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State of fisheries and aquaculture in the WECAFC region[1]

Preparation of this document

The first version of the State of Fisheries and Aquaculture in the WECAFC Region was presented at the Seventeenth Session of WECAFC, which was held in Miami, United States of America, 15-18 July 2019. The document was well received by WECAFC commissioners and several suggestions were made for future versions. The present document includes, to the extent possible, the suggestions made on the previous version, such as the status of main fisheries resources, more extensive information on recreational fisheries and consideration of sargassum influxes, among others.

Executive Summary

The region under the mandate of the Western Central Atlantic Fishery Commission (WECAFC) has relatively limited fisheries resources. In 2020, landings of marine fisheries in the Western Central Atlantic (FAO fishing area 31) were 1.25 million tonnes, following a declining trend since 2016 and far below the maximum of 2.5 million tonnes reported in 1984. The Western Central Atlantic is currently the area that reports less fisheries landings among the FAO fishing areas in the Atlantic Ocean. WECAFC marine landings represented about 1.4 percent of total world capture fisheries in 2020. However, as in other parts of the world, small-scale fisheries are relatively important and reported landings significantly underestimate production from this sector. There are

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still many gaps regarding knowledge on the status of exploited stocks especially in the Caribbean Sea and the Guianas-Brazil shelf.

In the Caribbean Sea and Gulf of Mexico marine recreational fisheries are an important component of the leisure and tourism industries. However, except for the United States of America where data are systematically collected, information on the ecological, social, and economic impacts of recreational fisheries is rather limited.

Reported marine and brackish water aquaculture production in the WECAFC region in 2020 was around 261 thousand tonnes with a value of about USD 730 million, which is less than 1 percent of total world marine and brackish water aquaculture production and value. Improved governance and adoption of adequate technologies are among the factors identified that have limited development of aquaculture in the region.

Overall, WECAFC Member States are a net importer of fisheries products. In terms of volume the region in 2019 imported almost 2 billion tonnes with a value of around USD 8.1 billion. On the other hand, exports by WECAFC Member States totalled about 974 thousand tonnes with a value of USD 4.8 billion.

Fish consumption is highest among some of the Caribbean countries/territories such as Antigua and Barbuda, Saint Kitts and Nevis, Saint Lucia and the British Overseas Territories which have annual consumptions greater than 34 kg per capita. However, in general the WECAFC area has per capita consumption rates that are below the world average.

There is limited socio-economic information on fisheries and aquaculture in the WECAFC region. The estimate of total number of fishers operating in small-scale and industrial fisheries is around 402 thousand of which Colombia, Haiti, Jamaica, Mexico, the United States of America, and Venezuela account for 79 percent. The contribution of fisheries to Gross Domestic Product is below 1 percent for most countries in the region, except for Belize, Grenada, Guyana, Nicaragua, and Suriname.

Fishing is a very hazardous job and decent working conditions are often lacking. In the WECAFC area information is limited on these issues, but efforts have been made to assess and improve working conditions and safety at sea in the eastern Caribbean, the lobster fishery in Honduras and Nicaragua, and the demersal fisheries of the Guianas-Brazil shelf.

Among the many challenges facing fisheries in the WECAFC area the report addresses recent regional activities for combatting Illegal, Unreported and Unregulated (IUU) Fishing, the impacts of sargassum influxes, status of coastal and marine pollution in the region including marine litter and plastic, the status of coral reefs, the COVID 19 pandemic and its effects on the fisheries sector, and

the impacts on fisheries of extreme events such as the recent hurricane seasons and La Soufriere Volcano.

1. Introduction

The present document provides an overview of the fisheries and aquaculture sectors in the WECAFC area, using fishery and aquaculture production statistics mainly from the Western Central Atlantic (FAO fishing area 31). The report addresses different aspects such as marine commercial fisheries and status of main exploited stocks, recreational fisheries, production and value of marine and brackish water aquaculture, fish consumption and trade, while highlighting information gaps when these occur. The report also addresses some of the main challenges facing fisheries in the WECAFC region, such as IUU fishing, sargassum influxes, extreme events and status of marine habitats using, to the extent possible, the most recently available information on these issues.

