

SWORDFISH Market Analysis Report

BARBADOS

UNCTAD and United Nations Division
for Ocean Affairs and the Law of the Sea
Oceans Economy and Trade Strategies Project

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United Nations publication issued by the United Nations Conference on Trade and Development

UNCTAD/DITC/TED/2022/3

eISBN: 978-92-1-002197-5

Acknowledgements

This report was produced by the United Nations Conference on Trade and Development (UNCTAD) under the Oceans Economy and Trade Strategy (OETS) project, funded by the United Nations Development Account and implemented by UNCTAD in cooperation with the Division for Ocean Affairs and the Law of the Sea (DOALOS) of the Office of Legal Affairs of the United Nations. The report was written by Dr. Shelly-Ann Cox, UNCTAD, DOALOS and Barbados National Fisheries consultant. The document benefited from substantive contributions of the staff of UNCTAD (David Vivas Eugui, Carla Vaca Eyzaguirre and Maria Durleva) and of DOALOS (Francois Bailet, Michele Ameri, and Bingzhuo Li). It also benefited from the comments of Barbados Fisheries Division staff, namely Joyce Leslie, Philip Jackman, Christopher Parker and Colvin Taylor, as well as from Travis Sinckler, Ministry of the Environment, National Beautification and the Blue and Green Economy of Barbados. Laura Moresino-Borini designed the cover and performed the desktop publishing.

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Explanatory notes

Reference to “dollar” and “\$” indicates United States dollars, unless otherwise stated.

Use of a dash (–) between dates representing years, e.g., 2015–2017, signifies the full period involved, including the initial and final years.

Reference to “t” is made for metric tons.

Reference to “M” is made for millions.

Reference to “mph” is made for miles per hour.

Reference to “lb” is made for pounds.

Reference to ‘kg’ is made for kilograms.

To reflect the closest estimate for data, decimals and percentages are rounded off. Numbers in money are rounded to the nearest dollar, unless otherwise stated.

Decimals and percentages in this document do not necessarily add up to totals because of rounding.

Abbreviations and acronyms

ALDFG	abandoned, lost, or otherwise discarded fishing gear
BARNUFO	Barbados National Union of Fisherfolk Organisations
BFD	Barbados Fisheries Division
BTMI	Barbados Tourism Marketing Inc.
CARICOM	Caribbean Community
CRFM	Caribbean Regional Fisheries Mechanism
DOALOS	Division for Ocean Affairs and the Law of the Sea
FAC	Fisheries Advisory Committee
FAO	Food and Agriculture Organization of the United Nations
FLE	Fisheries Learning Exchange
HS	Harmonized System
ICCAT	International Commission for the Conservation of Atlantic Tunas
NTMs	non-tariff measures
OETS	Oceans Economy Trade Strategies (project)
SPS	sanitary and phytosanitary measures
TNC	The Nature Conservancy
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
VMS	vessel monitoring system



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Executive summary

This report documents the outcomes of the investigation of the market potential (both local and export) for swordfish (*Xiphias gladius*). The objective of this preliminary study is to expand sustainable production opportunities available within the Barbados quota allocations for swordfish under the International Commission for the Conservation of Atlantic Tunas (ICCAT). The report begins with an introduction of the UNCTAD-DOALOS “Evidence-based and policy coherent Oceans Economy and Trade Strategies” (OETS project) and its overall objective. A brief overview of the longline fishery including a historic development timeline is presented to provide context and highlight major milestones over a 70-year period. Information on swordfish biology, harvesting and management is also outlined.

A multi-method approach, which included both primary and secondary data collection was employed in this study. Data collection, including 55 semi-structured interviews, analysis of swordfish landings, imports and exports, a literature review and participant observation, was conducted during the first semester of 2022. The use of multiple methods and data sources allowed researchers to obtain information on respondents' perceptions on barriers and enablers to establishing and sustaining a local swordfish market. Stakeholder perceptions and information gleaned through desk study were categorised into main themes that best illustrate key issues and opportunities at the different stages along the value chain (*i.e.*, inputs, harvest, processing and distribution, sales and marketing and consumers) and the essential support activities including quality control and environmental and social safeguards.

Swordfish landings by longline fishing vessels averaged 15t over the period 1997–2020. Landings were quite variable from year to year given the fact that swordfish are usually incidental catches and not specifically targeted by the longline fleet. Landings were well below the allotted annual quota of 45t (round weight) for swordfish except in 2005 when 44t was landed, with the longline fleet accounting for 33t. Exports have been minimal in recent years due to the low prices (\$3.75/lb) being offered by the Miami importer. However, prices in 2022 have increased to \$5.50–7.50/lb providing an opportunity to increase exports. Input costs for longline vessels generally range from \$4,500–10,500 for a typical 7–14-day trip resulting in a high market price for this premium product. Fresh swordfish is sold from the boat at \$4.00/lb, while market prices range from \$5.00–10.00/lb.

This preliminary analysis has given insight to the key issues and opportunities that exist along the value chain to promote the expansion of the local and export swordfish market. The recent increase in the export price offers an opportunity to explore new markets and earn foreign exchange. Key findings suggest that there is room for expansion within sustainable limits. However, there are some barriers that have hindered development in the past including high operational costs, limited access to funding and inconsistent data collection, along with, low ex-vessel price and lack of marketing and limited value added. Enablers also exist that can be promoted as interventions for changing practices such as communication tools and technology, youth engagement and fisherfolk leadership, representation, and advocacy. Recommendations for future development of swordfish local and export markets including innovative ideas for marketing swordfish are also presented. Literature cited and other resources are included in the penultimate section of this document. Appendices including interview questions, fuel receipts and examples of marketing initiatives close the report.

Summary of key findings:

- The Barbados longline fishery is currently an important contributor to the Barbados fishing industry. This fishery contributes over 90 per cent of the countries' landings of tunas, billfish and swordfish.
- There is room for expansion of the swordfish fishery in Barbados within sustainable limits. The current landing average of 15t is well below the annual quota of 45t. This presents an opportunity to increase production threefold, but there are some barriers that have hindered development in the past that will need to be addressed by both the public and private sector. Enablers also exist that can be promoted

as interventions for changing practices. For example, data-driven solutions including the integration of digital technologies in data collection should be considered to overcome barriers and promote evidence-based decision making.

- Demand for swordfish is increasing given its high-quality flesh, excellent palatability and nutritional value. The demand for swordfish in Barbados is quite high as indicated by the import data for 2020 and 2021. This confirms that there is a significant local market for fresh swordfish. Input cost reduction strategies should be explored to increase the profitability of the existing fishery, and to encourage investment by boat owners and captains.
- In Barbados, the nutritional value of swordfish is less promoted, and generally less known. This contrasts with international markets, including the United States, where swordfish nutritional properties are the main messages used in marketing. This has resulted in increased international demand for swordfish and a higher price being offered by the United States importers.
- Innovative marketing strategies that employ people-centered approaches and gender-neutral schemes should be developed in collaboration with partners such as the Barbados Tourism Marketing Inc (BTMI). These approaches use sophisticated consumer insights that allow a segmentation based on consumer's personality traits, interests and lifestyle.
- A multispecies traceability programme for large pelagics is highly recommended to promote access to other markets outside of the United States of America. This includes exports to Caribbean Community (CARICOM) countries given the fact that the regional market does not impose internal barriers and an external tariff scheme.

Section 1

Introduction

1. Introduction

This section provides a report outline, summary of the UNCTAD-DOALOS “Evidence-based and policy coherent Oceans Economy and Trade Strategies” (OETS project)¹ its overall objective and related project activities. A brief overview of the longline fishery including a historic development timeline is also presented. Information on swordfish biology, harvesting and management is outlined in the final sub-section of the introduction.

1.1. Report outline

This report documents the outcomes of the investigation of the market potential both local and export for swordfish (*Xiphias gladius*). The document begins with a summary of the UNCTAD-DOALOS OETS project, its overall objective and related project activities. A brief overview of the longline fishery including a historic development timeline is also presented to provide context and outline major milestones over a 70-year period. Following the introduction, the multi-method approach employed in the study and key findings are outlined. The discussion section outlines barriers that have hindered development of swordfish markets in the past and enablers that can be promoted as interventions for changing practices. Recommendations for future development of swordfish local and export markets including innovative ideas for marketing swordfish are also presented. Literature cited and other resources are included in the penultimate section of this document. Appendices including interview questions, fuel receipts and examples of marketing initiatives close the report.

1.2. UNCTAD-DOALOS OETS Project

The United Nations Conference on Trade and Development (UNCTAD), in cooperation with the Division for Ocean Affairs and the Law of the Sea of the Office of Legal Affairs of the United Nations (DOALOS), had implemented the OETS project from January 2018 to June 2022, within the framework of the 11th tranche of the United Nations Development Account. The beneficiary countries of the project were Barbados, Belize, and Costa Rica.

The OETS project aimed at supporting coastal developing countries, and particularly Small Island Developing States (SIDS), in realizing economic benefits from the sustainable use of marine resources and understanding the legal and institutional frameworks underpinning such potential. It further assisted coastal developing countries and key stakeholders in promoting the sustainable trade of products and services in ocean-based economic sectors by analysing, elaborating, and adopting evidence-based and policy-coherent OETS and enhancing national implementing capacities (UNCTAD, 2018).

In the context of the implementation actions for Barbados under the OETS project, an update and expansion of the 2008–2010 study “Economic Valuation of the Barbados Longline Fishery-Landings, Costs, Net Profit and Return on Investment” was commissioned at the request of the Barbados Fisheries Division. Additional project activities include the exploration of the market potential for both local and export of swordfish and the implementation of an experimental fishing exercise to identify best fishing techniques and costs for swordfish harvesting. The objective of this preliminary study is to expand sustainable production opportunities available within the Barbados quota allocations for swordfish under ICCAT. Finally, an assessment of the impact of circle hooks on catch composition and the rates of live versus dead capture of all species at haul-back taken by local longline gear will be conducted.

The preliminary findings of these experiments will be presented to stakeholders for their feedback, and participants will be encouraged to offer innovative ideas for marketing and selling swordfish. It is anticipated that the outcomes of this OETS project component will improve the capacity of national stakeholders to assess and identify promising products and/or services in key ocean-based economic sectors within the framework of the 1982 United Nations Convention on the Law of the Sea (UNCLOS).²

1.3. Brief overview of the Barbados longline fishery

The development timeline of the longline fishery in Barbados spans approximately 70 years (**figure 1**). The first notable milestone on the timeline occurred in the 1950s when experiments with miniature surface longlines were conducted by the Barbados Fisheries Division (BFD) (Wiles, 1963). A decade later, fishing trials were conducted with much longer surface longline gear under the UNDP/FAO Caribbean Development project. These trials had little success and it was concluded that it would not be profitable to develop a longline fishery in the eastern Caribbean region.

