop.

In the period 2006-2016, aquaculture production has increased at an annual average rate of 29 per cent. Reported production increased from two tons in 2006 to 26 tons in 2016, with red tilapia accounting for the vast majority of it (25 tons) (see Figure 24). In the same year, the sector generated revenues amounting to \$256,000.

#### 4.3.2. Employment

The largest aquaculture producing farm operating in the island employs two people (Table 16). However, there are many small commercial aquaponics set ups and backyard producers, approximately 15 small commercial aquaponics who sell to local market and 50 backyard producers.<sup>28</sup>

Adams Aquafarm is currently working with FAO on an aquaculture and visitor centre, and development of small aquaponics for the backyard.<sup>29</sup> The farm sells tilapia whole fish at \$3.50-\$4/lb<sup>30</sup> and used to sell fillets at \$7.50 but have discontinued selling the fillets. Crayfish sell at \$12.50/lb live weight.<sup>31</sup>

**Table 16: Individuals conducting aquaponics production in Barbados**

Individual/Business	Number of employees
Kristina Adams (Adams Aqualife)	2
Damian Hinkson (Baird Village Aquaponics)	1
Cassandra Cain – (Holligan)	1
Everton Hoyte	1
Rondell Lynch	1
Ryan Medford	3

Source: Author's survey, 2018.

### 4.4. Challenges and opportunities

Despite the prediction of a significant expansion of aquaculture and mariculture production in Latin America and the Caribbean (LAC), Barbados has seen slow progress in this area. This is on the back of some favourable tropical conditions such as high temperature and salinity that could aid the development of aquaculture and mariculture. However, factors such as the irregularity of rainfall, frequent droughts during the dry season and the location of Barbados in the hurricane belt compound their development. Moreover, although aquaculture products have generally favourable market conditions, the acceptability of some cultured species has been low as Barbadians have a preference of taste for marine fish. But these elements may not be enough to explain the current state of non-capture fish production in Barbados.

#### 4.4.1. Aquaculture

Since the early 1980's, there has been commitment by governments in the Caribbean to extend fish production from capture fisheries to aquaculture. However, unlike e.g. Belize and Jamaica that are at a commercial phase of development, Barbados is still at the experimental stage.

The development and implementation of pilot projects based on viable economic models to validate and adopt if and where necessary the technologies available has already provided important information about feasible schemes.

A FAO Technical Cooperation Project (TCP/BAR/9151) was carried out in 1991 aimed at assessing the feasibility of aquaculture development in Barbados. Much of the work conducted in this project remains relevant as there are some common factors to the Caribbean that influence future aquaculture production.

Currently, the scope to expand sustainable aquaculture for both domestic and external consumption is limited in Barbados due to land and coastal space as well as freshwater supply limitations. With regards to the land, the limited supply of both freshwater and suitable soil type are major constraints to further development. In addition, the permeable nature of coral rock, which forms over 80 per cent of the island, causes the almost complete lack of surface run-off especially during the dry season. There are also high rates of evaporation which make fresh water pond culture difficult. Construction of ponds which must be excavated to depths sufficient to provide adequate reserves of water to compensate for evaporation are costly. From both a technical and economic perspective, semi-intensive pond culture on a commercially viable scale has been deemed to be infeasible (Freddi, A. and FAO, 1991).

The culture of tilapia in land-based concrete tanks, however, still has some potential (CRFM, 2014b) which has been reinforced by the slight shift towards the adoption of tilapia that has been identified. Further development of this sector would require additional marketing on these species.

#### **4.4.2. Mariculture**

In principle, Barbados appears to be more suited to mariculture. With regards to the potential species to

be reared and taking into account the physical factors that greatly determine the possibility of commercial aquaculture development in Barbados, there is some potential that may exist for the following types of culture:

- bivalve culture along the south and west coast such as raft culture of oysters (which are already being reared in Jamaica, [CRFM, 2014b]) or the potential of the south; American rock mussel (*Perna perna*) which is heavily exploited in Venezuela and Trinidad and Tobago (FAO, 1993a);
- rearing of juvenile queen conch (*Strombus gigas*) for reseeding of shallow water areas;
- Gracilaria seaweeds (*Gracilaria spp.*, also known as “seamoss” locally) cultivation using long-lines;
- cage culture for dolphinfish.

Before disregarding the idea of expanding inland aquaculture and mariculture, this document suggests an updated and detailed study to determine feasibility for production of selected species considering the combination of unfavourable conditions and associated factors that limit the type of aquaculture and the species that can be reared is clearly necessary. Such study goes beyond the scope of the synthetic analysis undertaken in this document and would require some significant investment of time and resources.

## APPENDIX 1:

### Relevant international regulatory framework

Barbados is a Party to the following agreements:

- International/regional trade and economic integration treaties:
    - » World Trade Organization and goods and services related Uruguay Round Agreements, (1994). The WTO Agreements on technical barriers to trade (TBT) and on sanitary and phytosanitary measures (SPS) will be particularly relevant in the case of seafood manufacturing;
    - » Founding Member of the Caribbean Community (CARICOM), (1973) and Member of the Central American Integration System (SICA), (1998);
    - » The CARIFORUM-European Union Economic Partnership Agreement (EPA), (2008);
    - » Aquaculture: Various free trade agreements (FTAs) with Colombia, Costa Rica, Cuba, Dominican Republic, Guatemala and Venezuela.
  - Law of the Sea (For further analysis of the law of the sea and multilateral environmental agreements, see *The Legal and Institutional Framework Governing Ocean-based Economic Sectors in Barbados* (UNCTAD-DOALOS, forthcoming):
    - » The United Nations Convention on the Law of the Sea (1982);
    - » The United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (The United Nations Fish Stocks Agreement), (1995).
  - Fisheries:
    - » FAO's Port State Measures Agreement (PSMA), (2010);
    - » Fisheries regional bodies relevant to aquaculture:
      - ◊ Latin American Organization for Fisheries Development (OLDEPESCA);
      - ◊ Central America Fisheries and Aquaculture Organization (OSPESCA);
      - ◊ Caribbean Regional Fisheries Mechanism (CRFM).
  - Environment:
    - » The Convention on Biological Diversity (CBD) (1992);
    - » The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity (The Nagoya Protocol on Access and Benefit Sharing (2010);
    - » The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1975).
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- 6&chapter=21&Temp=mtdsg3&clang=\_en. Accessed on 5 June 2019.
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## Notes