2. Methodology

Information on the geography, fisheries, and socioeconomics of the WECAFC region were obtained from different sources. For example, FAO Fisheries and Aquaculture Country Profiles (FAO, 2022) contain information on number of fishers, fishing vessels, fisheries and aquaculture production, and main fishing gears. The FAO FishStatJ[2] software for fisheries and aquaculture statistical time series provided information on landings and production of commercially exploited and cultured marine resources (1950-2020), the value in USD of aquaculture production (1984-2020) as well as trade statistics of fisheries products (1976-2019) for the Western Central Atlantic (FAO Area 31). Additionally, the Globefish[3] country market profiles contained information on fisheries economics and fish consumption for WECAFC Member States. Other valuable sources of fisheries statistical data were the CRFM Statistics and Information Report for 2020 (CRFM, 2021), for Mexico the Anuario Estadístico de Acuacultura y Pesca 2018 (CONAPESCA, 2019) and the Fisheries Economics of the United States 2018 (NMFS, 2021a) report. Additionally, geographical information on the extent of the continental shelves and EEZs in the region was obtained from the Sea Around Us Project (Pauly *et al*. 2022).

3. The WECAFC Region

The Commission's area of competence covers all marine waters of the Western Atlantic bounded to the west by the coastline of the Americas between 10° 00'S latitude and 35° 00'N latitude and to the east by 30° 00'W longitude along the Western Central Atlantic (FAO Area 31) and to a maximum eastern extension at 20° 00'W longitude in the northern portion of FAO Area 41 (Southwestern Atlantic Ocean).

[2] https://www.fao.org/fishery/en/topic/166235
[3] https://www.fao.org/in-action/globefish/countries/en/

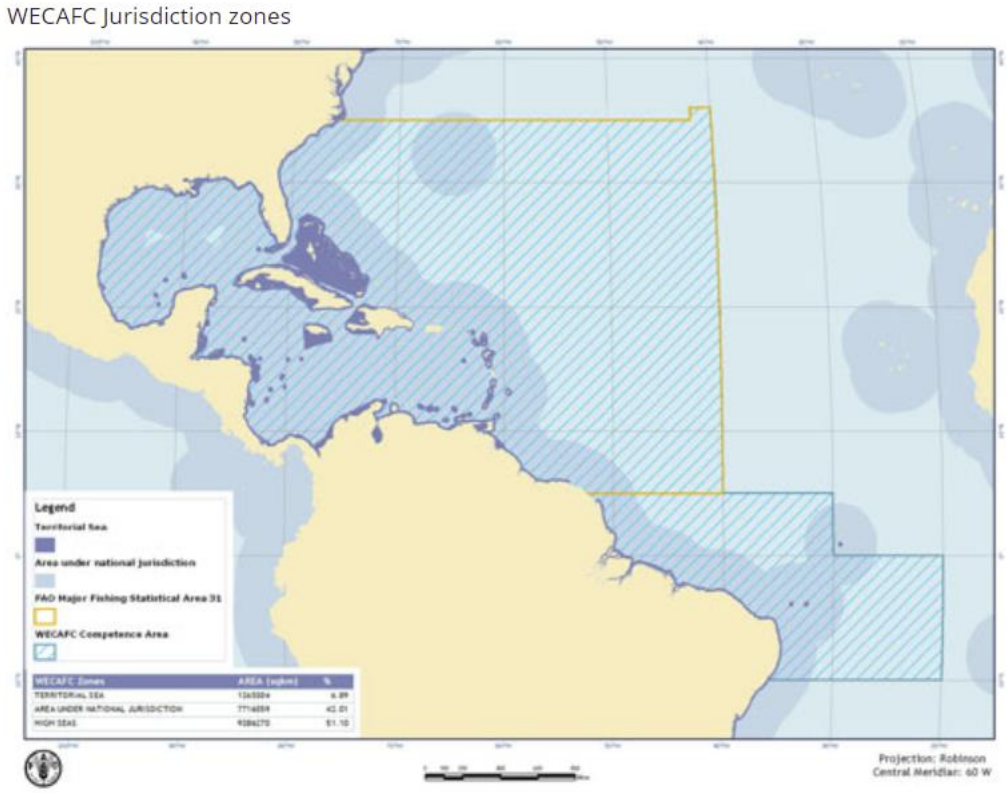

Figure 1. Geographic Extension of the WECAFC Area. The Western Central Atlantic (FAO Area 31) is bounded in yellow and the northern portion of the Southwest Atlantic (FAO Area 41) is bounded in blue.