During the winter of 1983–1984, United States long liners operating in the region effectively demonstrated that fishing for large pelagics in the Eastern Caribbean region was financially viable (Hunte *et al.*, 1994). This stimulated the interest of some local boat owners in the fishery and experiments with small longlines were conducted on some of the larger iceboats (Weidner *et al.* 2001).

In January 1988, trials using a typical longline operation to target swordfish ("Florida Style") were conducted as part of the Crown Agent Institutional Strengthening Project (Crown Agents, 1990). According to the report, the style of operation was very different to that which was practiced in Barbados at the time. Unfortunately, there was no account of the results of the trials in Volume 3 of the report.

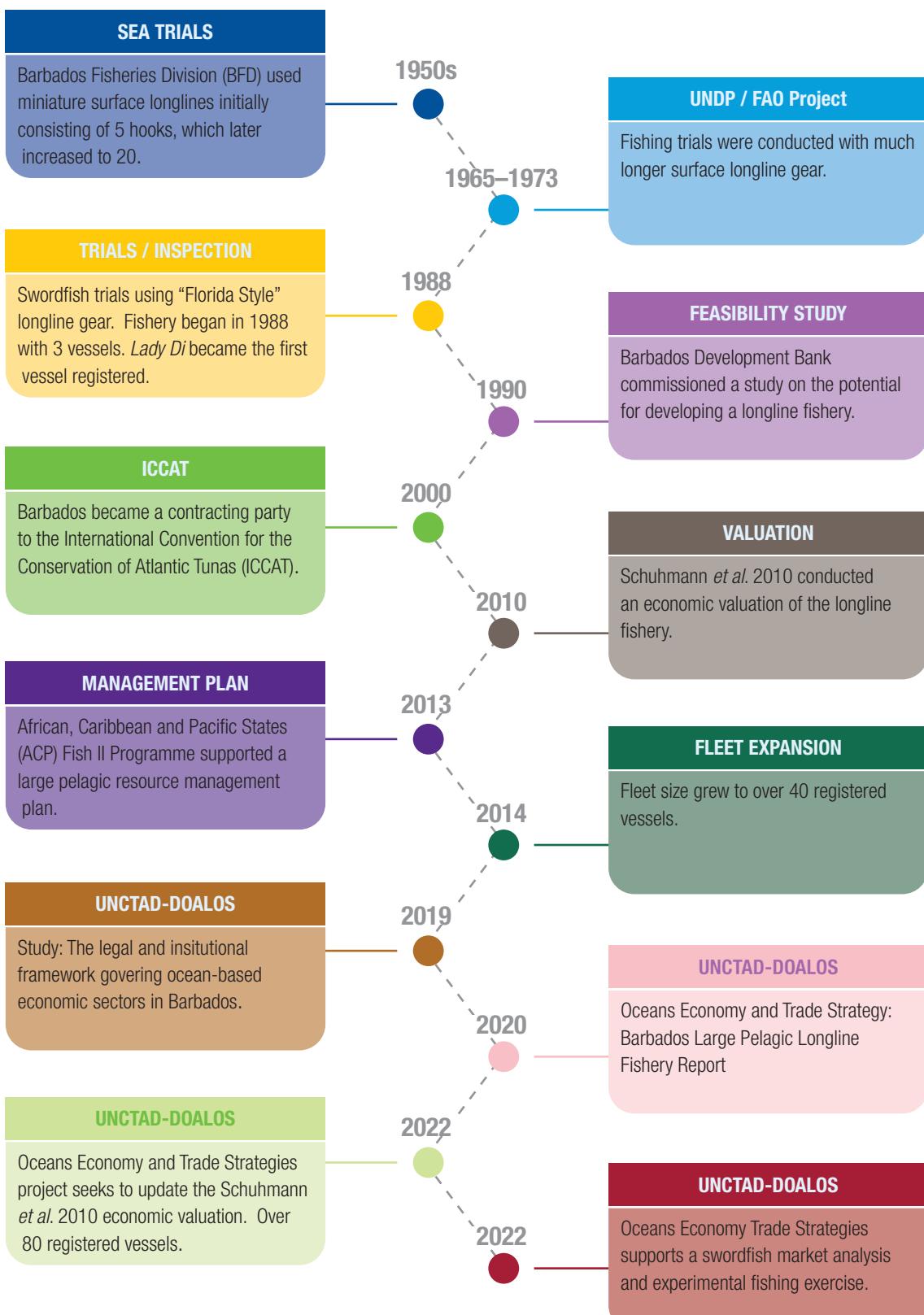
Commercial fishing had a modest start in 1988 with just three vessels and *Lady Di* becoming the first longline vessel registered to operate in Barbados according to BFD records. *Dragon Bay* was reported by key informants to be the first operational longliner. Since then, the fishery has grown rapidly, experiencing several shifts in target species, gear design and fishing operations (Walcott *et al.* 2009). Large pelagic species specifically targeted include mainly sailfish (*Istiophorus albicans*), blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*) collectively referred to as billfish; and the aggregate group of tunas comprised primarily of yellow fin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*) and albacore (*Thunnus alalunga*). Swordfish (*Xiphias gladius*) are also taken on longline gear.

The Barbados longline fishery is currently an important contributor to the Barbados fishing industry. It contributes over 90 per cent of the State's total catch of tunas, billfish and swordfish. The fishery was valued at \$5.3M in 2009 after considering vessel-level spending, landings and fleet earnings (Schuhmann *et al.*, 2010). Exports generate approximately \$1.6M in foreign exchange annually, based on an average of 176t tuna being shipped to the United States.

During sargassum years (2011–present), flying fish landings, which accounted for 62 per cent of total landings before 2011, now only account for 36 per cent (Leslie, 2021). Over the same period, the contribution of large tunas has increased from 8 per cent to 17 per cent and billfish by 2 per cent. This recent development has shown the potential for the fishery to maintain a year-round supply of fresh fish and support full-time direct and indirect employment in the fishing industry.

Taking into consideration the achievements of the longline fishery in such a short timeframe, the existing pool of human resources, and the important contribution to the Barbados fishing industry, the immediate future of longlining seems certain. The long-term outlook of the sector however is dependent on a variety of factors including the status of the target and ancillary species, private sector investment and continued demand in local and export markets.

Figure 1.
Development timeline of the Barbados longline fishery, 1950s–2022



Source: Cox S.A., 2022.

1.4. Swordfish biology, harvesting, management and governance

Swordfish are one of the fastest predators in the ocean. Their streamlined body allows them to swim at high speeds, up to 50mph. They are described as highly migratory meso-pelagic fishes widely distributed throughout tropical and temperate waters between 45°N and 45°S, and in large, enclosed basins such as the Gulf of Mexico, the Caribbean and Mediterranean Seas (Palko *et al.*, 1981; Nakamura, 1985). Swordfish grow quickly and reach a maximum size of about 1,165 pounds and up to 14 feet long. However, the average size caught in the fishery is 50 to 200 pounds (NOAA, 2020). Swordfish have a lifespan of about nine years and reach sexual maturity between 4 and 5 years of age. Spawning occurs multiple times throughout the year in warm tropical and sub-tropical waters. Swordfish feed at the top of the food chain and are rarely preyed on by other animals. They feed on a variety of fish and invertebrates such as squid. Swordfish support significant commercial fisheries worldwide (approx. 66 countries), with recent global annual catches of around 110,000–120,000t (FAO, 2020). The species is also important to many subsistence and artisanal fisheries, and is a highly prized recreational sportfish (Moore, 2020).

Fishermen mainly use pelagic longline gear to harvest swordfish. Fishing is usually conducted at night with lightsticks acting as lures attached to the gear (Parker *et al.*, 2015). Rod-and-reel, harpoon, and buoy gear are also used to target swordfish. Pelagic longline gear has no impact on habitat because they're used in the water column and do not come into contact with the ocean floor.

Deep-drop fishing gear to harvest swordfish is being promoted by The Nature Conservancy (TNC) and partners as a more sustainable way to fish. A recent TNC magazine article outlines the following description of how the gear is configured to maximise catch rates:

“Fishing tackle is suspended off a buoy that floats at the water’s surface. A flag acts like a bobber, visually indicating when a fish has been caught. Instead of placing swordfish baits near the water’s surface, this new gear is set 800 to 1,200 feet deep. This is where swordfish are likely to be caught during the day, and where the baits will attract fewer other fish or marine mammals. The main line is outfitted with a weight to keep it steady in the ocean currents and reduce entanglement with other animals. It also has a small strobe light, believed to either attract swordfish or mimic the bioluminescence of squid. Baited hooks are attached to the main line.”
(Jenkins, 2021).

In 2000, Barbados became a contracting party to the ICCAT, the international fisheries management organisation,³ responsible for managing fisheries for large pelagic species. Since then, Barbados has been operating within the management restrictions of ICCAT which enforces an annual quota of 45t for swordfish. Parker *et al.*, 2015 outlines that Barbados acquires several rights and obligations in relation to the management of its large pelagics fisheries through its membership in ICCAT. The authors argue that to strengthen its negotiating position with ICCAT to benefit the local longline fishery, Barbados must both demonstrate a clear commitment to effectively manage the fishery while articulating its development objectives.

In 2013, a large pelagic resource management plan for Barbados was developed with support from the Africa Caribbean and Pacific (ACP) Fish II Programme. The main objective of the plan was to improve the management of the fishery to address central issues such as increasing profitability and controlling fishing pressure pending the collection of relevant data and information.

Future management measures to be implemented include the use of large circle hooks to prevent bycatch and the use of dehooking devices to release incidentally caught turtles. Circle hooks minimize the damage caused by hooking, giving sea turtles and other marine mammals a better chance of survival when released. The updated fisheries management regulations will also enforce a size limit of 50lbs for swordfish.

The operationalization of governance arrangements including the appointment of members to the new Fisheries Advisory Committee,⁴ an advisory body that advises the Minister on matters related to fisheries, is in progress. When implemented, the mechanism is expected to facilitate the designation of subcommittees which may include the formation of a longline fisheries advisory group to champion the implementation of management measures.

Section 2

Methodology

2. Methodology

A multi-method approach, which included both primary and secondary data collection was employed in this study. Primary data collection involved interviews with longline boat owners ($n=12$), longline captains ($n=4$), sport fishers ($n=2$), restaurants and hotels ($n=4$), and fisheries management officials ($n=3$). Barbados National Union of Fisherfolk Organisations (BARNUFO) board members were also consulted. Interviews were conducted in person at the Bridgetown Fisheries Complex, online using Zoom web conferencing platform and over the telephone. Semi-structured interviews were conducted since they facilitated a pre-determined list of interview questions (Appendix 1) but still gave the interviewers the scope to ask further and more in-depth questions. This flexibility allowed responses to be coded by theme, while still preserving the individuality of responses.