- 1 <https://stock.adobe.com/bg/images/barbados-political-map/81632630>.
- 2 See <https://barnufo.org>.
- 3 <https://www.st.nmfs.noaa.gov/st4/documents/FishGlossary.pdf>.
- 4 See UNCTAD (2016) for a detailed discussion.
- 5 Scientific evidence i.e. "...as qualified by relevant environmental and economic factors, including the economic needs of coastal fishing communities and the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global." (Article 61 (3) of UNCLOS, 1982).
- 6 See <http://www.fao.org/fishery/statistics/software/fishstatj/en>.
- 7 For tunas, raised landings as required by ICCAT are reported. For the Barbados social and economic report, recorded landings are reported.
- 8 See <https://www.nationnews.com/nationnews/news/96267/issue-saving-land-future>.
- 9 Seafood processing refers to larger scale processors operating outside of the market with investment in infrastructure. Processing refers to small processors that buy and clean fish; also, known as vendors (information provided by Barbados Fisheries Division, 2019 during an interview).
- 10 BBD/\$: 2.00/1 as at 21 February 2019 (<https://www.xe.com>).
- 11 <https://www.iccat.int/en/RecRes.asp>.
- 12 Raw calculations based on the number of arrivals and the average length of stay indicate that tourist population would correspond to a permanent population of 20000. Assuming tourist and Barbadians have the same propensity to eat fish the total fish supply per capita would be slightly more than 24kg/capita.
- 13 Businesses which are listed under Part II- B of the Customs Tariff are exempted from customs duty. Included under this section are all manufacturers and agriculturalists (who purchase packaging materials, machinery and other equipment) which are imported for business use.
- 14 Animal products not elsewhere specified or included; dead animals of Chapter 1 or 3, unfit for human consumption.
- 15 The Central Product Classification (CPC) has had five versions to date: (1) Provisional CPC (1991); (2) CPC Version 1.0 (1998); (3) CPC Version 1.1 (2002); (4) CPC Version 2 (2008); (5) CPC Version 2.1 (2015).
- 16 "A service supplied in the exercise of governmental authority" is defined as any service which is supplied neither on a commercial basis, nor in competition with one or more service suppliers.
- 17 See [https://www.wto.org/english/docs\\_e/legal\\_e/26-gats.pdf](https://www.wto.org/english/docs_e/legal_e/26-gats.pdf).
- 18 At present, the GPA has 19 Parties comprising 47 WTO members.
- 19 UNCTAD's sector definition, indicators and data sources for ocean-based sectors for the Oceans Economy and Trade Strategies (OETS) project"; working document: <https://unctad.org/en/pages/MeetingDetails.aspx?meetingid=2052>.
- 20 See [https://docs.wto.org/dol2fe/Pages/FE\\_Search/FE\\_S\\_S009-DP.aspx?language=E&CatalogueIdList=31391,10335,2244,15832,33570,37471,26509&CurrentCatalogueIdIndex=6&FullTextHash=&HasEnglishRecord=True&HasFrenchRecord=True&HasSpanishRecord=True#](https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S009-DP.aspx?language=E&CatalogueIdList=31391,10335,2244,15832,33570,37471,26509&CurrentCatalogueIdIndex=6&FullTextHash=&HasEnglishRecord=True&HasFrenchRecord=True&HasSpanishRecord=True#).
- 21 See detailed analysis at [http://www.sice.oas.org/TPD/CAR\\_EU/CAR\\_EU\\_e.asp](http://www.sice.oas.org/TPD/CAR_EU/CAR_EU_e.asp).
- 22 See <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:289:0003:1955:EN:PDF>.
- 23 See [www.blue-finance.org](http://www.blue-finance.org).
- 24 Most international trade in services databases, such as UNCTADStat, abundantly draw from Balance of Payments (BoP) statistics reported by countries according to the Extended Balance of Payments Services classification (OECD, 2010). As Box 5 shows, such a reporting framework lacks the level of detail that is necessary to capture trade in marine and coastal environmental services. In order to shed light on it, relevant information shall be collected at the firm level. Findings from preliminary data collection in Barbados are presented in section 3.7. Government support in gathering granular BoP data and/or obtaining access to official business statistics (national business registers etc.) is crucial to advance this type of research in the future.
- 25 See <https://unstats.un.org/unsd/envstats/fdes/basicset.cshtml>.
- 26 Item 10.3.2 of the 2010 Extended Balance of Payments Services Classification (EBOPS 2010).
- 27 See [http://www.fao.org/fishery/countrysector/naso\\_belize/en](http://www.fao.org/fishery/countrysector/naso_belize/en).
- 28 These are non-official data. Estimates are based on personal conversations with the producers.

- 29 For a description of the activity see <https://www.facebook.com/adamsaqualife/>.
- 30 1lb = 0.45kg.
- 31 These are non-official data. Estimates are based on personal conversations with the producers.
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