WECAFC has competence over an extension of nearly 15 million km^2 of marine area extending from Cape Hatteras in North Carolina, United States of America (35°N) to south of Cape Recife, Brazil (10°S). This area covers the south-east coast of the United States, the Gulf of Mexico, the Caribbean Sea, and the north-east coast of South America. Approximately 51% of the mandate area is in areas beyond national jurisdiction (ABNJ) and around 81% corresponds to waters with depths greater than 400 m. Except for Northern Brazil, which is included in FAO Area 41, the rest of the management area corresponds to FAO Area 31 (Figure 1). This area of ocean includes five Large Marine Ecosystems (Southeast U.S. continental shelf, Gulf of Mexico, Caribbean Sea, North Brazil Shelf, and the northern portion of the East Brazil shelf).

The Caribbean Sea supports the highest species diversity in the Atlantic Ocean and is a global-scale hot spot of marine biodiversity (Roberts *et al*. 2002, Miloslavich *et al*. 2010). This species diversity supports industrial and small-scale fisheries along the region which target mollusks, crustaceans and fishes inhabiting from shallow coastal areas to deep abyssal slopes. The productivity of the Western Tropical Atlantic is quite heterogeneous; the most productive regions are related to riverine input and upwelling systems, especially in the Gulf of Mexico and along the North-eastern shelf of South America. Also, coral reefs, coastal lagoons, mangrove forests and seagrass beds are

highly productive and sustain important fishery resources. The diversity and complexity of these coastal and marine ecosystems represents a serious challenge for fisheries research and management in this area.

The area of continental shelf covers approximately 1.5 million km^2 and is particularly extensive in the Gulf of Mexico, in the north-eastern coast of South America from Venezuela to Brazil, in the western Caribbean (shelf areas of the Yucatan Peninsula, Honduras and Nicaragua), and around some island countries and offshore banks (e.g. The Bahamas and Cuba). On the other hand, the Exclusive Economic Zones (EEZs) of WECAFC member countries that border the Western Tropical Atlantic cover more than 6.5 million km^2. The WECAFC includes 16 UN Member States that are Small-Island Developing States with a combined EEZ area greater than 2.2 million km^2 (Table 1).

Table 1. Length of coastline, shelf area and EEZ area of WECAFC Member States that border the Western Atlantic. Data for France cover French Guiana, Guadeloupe and Martinique. Data for the Netherlands cover Aruba, Bonaire, Curacao, Saba and Sint Eustatius. Data for the United Kingdom cover Anguilla, Bermuda, British Virgin Islands, Cayman Islands, Montserrat and Turks and Caicos Islands.

Country	Coastline Km	Shelf Area Km^2	EEZ area km^2
Antigua and Barbuda	289	3 886	102 867
The Bahamas	3 542	116 550	369 149
Barbados	97	342	183 436
Belize	386	10 491	36 182
Brazil	NA	229 147	1 069 456
Colombia	1 600	33 158	417 661
Costa Rica	212	2207	26 961
Cuba	3 735	63 996	222 204
Dominica	152	356	24 917
Dominican Republic	1 288	11 719	246 454
France	NA	46 456	272 598
Grenada	252	2 709	20 285
Guatemala	NA	1 481	1 600
Guyana	459	50 506	140 369
Haiti	1 771	5 672	123 525
Honduras	671	60 303	218 057
Jamaica	1 022	13 874	263 284
Mexico	3 294	235 490	829 311
Netherlands	NA	2 191	80 492
Nicaragua	530	61 293	161 241
Panama	NA	11 464	142 164
Saint Kitts and Nevis	135	855	10 209
Saint Lucia	158	593	15 472
Saint Vincent and the Grenadines	264	2 340	36 304
Suriname	386	53 738	127 817

Trinidad and Tobago	362	23 236	79 798
United Kingdom	833	12 587	902 889
United States of America	NA	466 965	969 169
Venezuela (Bolivarian Republic of)	2 800	107 560	474 769