Interviewees were selected using a snowball sampling approach. The sole tuna exporter was a key informant consulted in the early stages of the study to ascertain the number of active boats ($n=32$) and acquire contact information for boat owners and captains. Snowball sampling is a non-probability sampling technique where existing participants recruit other participants for the study. Here, key informants identified other interviewees of interest. This method can be useful in identifying participants within a specific area since it exploits existing social relationships. This made it easier for researchers to find participants and as a result, data collection was cost effective and time efficient. Codes are used in the key findings section of the report to refer to the perspectives of key informants. The codes used follow a simple format KI BBD #, where 'KI' stands for key informant, BBD refers to Barbados and a specific number is included to differentiate interviewees.

Participant observation was also a key method used to support data collection and validate responses. Researchers were immersed in the day-to-day activities of participants through frequent visits to the Bridgetown fisheries complex to observe offloading, fish sales, and preparatory activities for fishing trips. This approach allowed the researchers an opportunity to observe social issues first-hand and provide information on human behaviours and experiences in a particular context.

Secondary data collection was conducted to gather existing data and information on the Barbados longline fishing industry generally and swordfish harvesting techniques, management challenges and marketing strategies specifically. Data and information were collected from peer-reviewed journal articles, technical reports, conference proceedings, newspaper articles, webpages, and grey literature. This review offered insight into the responses of key informants and validated information in many cases.

Swordfish landings data (1997–2020) were provided by the Fisheries Biologist of the Barbados Fisheries Division. Information on swordfish exports was acquired from the sole tuna exporter. Figures on swordfish imports were obtained directly from a large fish processor (2018–2022) and the Senior Economist in the Ministry of Agriculture and Food Security (2009–2021).

Information on non-tariff measures (NTMs) imposed by the United States as it relates to swordfish imports was downloaded from the Trade Analysis Information System (TRAINS) online database. Trade and market access data were collected using the Harmonized Commodity Description and Coding System generally referred to as "Harmonized System" (HS)⁵ which includes specific codes for swordfish, or explicitly list swordfish as part of an HS code. Swordfish can be found within the HS categories 0302 to 0305, which include various forms of presentation from fresh meats to frozen fillets.

The use of multiple methods and data sources allowed researchers to obtain information on respondent's perceptions on barriers and enablers to establishing and sustaining a local swordfish market. Data collection and review took place between 15 February–3 May 2022. Stakeholder perceptions and information gleaned through desk study were categorized into main themes of relevance to researchers, fisherfolk, fisheries management officials and policy makers interested in addressing gaps in knowledge and those concerned with supporting innovation using new fishing gear and harvesting methods.

A validation workshop⁶ was held on the 22 July 2022 at the Fisheries Division, Bridgetown Barbados. Forty-seven participants from the private sector, government and academia attended in-person and online via Zoom. Feedback from participants at the workshop has been integrated into this report.

2.1. Limitations

It was originally intended that the market analysis study would be conducted simultaneously with the swordfish experimental exercise to support participant observation, field trials, and offer insight into the profitability of trips where swordfish was targeted. Field trials would allow fresh swordfish and prepared dishes to be tested in real life selling conditions. Trials could also provide the opportunity to solicit consumer feedback and their willingness to pay. Due to delays with the procurement of gear and equipment, the experimental exercise began in the final month of project implementation.

The most recent fish import data available for this study (2009–2019) groups billfish imports under the same entry as swordfish. This made it difficult to determine the exact values of swordfish imports. However, the fish import data for 2020 and 2021 were disaggregated allowing figures for swordfish imports to be reported (see section 3.2). Recommendations have been made by the Chief Fisheries Officer to disaggregate the data in future reporting.



Section 3

Key findings

3. Key findings

In this section, a respondent profile, preliminary findings, and stakeholder perceptions are presented using a value chains lens. Evidence documented in published literature of the key constraints are also included. The implications of these findings are discussed in the section that follows.

3.1. Respondent profile

A total of 55 semi-structured interviews (table 1) were conducted over a two-and-a-half-month period (15 February–3 May 2022). These interviewees were a subset of the range of stakeholders (**figure 2**) involved in the harvesting, sale, and management of swordfish in Barbados. Given the short timeline of the study only key stakeholders were targeted.

Table 1.
Summary of key informant stakeholders

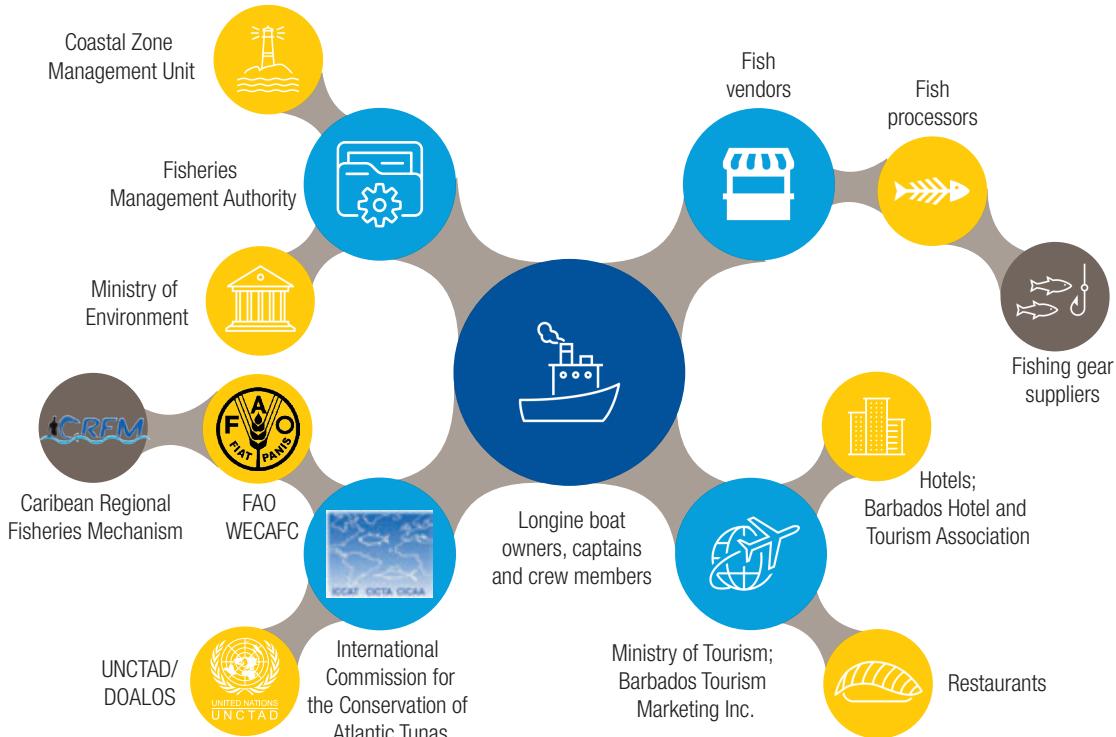
Interviewees	No. of respondents	Gender
Longline boat owners	12	12 M 0 F
Longline captains and crew members	25	25 M 0 F
Sport fishers	2	2 M 0 F
Fish vendors	5	2 M 3 F
Large fish processors	4	4 M 0 F
Restaurants and hotels	4	3 M 1 F
Fisheries management officials	3	2 M 1 F
TOTAL	55	50 M 5 F*

Source: Cox S.A., 2022.

Note: M (Male) and (F) Female.

* Respondents were mostly male given the fact that the fishery sector in Barbados is male dominated. There are no female longline fishers and only a few female-owned active vessels (n=5).

Figure 2.
Stakeholder map of key players involved in the harvesting, sale, and management of swordfish



Source: Cox S.A., 2022.

3.2. Swordfish landings, exports, and imports

Swordfish landings by longline fishing vessels (1997–2020) are illustrated in figure 3. Landings are quite variable from year to year (average of 15t) given the fact that catches are usually incidental as reported by longline captains and crew members. Swordfish catches are generally higher in the second half of the year (Schuhmann *et al.*, 2010). Landings are also well below the allotted annual quota of 45t (round weight) for swordfish. In 2005, the industry came close to reaching that quota when Swordfish landings reached 44t (Parker, Earle and Marshall-Gill, 2015), with the landings from the longline fleet accounting for 33t. The El Niño Southern Oscillation may be attributed as one of the factors that contributed to the exceptional low landings in 2019. Further research is needed to determine the reason for the occurrence.

In 2020, an increase in landings occurred amidst lockdowns and government restrictions during the COVID-19 pandemic, but it was still well below landings in previous years. In the most recent Caribbean Regional Fisheries Mechanism (CRFM) Statistics and Information Report (CRFM, 2021), swordfish landings were reported for only four Caribbean countries for the year 2017. These countries included Barbados (16t based on a 2016 estimate), Dominica (0.5t), Grenada (36.28t), and Trinidad and Tobago (35.61t). Disaggregated species weights were not available for 2019 and 2020 for most CRFM Member States.

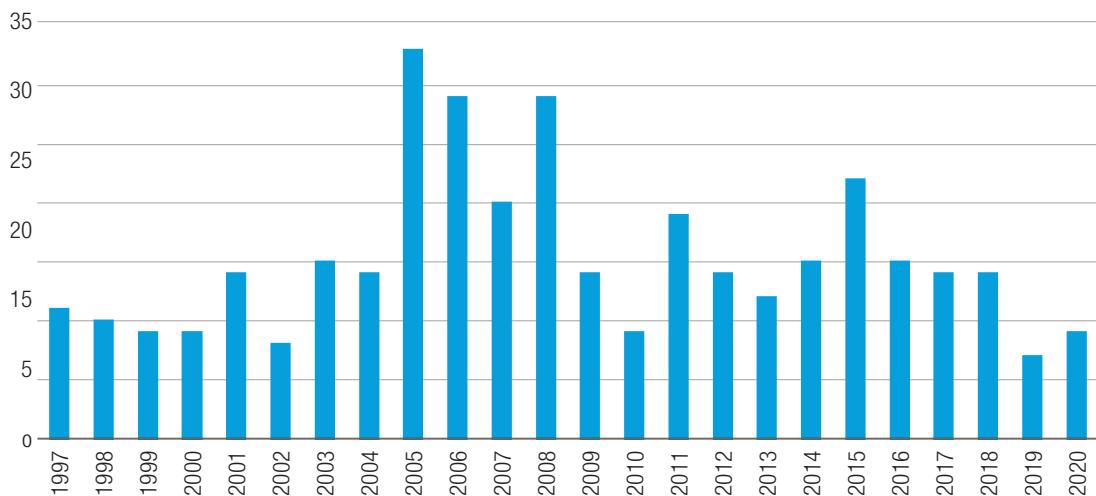
A value of \$2,000 of swordfish exports was reported in 2019 (UNCTADStat). The sole tuna exporter (KI BBD 1) reported that in recent years swordfish was not exported due to low prices (\$3.75/lb) being offered in the overseas market. This was not profitable given the export cost and logistics involved, and the fact that the price in the local market started at \$4/lb. In 2022, however, the price increased to \$5.50–7.50/lb. At the time of reporting, only three swordfish had been exported in 2022.

The main market for Barbados' swordfish has been the United States. The import requirements of the latter include a minimum size limit for swordfish and a catch documentation scheme for swordfish imports.⁷ In the past, the United States requirement of a minimum levels of mercury content was considered a barrier, such restrictions were however lifted by the United States in 2015. In this regard, it has been reported that a multispecies traceability programme for large pelagics and an improved sustainable harvesting practices to reduce bycatch could respond to these requirements and hence contribute to expanding Barbados's market (UNCTAD, DOALOS & FAO, 2021). In what concerns CARICOM countries, Barbados' swordfish has seldom been exported to those markets. That is despite that this regional market does not impose internal barriers and an external tariff scheme.

As it relates to imports, a large fish processor (KI BBD 2) reported that in the last 5 years, his company imported on average 70,000lbs of swordfish per year. In 2021, after tourism had rebounded, 115,000lbs of swordfish were imported with a steady demand throughout the year. The increased national demand may offer an opportunity if large fish processors are willing to pay a higher ex-vessel price.

Disaggregated data on swordfish imports (2020–2021), acquired from the Ministry of Agriculture and Food Security, reports 127,911kg (281,404.2lbs) of swordfish imported in 2020 valued at \$564,994.00. In 2021, 326,502kg (718,304.40lbs) of imported swordfish was reported at a value of \$1,063,012.00. These figures are well above what is currently being landed by the longline fleet (**figure 3**).

Figure 3.
Annual swordfish landings captured by longline vessels in Barbados, 1997–2020
(in metric tons)



Source: Cox S.A., 2022, based on data procured from Barbados Fisheries Division, 2022.

However, in 2022 the supply chain crisis resulted in many challenges including the delays in the importation of food, important medical supplies, and pharmaceutical products (Henry, 2022) and material and equipment for electricity generation (Deane, 2022). For this reason, only 7,984lbs of swordfish have been imported to date. Another large processor (KI BBD 3) also described challenges with imports and informed that the current price for frozen swordfish from Trinidad and Tobago was around \$3.50/lb – i.e., about half the price of local swordfish. This competitive pricing is possible because of lower fuel prices in Trinidad and Tobago among other factors.

3.3. Swordfish value chain description

A value chains lens was employed to present the responses and stakeholder perceptions under relevant themes. These themes best illustrate key issues and opportunities at the different stages along the value chain (inputs, harvest, processing and distribution, sales and marketing and consumers) and the essential support activities (figure 4).

Figure 4.
Simplified swordfish value chain



Source: Cox S.A., 2022.

3.3.1. Inputs

According to the longline boat owners and captains interviewed, input costs for longline vessels generally range from \$4,500–10,500 for a typical trip (7–14 days). Fuel, ice, squid bait, food and gear replacements are the main recurring costs (figure 5). Recent fuel prices have resulted in significant increases in input costs (\$0.29 increase in May 2022). One longline boat owner and captain (KI BBD 4) paid \$3,000 for 2143.1 litres of diesel on 23 March 2022, less than two months later (3 May 2022), he paid \$4,029.40 for 2289.42 litres of diesel (Appendix 2). Other longline captains reported an increase in fuel costs ranging from \$750–1,500.

Additional costs that are not paid at every trip include cooking gas, oil, and filters and other preventive maintenance costs, vessel insurance, subscriptions to vessel monitoring systems (VMS), satellite data products and satellite phones.

Key informants outlined that to specifically target swordfish, additional gear including circle hooks and light sticks would be needed. Trips would also have to coincide with the full moon. Ideally each of the 500 or more hooks on the branch line would need to have a light stick to attract the swordfish. Local gear and equipment supply stores current sell light sticks for \$0.48–0.74 each and circle hooks in different

sizes for \$0.57–1.65 each. Interviewees also outlined that the gear may be configured in a different way to maximise swordfish catches and this may require the need for a separate hook tub (\$500–750 each).

Figure 5.
Inputs used by longline vessels

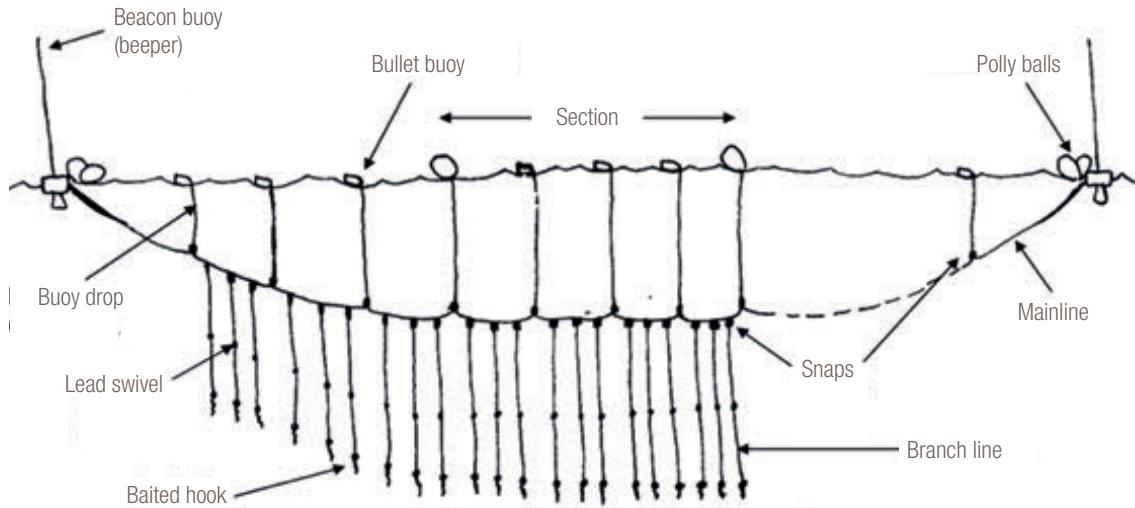


Source: (Clockwise from left) Longline vessel loading ice (Photo by Clish Gittens, 2019); Boxes of bait; Fuel pump; and Gear aboard vessel (Photo by Pamela Burke, 2022; 2017; 2022).

3.3.2. Harvest

Anecdotal evidence from key informants suggests that fishing at night during the full moon is the best time to catch swordfish. Some empirical studies have shown that surface longlines set at night are more productive for capturing swordfish (Poisson et al. 2010). Swordfish harvesting techniques using surface longline gear are quite similar to the gear targeting yellowfin and bigeye tunas (**figure 6**), but lines may be weighted to 120 feet or deeper, and buoys configured differently. The figure below illustrates fishing gear composed of a long main line to which several baited hooks are attached at intervals by shorter branch lines called “snoods” or “gangions”.

Figure 6.
Typical longline fishing gear set up, showing details of the end and adjacent section only



Source: Walcott et al., 2009.

Note: The full gear is made up of around 15 sections.

Longline captains and crew members, as well as sport fishers also informed that there are swordfish breeding grounds close to shore, approximately four miles off the West Coast of Barbados by the 'shelf'. This is where juveniles referred to colloquially as 'mice', 'rats' and 'pups' were occasionally caught. The names correspond to the size in weight where mice are less than 25lbs, rats are greater than 25lbs, but less than 50lbs and pups are greater than 50lbs, but less than 100lbs. Adults are referred to colloquially as 'markers' at 100lbs, 'double markers', 200lbs and 'triple marker', 300lbs. Larger swordfish referred to as 'monsters' are known to be caught in the north and northwest of Barbados. Other fishing grounds identified were 90 miles south of Barbados and even further offshore in the southeast area known as the 'Research Ridge' (KI BBD 4).

A key challenge is the unknown status of stocks of many of the marine fishery's resources. There is a need for further research to be conducted on fish stocks to understand the status and inform on management with regards to overfishing, especially in targeted or potentially targeted commercial species (UNCTAD, 2020). Preliminary outcomes from the experimental exercise highlight the fact that not knowing the exact locations to target adult swordfish can result in juveniles and bycatch being caught. Catch rates and other results from the experimental exercise will be documented in a forthcoming internal brief that will be prepared for the BFD and fisheries stakeholders.

3.3.3. Processing and distribution

Swordfish is landed headed and gutted at the Bridgetown Fisheries Complex and sold directly to fish vendors, larger fish processors and restaurateurs who then transport it to their plants or places of operation for further processing. In some cases, the swordfish is cut into smaller pieces, weighed, boxed, and prepared for export to Miami (**figure 7**).

Figure 7.
Swordfish being prepared for export



Source: Photos by Shelly-Ann Cox, 2022.

Larger fish processors import headed and gutted swordfish (preferred size is 80lbs) from Trinidad and Tobago primarily and process at their plants. The fish is prepared to suit their clientele's needs (loins, steaks, fillets, etc.) and then collected or delivered. Swordfish is also prepared boneless and skinless and vacuum-packed by large processors usually for local supermarket chains. There is an online fish vendor that also sells vacuum-packed boneless and skinless swordfish at a premium price of \$10.00/lb (Appendix 3).

Key challenges faced by the processing sector are post-harvest procedure quality as well as waste reduction. A fish silage production feasibility study commissioned by FAO outlines that Barbados produces an aggregate of 1,521t of fish waste annually (Drakes *et al.*, 2020). At present, 90 percent of fish waste is dumped at the landfill instead of being used to increase earnings through further processing into, for example, fish silage, fish skin leather, animal feed, organs can be used for food (melts and roe) and the development of value-added products such as fish sausages and burgers. The waste can also be used to create biofuels and fertilisers (UNCTAD, 2020). A large fish processor company has been experimenting with the production of biogas in collaboration with a United Nations Development Programme (UNDP) Blue Lab Innovator (KI BBD 3).