4. The Fishing Fleet

The number and characteristics of fishing vessels registered in WECAFC Member States and operating in the Western Atlantic are not readily available or frequently updated. Data for CRFM Member States was obtained from the most recent statistics and information report (CRFM, 2021), for OSPESCA Member States data for the Caribbean coast was obtained from FAO (2014), data for Mexico covering the Caribbean and Gulf of Mexico coasts was obtained from the 2018 Fisheries and Aquaculture Statistics Yearbook (CONAPESCA, 2019) with data for the states of Campeche, Tabasco, Tamaulipas, Quintana Roo, Veracruz, and Yucatán. For the rest of the countries data, when available, was obtained from the FAO fishery and aquaculture country profiles (FAO 2022). Estimates of fleet size were not available for the United States of America, Brazil, and France in the WECAFC area. For some countries (e.g. Venezuela) only the total number of boats was available and it was not possible to disaggregate into small-scale and industrial vessels. The total number of vessels from the countries with available data was equal to 125 520. It is important to keep in mind that for most countries the data refers to registered vessels, which represents an underestimate particularly regarding small-scale fisheries vessels.

Table 2. Estimated number of small-scale and industrial vessels from WECAFC Member States bordering the Western Atlantic. For CRFM Member States, when available, industrial vessels were estimated as vessels longer than 18 m. Estimate for the United Kingdom only covers Anguilla, Bermuda and Turks and Caicos Islands. Data for the Netherlands refer to Aruba, Bonaire and Curacao.

Country	Small-scale	Industrial	Total
Anguilla	139	0	139
Antigua and Barbuda	354	0	354
The Bahamas	1 062	38	1 100
Barbados	NA	NA	1146
Belize	607	0	607
Costa Rica	350	0	350
Cuba	3 160	30	3 190
Dominica	339	0	339
Dominican Republic	4 800	NA	4 800
Grenada	2 197	10	2 207
Guatemala	1 840	23	1 863
Guyana	NA	NA	1505

Haiti	11 600	0	11 600
Honduras	2 794	218	3 012
Jamaica	8 031	142	8 173
Mexico	24 280	939	25 219
Netherlands	830	5	835
Nicaragua	3 902	78	3 980
Panama	367	31	398
Saint Kitts and Nevis	206	0	206
Saint Lucia	926	1	927
Saint Vincent and the Grenadines	933	4	937
Suriname	995	181	1176
Trinidad and Tobago	2 559	56	2 615
United Kingdom	300	NA	300
Venezuela (Bolivarian Republic of)	NA	NA	49 384

5. Commercial Fisheries Production and Status of Stocks

In this section most of the information will refer to the Western Central Atlantic (FAO Area 31). As mentioned above the WECAFC area includes the Western Central Atlantic and the northern part of the Southwestern Atlantic (Area 41), which includes the marine waters adjacent to the States of Amapá, Pará, Maranhao, Piauí, Ceará, Rio Grande do Norte, Paraiba, Pernambuco, and Alagoas in north and northeast Brazil. Due to administrative rearrangements of the fisheries sector in Brazil over the last decade the country has not been reporting fisheries data since 2011, except for species under ICCAT mandate, and the data available for other species in the FAO database for recent years (2014-2019) are carry-overs applied by FAO. Efforts have been made by fisheries researchers in Brazil to reconstruct spatially and temporally the fisheries catches of Brazilian fisheries (Freire *et al*. 2021) and to make them openly available. However, to our knowledge this information is not yet considered official by the Brazilian Fisheries Administration (Secretaria de Aquicultura e Pesca). Nevertheless, we will reference this database when dealing with the relevant fisheries resources in the sections below.

After a few years of relative stability around 1.5 million tonnes, total reported landings in 2020 decreased to just under 1.25 million tonnes (Figure 2), representing around 1.4 percent of total worldwide capture fisheries landings. The main producing countries in 2020 were the United States of America, Mexico and Venezuela which reported just over 1 million tonnes representing 80 percent of total landings in Area 31 (Table 3). Guyana, Suriname and Nicaragua followed in importance with a combined contribution of around 95 thousand tonnes. A significant reduction of around 129 thousand tonnes was observed in ISCAAP group 35 (herrings, sardines, anchovies) from

2018 to 2020, this group has maintained its contribution to total landings around 43 percent from 2018 to 2020.