3.3.4. Sales and marketing

Locally caught fresh swordfish is highly sought after by seafood companies and their clientele. Swordfish is targeted for its high-quality flesh and excellent palatability. Vendors usually purchase swordfish directly from the boats at \$4.00/lb (KI BBD 5). The market price for fresh swordfish ranges from \$5–10.00/lb. Frozen swordfish is usually sold by large fish processors at \$6–7.00/lb. Fish vendors generally sell to market visitors or make deliveries to individuals. Large fish processors sell to hotels, restaurants, fryers, and even to individuals depending on the demand (KI BBD 3). The winter season (December–April) is usually when demand increases to account for the tourism season. The export market currently pays \$5.50–7.50/lb for fresh swordfish (KI BBD 1). These prices are currently higher than the prices paid by vendors when they buy directly from the boat. Key informants also reported that in some instances shark meat is intentionally or mistakenly sold as swordfish due to the similarity in texture and appearance. This occurrence may warrant surveillance strategies to ensure that in promoting the expansion of the swordfish fishery, endangered species are not targeted and mislabelled.

Marketing is usually done by word of mouth, radio announcements, websites, and social media (Appendix 3). During the COVID-19 pandemic period, many online seafood marketplaces were launched making it easier for consumers to make online payments and have swordfish conveniently delivered right to their door. Swordfish is usually marketed as a smart seafood choice which is sustainably managed and responsibly harvested (Appendix 4).

In Barbados, the nutritional value of swordfish is less promoted, and generally less known. This contrasts with international markets, including the United States, where swordfish nutritional properties are the main messages used in marketing. Swordfish is an excellent source of selenium, Omega-3, niacin, zinc, vitamin B12, D and other micronutrients that offer important heart health, immune system and cancer-fighting properties and other benefits (Cobas *et al.*, 2022).

3.3.5. Consumers and market measures

Local consumers interviewed stated that they generally prefer fresh swordfish and are willing to pay between \$5.00–6.00/lb. Hotels and restaurants are willing to pay premium prices for fresh swordfish at \$6.00 or more during the tourism high season (November–April) when demand is high. Two all-inclusive hotels interviewed reported that they purchase 1,000lbs of swordfish a year at \$6.00/lb.

As discussed at the beginning of the section, international demand for swordfish is increasing. The trend may be due to recent prices being offered by importers. This may also be a response to the increased demand for healthy products.

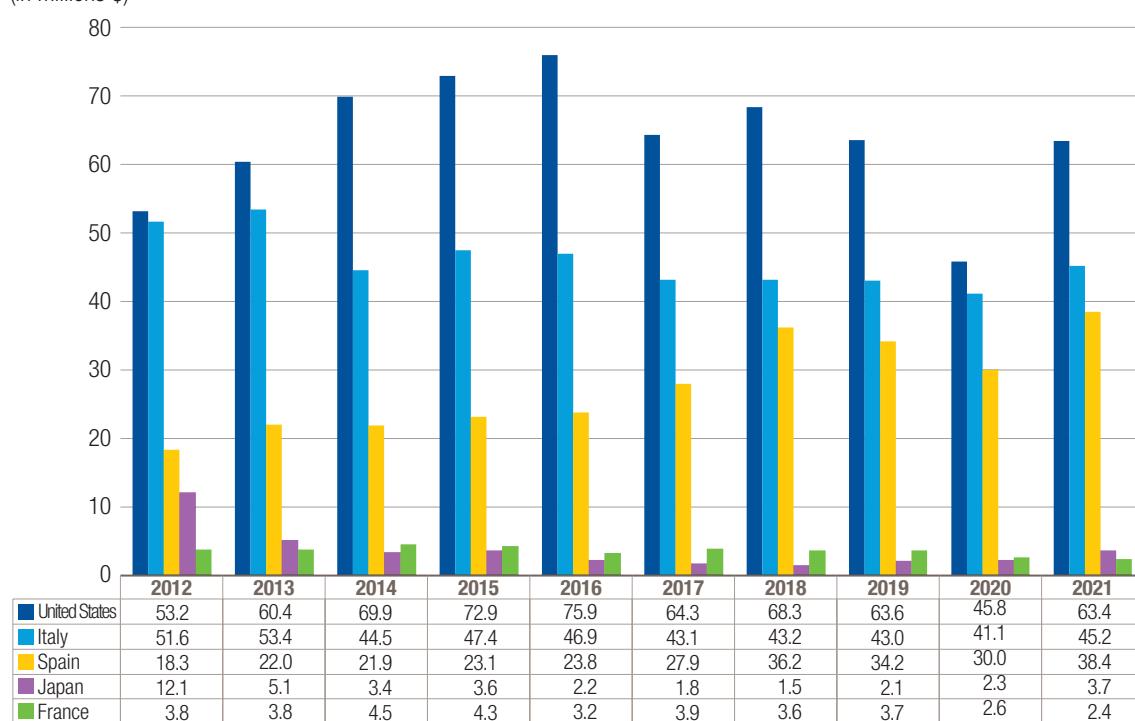
The United States is the world's largest market for swordfish, although swordfish is also consumed in Europe, Japan and throughout the developed world (Govender *et al.*, 2016). The market intelligence and data browser platform TRIDGE (Transaction Bridge) lists the top five swordfish importers (HS Code 030247 - Fresh or chilled swordfish) in the world based on 2021 import value (millions \$). These countries are the United States (\$63.4),⁸ Italy (\$45.2), Spain (\$38.4), Japan (\$3.7) and France (\$2.4); the European Union (28 countries) imports of HS 030247 reached \$87.7M.⁹

Figure 8 shows a time series of import data (millions \$) of the top 5 swordfish importers in the world over ten years (2012–2021). The data shows overall an increase in demand in recent years with a noticeable decrease in 2020 at the beginning of the pandemic. United States and Italy had their highest import values in 2016.

Figure 8.

Import value for top 5 importers of HS Code 030247 – Fresh or chilled swordfish

(in millions \$)



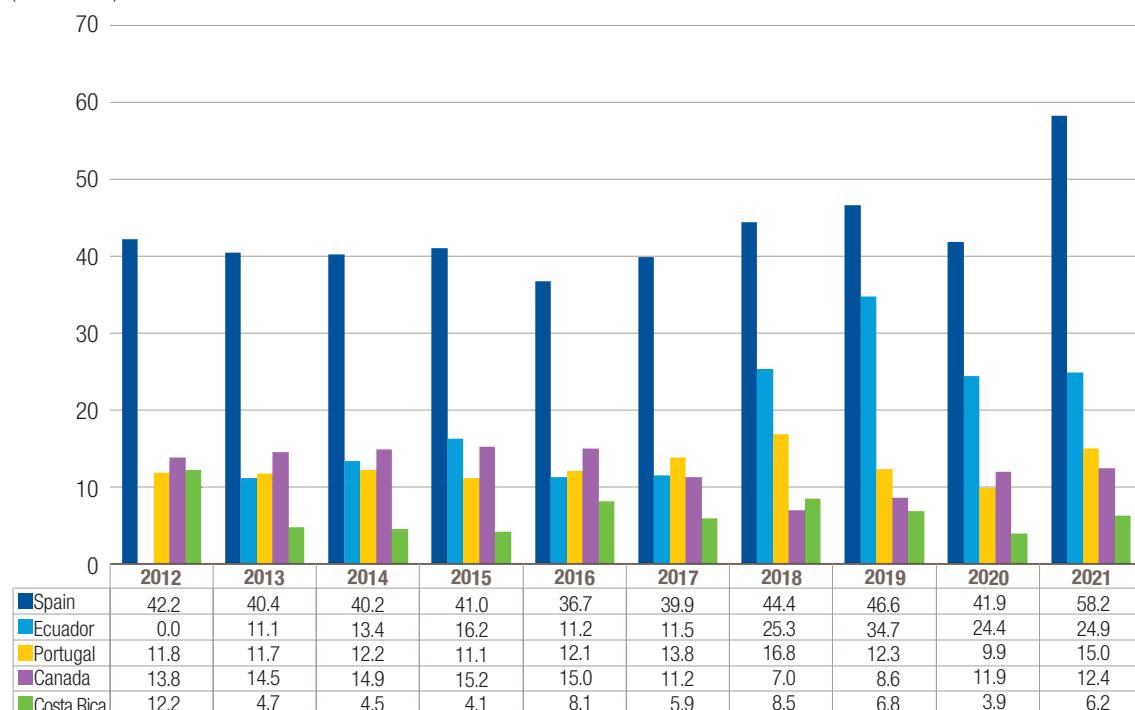
Source: Cox S.A., 2022.

Figure 9 shows a time series of export data (millions \$) of the top 5 swordfish exporters in the world over ten years (2012–2021). Latin America countries Ecuador and Costa Rica are major exporters with Brazil also ranked as 6th in the world. The data shows variation in supply with a noticeable decrease in 2020 at the beginning of the pandemic except in the case for Canada. This may be due to Canada's proximity to the largest export market in United States during the supply chains crisis.

Figure 9.

Export value for top 5 exporters of HS Code 030247 – Fresh or chilled swordfish

(in million \$)



Source: Cox S.A., 2022.

The United States and the European Union market offer a competitive edge for Barbados. The tariffs applied by the United States to the country's fisheries is zero except for preparations of fish which are imposed a tariff of about 8 per cent. In addition, distance, language, and already existing trade relationship between the two countries vis-à-vis other competitors can play in favour of Barbados. In the case of the European Union, Barbados receives duty free access to most fish and fisheries products, only processed products are exempted.

In terms of non-tariff measures (NTMs), the most common measures applied by almost all countries globally are sanitary and phytosanitary measures (SPS) and technical barriers to trade (TBT) in all products of the fish sector (UNCTAD, 2021). In the case of the United States, it applies 17 SPS measures, 5 TBT, 1 pre-shipment measure and 1 import permit measure. Although these are numerous, and compliance may be costly, the measures are almost identical across most swordfish products; only "Swordfish, frozen excluding swordfish fillets and other fish meat" (030357) and "Fillets of swordfish (*Xiphias gladius*), fresh or chilled" (030445) must present Fisheries Certificate of Origin in addition to the other NTMs.¹⁰ As for the European Union countries, as part of the Economic Partnership Agreement the European Union provide Barbados training on import compliance, such as on SPS (UNCTAD, 2020).

At the regional level, the top five importers of fish, based on average value (millions \$) for the period 2019–2020 are Jamaica (\$126.9), Haiti (\$53.9), Trinidad and Tobago (\$44.4), Bahamas (\$30.6) and Barbados (\$26.5). Saint Lucia is a close runner up at \$10M (CRFM 2021). These figures are not disaggregated by species but show a general demand for fresh fish and fish products. These countries can be considered as potential markets for the export of swordfish. In addition, regional markets in CARICOM have no internal barriers or an external tariff scheme that would hinder the trade of swordfish.

At present, the Barbados exporter is the main source for data on tuna and swordfish exports that is sent to the Fisheries Division for archiving. The exporter also monitors import trends to inform the fishing fleet of potential opportunities.



Section 4

Discussion

4. Discussion

This preliminary analysis has given insight to the key issues and opportunities that exist along the value chain to promote the expansion of the local and export swordfish market. The above findings suggest that there is room for expansion within sustainable limits based on ICCAT quotas. However, there are some barriers that have hindered development in the past. Notwithstanding, enablers also exist that can be promoted as interventions for changing practices (table 2).

4.1. Barriers and enablers

Table 2.

Barriers and enablers to the development of a local and export swordfish market

Enablers	Stakeholders perceptions*
Fisheries Act/Regulations	Provides good guidelines but needs to be updated
Fisheries Policy	Draft policy exists but has not been finalised
Fisheries Advisory Committee (FAC)	FAC has not been appointed after recent elections (January 2022)
Fisherfolk leadership, representation, and advocacy	BARNUFO plays an important role in representing fisherfolk and advocating for change
Involvement of women in the sector	Women bring new effective leadership styles
Training and education	Annual fisherfolk training programmes build capacity
Insurance and social security	Social security schemes exist and should be subscribed to
Coastal families preserving culture	Coastal fishing communities are keeping the culture alive
Youth engagement	Fishers are passing on skills to younger family members
Barriers	Stakeholders perceptions*
Limited access to funding	It is very difficult to access loans for business development or to purchase vessels
Impacts of climate change, environmental factors, pandemic	The pandemic has resulted in a supply chain crisis that has had a domino effect on operations along the value chain
Competitive pricing of imported frozen swordfish	Competition from cheap fish imports which may be duty-free
Fluctuating demand	Fluctuations in market demand are very dynamic
Limited integration with other institutions/sectors	Intersectoral collaboration is needed to solve complex problems
Limited ICT capacity and low digital literacy	Fisherfolk are not proficient ICT users but in recent times fisherfolk are using WhatsApp and Zoom on their smartphones to communicate and attend online meetings
Political involvement/interference	Government restrictions during the COVID-19 pandemic led to market closures in 2020
Lack of fisherfolk participation and support to the national fisherfolk organisation	Fishers need to come together to advocate with one voice
Unsatisfactory insurance premiums/deliverables	Vessel insurance premiums are too high and the process for claims is very tedious
Inconsistent data collection	Landings recorded are underestimated of what is offloaded
High operational cost	High fuel taxes are significantly affecting the fishery's profitability
Communication tools and technology	Digital technologies can support data-driven solutions

Source: Cox S.A., 2022.

* Paraphased responses.

The barriers and enablers identified by respondents align well with the SWOT analysis (**figure 10**) that was completed for the Barbados longline fishery in 2021 (UNCTAD, DOALOS and FAO, 2021). The strengths outlined in the figure 10 can be added to the existing list of enablers to support the access to markets.

Figure 10.

Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of the Barbados longline fishery

Strengths	Weaknesses
<ul style="list-style-type: none"> • Experienced captains • On-vessel fish handling industry standard • Consistent air lifts • Responsive industry ready for change • Meets United States' sanitation standards for headed and gutted • Barbadian dollar pegged to United States dollar 	<ul style="list-style-type: none"> • High operating costs • Aging infrastructure • Inconsistent data collection • Grading risk on fishers • Dependent on single importer • Co-management limitations • Inefficient vessel management
Opportunities	Threats
<ul style="list-style-type: none"> • Strong global demand for raw tuna • Increase market access through ready-to-eat Hazard Analysis and Critical Control Point (HACCP), entering into a Fishery Improvement Project (FIP), traceability • Electronic landings data capture • Import substitution • Increase exports of yellowfin and bigeye (grade 1 and volume) 	<ul style="list-style-type: none"> • Systemic barriers to supply capacity development and export • Limited active participation at the International Commission for the Conservation of Atlantic Tunas • Climate change impacts • High fuel taxes • Cost recovery low and inconsistently collected • Lack of availability of credit • Competition for cheap, duty-free fish imports in certain segments (<i>i.e.</i>, processing and hotels)

Source: UNCTAD, DOALOS and FAO, 2021.

An important point of discussion that arose during interviews was the fact that given high input costs it did not make economic sense for boat owners, captains, and crew members to bear the cost of the extra gear needed to specifically target swordfish. This is reasonable since they are presently getting better prices (\$7.50–11.00/lb) for yellowfin and bigeye tuna with current gear configurations. As a result, opportunistic catches are likely to continue.

Other respondents alluded to the fact that there is no guarantee that when a large swordfish catch is landed, fish vendors and processors will want to pay \$4.00/lb, they most likely will offer a lower price for larger quantities. Larger fish processors stated their preference for 80lb sizes as ideal for preparation of loins, steaks, and fillets requested by clientele (KI BBD 3). However, uniformed sizes of swordfish have never been caught by longliners and in most cases fish landed are over 100lbs (KI BBD 4). It is for this

reason that large fish processors have been importing swordfish from Trinidad and Tobago and other countries where input costs are significantly lower, and prices are competitive.

Stakeholders also posited that the model for increasing swordfish landings might be to outfit smaller vessels like iceboats with mini surface longlines or use rod and reel to target swordfish. This may be more economical given the fact that there would be lower input costs and smaller storage capacity. Alternatively, fishing charter boats using rod and reel can explore swordfish harvesting.

The arguments presented above warrant the need for an experimental swordfish fishing exercise using different classes of vessels to determine the most efficient and profitable harvesting techniques for targeting swordfish.

Section 5

Recommendations

5. Recommendations

The following recommendations are proposed to promote future development of a local and export market for swordfish and the longline fishery generally. The recommendations are structured using the five UNCTAD Oceans Economy Pillars¹¹ and based on trade-related targets of Sustainable Development Goal (SDG) 14.¹²

5.1. Economic and trade pillar

Input cost strategies proposed include a reduction in the cost of bait by importing squid directly from Argentina where the price is more affordable (KI BBD 1). In addition, the consistent supply locally and regionally and use of other cost-effective bait including mackerel, jacks (bigeye scad) and ballyhoo fish needs to be explored. Renewable energy systems can be utilized to power lights, appliances, and charge batteries aboard vessels. Given the recent increase of fuel costs, the use of fuel efficient or hybrid engines, or the use of locally produced biofuels blends including Bio-CNG (Compressed Natural Gas) made using sargassum¹³ can be considered. Furthermore, the local production of circle hooks and other tackles, in the country or the region, should be further explored.

Fisherfolk organisations can support the identification of lower prices for specific inputs including fishing gear and offer training to its members on how to conduct a cost-benefit analysis. This analysis can support the selection of affordable but quality products. The organisations can also implement internship programmes to involve the youth in supporting the analysis, keeping the information updated and identifying any barriers or policies that could support access to quality yet competitive prices e.g., elimination of tariffs, or reduction of NTMs.

Challenges posed by existing machinery and equipment can benefit from partnerships with stakeholders. Longline captains and boat owners raised concerns about the use of computerized hybrid engines due to the inability to troubleshoot and fix issues while out to sea. However, they were optimistic that the engines would become more desirable in a few years with the development of new technologies. Government should explore the installation of a solar-powered ice making machine at the Bridgetown Fisheries Complex to reduce the cost of ice. There is already a proof of concept that was piloted at the Skeete's Bay Fish Market in the early 2000's. Fisherfolk can consider buying their own ice making machinery or installing cooling systems onboard vessels. These strategies could be foreseen together with initiatives that promote direct advance purchase commitments by restaurants, hotels, and vendors, as such, contracts would provide the capital needed for increased gear requirements to target swordfish.

In terms of harvest, proper fish handling practices at sea including the upkeep of vessels are encouraged to maintain the quality of the fish before it is landed. BARNUFO in collaboration with the Fisheries Division and the Ministry of Health and Wellness have conducted fish handling training for fishers, fish vendors, processors and other players along the value chain. These training exercises should be conducted annually to ensure that all players in the sector are certified.

As for improving post-harvest procedure quality as well as reducing waste, 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 can 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 2019.¹⁴ 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 (UNCTAD, 2020).

Since then, another pilot project was implemented in 2021 under the FAO-StewardFish project in collaboration with the all-female Central Fish Processors Association (CFPA).¹⁵ These initiatives should be promoted and scaled up to reduce waste, support cost recovery for government, provide alternative

livelihoods for fisherfolk and promote zero waste policies. Furthermore, fish waste has been used in other parts of the world to produce plastics substitutes such as for flexible plastics.¹⁶

In what concerns NTMs, legislation on measures to improve fish handling techniques in line with sanitary and phytosanitary measures (World Trade Organization [WTO] 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) Project¹⁷ 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 (UNCTAD, 2020). These types of initiatives and trainings are important as SPS, together with technical barriers to trade (TBTs), are the most common measures applied to fish and fish by-products by Barbados but also by almost all importing countries.

Stakeholders should consider attending international fairs, notably the Seafood Expo North America¹⁸ and Seafood Expo Global¹⁹ to explore new export markets for swordfish and tuna. Funding can be requested to rent a booth to display high quality seafood products that are branded Barbadian (colloquially known as 'Bajan'). Like Maine lobster, or Alaskan salmon, there is capacity to brand Bajan swordfish, yellowfin, and bigeye tuna as both exotic and superior. Barbados could promote the unique selling point such as that the fish is locally sourced, sustainably harvested (Appendix 4) by third and fourth generation fishers who are preserving their cultural heritage and has a superior quality.

An innovative marketing strategy can begin by positioning Bajan swordfish, yellowfin, and bigeye tuna as a delicacy. Restaurants that feature it can highlight it on the menu, share the unique product characteristics with customers and enhance its brand recognition throughout the island of Barbados.

The marketing strategy should also capitalize on the health properties of swordfish while cautioning about the potential high rates of mercury based on the size of the fish and other factors (Barone *et al.*, 2018). Key messages in the marketing strategy could advise consumers about the health risks of over consumption. Marketing swordfish products as a healthier option is particularly important in a context where the international community is taking action at the country and global level, to increase consumption of healthier food to address the increasing trends of different forms of malnutrition (such as undernutrition, obesity) and non-communicable diseases.

Processors and vendors can explore the preparation of swordfish in other forms, such as canned, or in jars for export to Europe and the United States. The business viability of the production of these products will be based on the costs of equipment, labour, and packaging since cans or jars are not manufactured locally. Flying fish canning was not sustained in the past for similar reasons.

5.2. Environmental pillar

The impact of single-use plastic light sticks on the environment should be considered in fishing operations. Light sticks that are retrieved should be brought back to shore and disposed responsibly. Local fishing gear companies should be encouraged to keep cost-effective reusable battery operator light sticks in stock and explore bioplastic alternatives.

Abandoned, lost, or otherwise discarded fishing gear (ALDFG) from longline fishing operations is also an environmental problem that is increasingly of concern. Recommendations for future action to reduce ALDFG debris should be discussed and included in fishery management plans. Besides this, the OETS Barbados report deeply analysed the environmental performance of the country's longline fisheries sector and provided specific recommendations in this regard (UNCTAD, 2022).

5.3. Social pillar

To gain sufficient public buy-in, the public needs to be convinced that Bajan swordfish, yellowfin and bigeye tuna have the capacity to add to Barbados' economy, cultural heritage, and food quality in a

significant way. This also provides the opportunity for the fisheries sector in Barbados to build its overall brand, not only as it relates to swordfish or tuna. Barbados can position itself as a leader in fish quality in the Caribbean Region. Barbados is well positioned to achieve this objective taking into account its heritage of fishing, the prominence fishing villages, and its cultural and societal significance imbued its national symbols. There are also many opportunities for cross collaboration with other sectors in Barbados, including cultural and creative industries, tourism, agriculture, health, and energy sectors.

It is on this premise that the development of an innovative marketing strategy and plan is proposed. The Barbados Tourism Marketing Inc. (BTMI)²⁰ may be a potential partner in the development of this plan. The strategy may take into consideration the unique approach of human-centred marketing that makes customers feel seen, heard, and valued and immediately builds trust. In addition, highlighting marketing initiatives that are experiential and promote products in a more effective, communicative and unique way could also be beneficial to harnessing the potential of cross-sectoral collaboration.

Gendered marketing was promoted in the past as a useful strategy for engaging consumers, however recent reports outline that consumers are generally becoming less receptive to this technique (Høyskolen, 2020). This approach segmented consumers based on their gender and one or several elements of the marketing mix are tailored (product, price, promotion, place) based on gender stereotypes (Powers, 2019). It is recommended that gender-neutral marketing should be considered for inclusion in the innovative plan proposed, where sophisticated consumer insights that allow a segmentation based on consumer's personality traits, interests and lifestyle are employed. Implementation of the key components of the strategy and plan should be supported by analytics and a monitoring and evaluation framework to measure performance and impact of communication products.

Gender dimensions, especially women empowerment, must however be an integral part of all policies that are to impact producers at all stages of the value chain. It is important to keep in mind that about 20 per cent of the labour force of the large pelagic longline fishery value chain is female. Although very few women are fishers (harvesting phase) or boat owners, the processing and sale phases are dominated by women.

The OETS report for Barbados recommends implementing rules and hiring policies in processing facilities that comply with, and lead the development of, international social standards that enable gender and diversity inclusion. Similarly, when providing finance, access to inputs, trainings, and initiatives regarding access to markets, the specific needs of women must be considered when elaborating the implementation process of any new policy or strategy (UNCTAD, DOALOS & FAO, 2020). Existing social security schemes for the fisherfolk community informal actors in the fisheries value chain should be employed to improve social resilience and reduce vulnerability.

5.4. Scientific and technology pillar

Experimental fishing exercises are key in informing the potential for expanding the swordfish market. The exercises implemented under the UNCTAD-DOALOS OETS project will demonstrate the impact of using circle hooks and light sticks on catch rates and determine the feasibility of targeting swordfish. Future exercises should consider the use of hook timers and time depth recorders to investigate direct and indirect effects of the lunar cycle and other operational factors that affect catch rates, catch composition, fish behaviour, capture time, and fish survival.

Future research and development studies can consider the use of advanced tagging technology devices, such as archival tags and pop-up satellite archival tags that can provide comprehensive information on the behaviour of swordfish and their movement patterns.

The use of vessel monitoring system (VMS) can also support efforts at mapping swordfish fishing grounds areas and the visualization of catch per unit effort (CPUE). VMS supports the development of data-driven solutions that can inform decisions about how a fishery can be best managed to balance diverse societal

objectives and improve livelihoods. The use of VMS is also important in determining catch location and supporting the development of a multispecies traceability framework for large pelagics. There is a growing view among regulators that traceability can be an effective means to identify risk, improve data availability, reduce illegal imports, and address the fragmentation of seafood value chains. Subject to enabling policy and regulatory frameworks governing seafood product sustainability, the use of VMS could facilitate compliance with NTMs, curtail illegal, unreported and unregulated fishing (IUU) fishing and consequently, raise the value of seafood by providing confidence and accountability to consumers that Bajan seafood is sourced sustainably.

The creation of a National Fisheries Innovation hub or cluster should be considered as a standalone initiative or as part of existing blue economy hubs e.g., UNDP Blue Lab to inspire creativity and offer the opportunity for ideas to become a reality. The hub can connect fisherfolk, fisheries management officials and software developers to funding agencies or financial institutions that can provide venture capital to support initiatives.

5.5. Governance pillar

The integration of the country's obligations under UNCLOS and other United Nations treaties and soft law with traditional and local knowledge (e.g., on locations of fishing grounds, biological and ecological information on fish species, knowledge of oceanic climate variables, etc.) and natural and scientific information should be institutionalised within existing governance arrangements and should not remain exclusive to project related activities. Informal forums coordinated by fisherfolk organisations can also support knowledge transfer and integration. Establishing and sustaining a longline fishery advisory committee that reports to the Fisheries Advisory Committee (FAC) can provide a mechanism for co-management and the formulation and implementation of a development strategy and plan for the fishery.

Fisherfolk and partners in the Caribbean should be encouraged to attend and present at regional forums like Gulf and Caribbean Fisheries Institute (GCFI) Annual Conference and the Caribbean Network of Fisherfolk Organisation's (CNFO) General Assembly. Their attendance can promote interagency/intergovernmental cooperation, facilitate information exchange, provide learning opportunities about the latest technologies, and allow them to share their innovations and experiences.

Fisheries Learning Exchanges (FLEs) can be considered as a mechanism for promoting innovation in swordfish harvesting techniques. FLEs promote experiential learning which allows participants to better grasp concepts and enhance knowledge and skills. An example of a FLE would be an exchange where fishers from Barbados would be given the opportunity to visit Trinidad and Tobago, Grenada or the United States to observe and learn new swordfish harvesting techniques.

5.6. Policy implications

The following supporting policy actions are recommended to promote the expansion of local and export markets for swordfish:

- Mobilizing local knowledge for evidence-based policymaking is essential for more effective and sustainable implementation of the fisheries policy and associated management plans.
- Policy formulation and fisheries management plans at the national level should integrate risk management concepts to ensure sustainability across the Ocean Economy pillars²¹ and build resilience to external factors.
- The engagement and support of the private sector should be enhanced to facilitate investment and innovation in the fisheries sector.
- Marketing strategies and plans should adopt a gender inclusive approach and capitalize on the different interests of men, women, and youth in the fisheries sector and public.



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marina

FISHING



Endnotes

- ¹ For more information on the UNCTAD-DOALOS OETS project, see <https://unctad.org/project/evidence-based-and-policy-coherent-oceans-economy-and-trade-strategies>.
- ² For full text, see https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf.
- ³ For more information, see <https://www.iccat.int/>.
- ⁴ Section 5 of the Fisheries Act of 1993 (Cap. 391). Part I stipulates that the Fisheries Advisory Committee (FAC) shall be appointed by an instrument in writing by the Minister. For more details, see http://www.ilo.org/dyn/natlex/natlex4.detail?p_lang=en&p_isn=87104&p_country=BRB&p_count=284.
- ⁵ The Harmonized System (HS) is a multipurpose international product nomenclature developed by the World Customs Organization (WCO). The system is used by more than 200 countries and economies as a basis for their customs tariffs and for the collection of international trade statistics. Over 98 percent of the merchandise in international trade is classified in terms of the HS (see WCO webpage: <http://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx>).
- ⁶ For more details, see <https://unctad.org/meeting/workshop-implementation-priority-actions-sustainable-trade-swordfish-and-other-longline>.
- ⁷ Market access measures concerning the United States and other markets are discussed in section 3.3.5 of this report.
- ⁸ The second most imported swordfish product by the United States is “Frozen fillets of swordfish” (HS 030484), imports reached \$18.3M in 2021 (UNCTADStat data).
- ⁹ Import values are from UNCTADStat online database.
- ¹⁰ Data collected from the UNCTAD TRAINS portal. For more details, see <https://trainsonline.unctad.org/home>.
- ¹¹ See <https://unctad.org/system/files/information-document/dltc-ted-21062021-Ocean-economy-pillars.pdf>.
- ¹² Sustainable Development Goal 14 (Life below water). For details on SDG 14.6 (trade-related targets and indicators), see <https://sdgs.un.org/goals/goal14>.
- ¹³ For more information, see <https://rumandsargassum.com>.
- ¹⁴ Sheena Forde-Craig (Barbados Government Information Service), “Barbados Embarking on Fish Waste Silage Project”, 8 February 2019.
- ¹⁵ Information from KI BBD6. Further details are available at <https://www.fao.org/documents/card/es/ca6446en/>.
- ¹⁶ As an example of such initiatives, see <https://www.weforum.org/agenda/2019/11/tipping-the-scales-briton-develops-fish-waste-plastic>.
- ¹⁷ See <https://www.ippc.int/en/news/the-2016-ippc-regional-workshop-for-the-caribbean-held-in-barbados/>.
- ¹⁸ For more information, see <https://www.seafoodexpo.com/north-america/>.
- ¹⁹ For more information, see <https://www.seafoodexpo.com/global/>.
- ²⁰ For more information on this initiative see <https://www.visitbarbados.org/about-us>.
- ²¹ Supra note 11.



Appendices

PESCE SPADA
Locue
Euro 26,-

SALMONE

Euro 16,-

Appendix 1. Interview questions

Questions for longline captains and boat owners

Name of interviewer:	Date:
Name of participant:	Boat name and registration number:
Gender:	

1. In your opinion, is there a high demand in Barbados for swordfish?
2. What harvesting techniques do you use to target swordfish?
3. Where are the swordfish fishing grounds located?
4. How often do you catch swordfish?
5. What factors affect catch rates?
6. Are there specific months in the year when swordfish landings are higher?
7. What is the market price? How does the price fluctuate during the year?
8. Have you considered investing in the gear needed to target swordfish?
9. Are you familiar with ICCAT's annual quota of 45 mt?
10. What are your recommendations for building out a local swordfish market?
11. What has hindered development in the past?
12. Are there any factors that exist that can promote expansion?

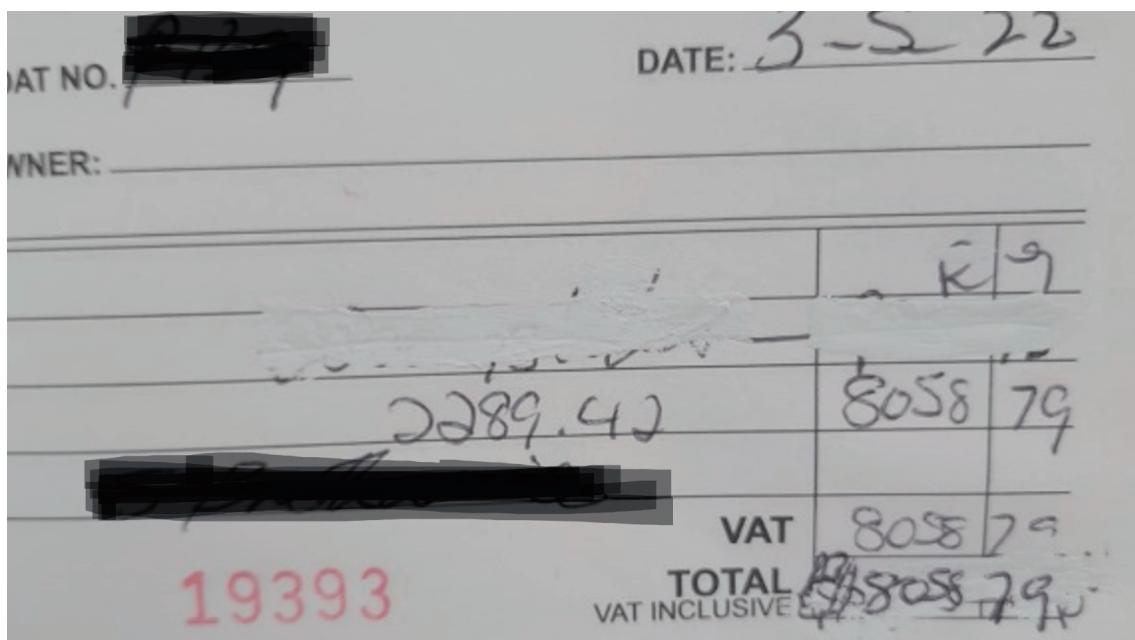
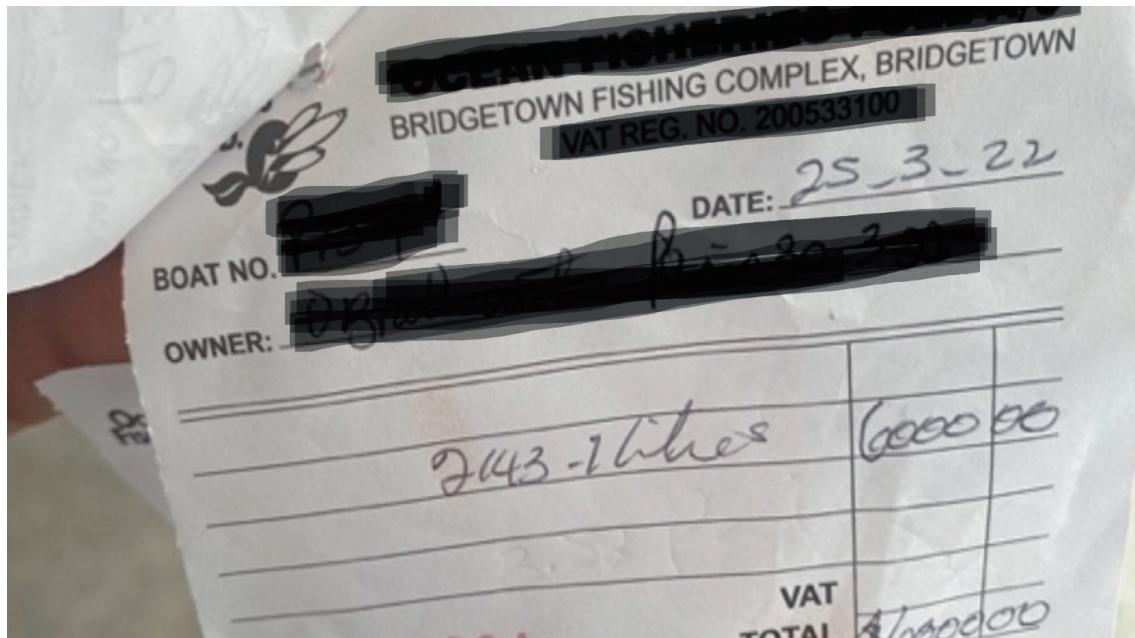
Questions for vendors, large fish processors, restaurants and hotels

Name of interviewer:	Date:
Name of participant:	Company/Organisation>Title (if any):
Gender:	

1. Is there a high demand for swordfish? If so, can you give a brief overview of your clientele?
2. Are there specific months in the year when demand is higher?
3. What is the market price? How does the price fluctuate during the year?
4. How has the pandemic affected supply chain logistics?
5. Do you import or buy swordfish locally?
6. On average what volume of swordfish do you purchase monthly?
7. In your opinion, is the quality of fish caught locally superior to the frozen fish imported?
8. Do you think local longliners should invest in the gear needed to target swordfish?
9. Are you familiar with ICCAT's annual quota of 45 mt?
10. What are your recommendations for building out a local swordfish market? What has hindered development in the past?



Appendix 2. Fuel receipts





Appendix 3. Marketing initiatives

**HOOKED
BARBADOS**

Home Shop About Blog FAQ Contact Us

Home / Shop / Swordfish

Swordfish

\$20.00

Quantity

Add to Cart

PRODUCT INFO

Premium custom cuts of local, wild caught fish - At Hooked we do things a bit differently. Fish is offloaded fresh in the morning and cleaned & steaked. We only package the most premium cuts removing all 'waste pieces' like bones and skin. Next we vacuum seal your fish to preserve the freshness. We offer custom packaging where you can choose how many steaks you would like in each vacuum sealed pack. Prices are listed in Barbados Dollars.

ORDERING & DELIVERY

Hooked accepts orders all week for delivery on Thursdays. Delivery is FREE on all orders over \$100 BDS. We do not currently accept payment online but you can pay with cash or cheque upon delivery or collection.

Fresh, local, swordfish, vacuum sealed to lock in freshness. Price listed is for a 1 pound pack of about 4 steaks / pack.

**TRELLIS
ESTATE**

ISLANDWIDE
DELIVERY

SWORDFISH

Local Swordfish Available!

246-546-8946 | info@theculpepper.com
www.theculpepper.com

HOME SEAFOOD MEATS PANTRY FAQS CONTACT

Home > FRESH SWORDFISH LOCAL KG

FRESH SWORDFISH LOCAL KG

\$27⁵⁶

Tax included.

SOLD OUT

FRESH SWORDFISH LOCAL

Price per Kg

Prices in BDS & include VAT. Free delivery on orders over \$100

[Sign in](#) or [Create an Account](#)

Search all products...

CART



Appendix 4. Slowfish Barbados Sustainable Seafood Consumer Guide

TAKE ACTION
THINK ABOUT THE JOURNEY FROM OCEAN TO PLATE.

ASK

- Where your fish is coming from, what methods were used to catch it, and whether it is in season

BUY

- Species under best choices list and if unavailable, then choose alternatives
- Do not buy fish in the avoid list due to them being overfished, out of season, not reproductively mature or caught by destructive fishing methods

SUPPORT

- Fisherfolk that practice sustainable fishing and in turn their livelihoods

BECOME A RESPONSIBLE CONSUMER

Fish can be a great dietary choice: It's lower in calories and saturated fat than red meat and naturally higher in healthy omega-3 fatty acids. However, many fish species are overfished and may contain mercury and other potentially harmful contaminants including plastic, so be sure to choose responsibly.

Patronise local small-scale fish and food selling enterprises, along with small-scale harvest operations.

FISHERFOLK, FISH SUPPLIERS, INDIVIDUALS, CHEFS, RESTAURANTS, HOTELS & SUPERMARKETS - use our recommendations to support sustainable fisheries. Be sure to purchase local seafood in season, reproductively mature and caught in ways that do not harm the environment or other species. Support healthy oceans for now and future generations.

STAY CONNECTED

Follow us on Facebook, Twitter and Instagram and visit our website above to keep up to date with our info cards, Fishy Facts and #SlowFishWednesday social media posts.

Vote with your wallet and support local fisherfolk who are doing the right thing.



Slow Food
Barbados
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Vote with your wallet and support local fisherfolk who are doing the right thing.



SUSTAINABLE SEAFOOD CONSUMER GUIDE

BARBADOS 2018

Make responsible seafood choices for your health and the environment.

BEST CHOICES

- LIONFISH "MOST SUSTAINABLE CHOICE"
- FLYING FISH
- DOLPHIN FISH (MAHI-MAHI)

Buy these species first as they are often fast growing and reproduce quickly (e.g. flying fish & dolphin fish); current stock levels are relatively abundant and can withstand fishing pressure. They are usually well managed and caught responsibly.

ALTERNATIVES

- Wahoo
- BARRACUDA
- KING MACKEREL (KINGFISH)
- AMBER JACK
- ATLANTIC TRIPLE-TAIL (CONGALIE)
- Skipjack Tuna (BONITO)
- NORTH ATLANTIC YELLOW FIN TUNA (ALBACORE)
- OCEAN TRIGGERFISH (TURPIT)

Species under this list are good alternatives, but be aware of current population levels and how they are caught.

AVOID!

- SHARKS
- RAYS
- ATLANTIC BIGEYE TUNA
- PARROT FISH (CHUBS)
- MARLIN

Species in this list are overfished, or caught in ways that harm the environment and other marine life; and some species may have high mercury content (e.g: sharks). Take a pass on these species.

OUR SUGGESTIONS

- DO NOT CATCH, SELL OR BUY INDIVIDUAL DOLPHIN FISH LESS THAN 85CM IN LENGTH
- DO NOT CATCH, SELL OR BUY GREEN CONCH LESS THAN 22.9 CM IN LENGTH
- IT IS ILLEGAL TO CATCH, SELL OR BUY SEA EGGS (WHITE SEA URCHINS) OUT OF SEASON IN BARBADOS
- DO NOT TAKE FEMALE LOBSTERS WITH EGGS
- DO NOT CATCH, SELL OR BUY LOBSTERS THAT ARE UNRESIZED (LESS THAN 25CM IN LENGTH AND LESS THAN 15LBS IN WEIGHT)

SIZE MATTERS!

Many of the suggestions above are in line with regional regulations, management plans and precautionary measures.

Source: See <https://www.slowfoodbarbados.org/resources>.

Note: Updated digital guide is currently in progress.