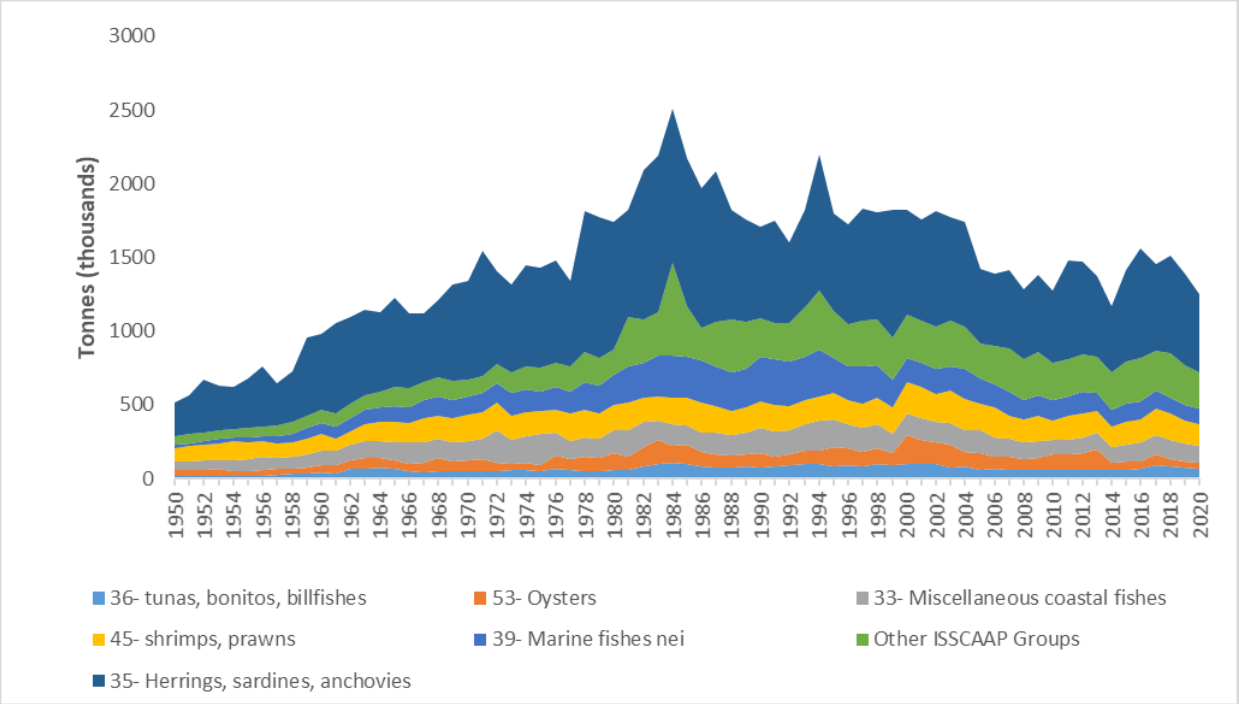

Figure 2. Total fisheries production in the Western Central Atlantic (Area 31) for main ISSCAAP groups (1950-2020).

Table 3. Fisheries landings from Area 31 reported to FAO in 2020 by WECAFC Member States. Estimates for Brazil are only indicative and represent 39 percent of total country landings for 2020 (MPA 2012).

Country	Fisheries production in tonnes (2020)
Antigua and Barbuda	3 165
The Bahamas	7 433
Barbados	1 517
Belize	5 334
Brazil	188 948
Colombia	7 163
Costa Rica	270
Cuba	18 464
Dominica	854
Dominican Republic	9 013
France	6 968
Grenada	1 813
Guatemala	396
Guyana	39 949
Haiti	15 750
Honduras	6 169
Jamaica	11 963
Japan	1 730

Mexico	237 056
Netherlands	911
Nicaragua	26 555
Panama	36
Republic of Korea	29
Saint Kitts and Nevis	646
Saint Lucia	1 424
Saint Vincent and the Grenadines	2 124
Spain	659
Suriname	28 922
Trinidad and Tobago	12 913
United Kingdom	3 404
United States of America	563 874
Venezuela (Bolivarian Republic of)	205 147

5.1. Pelagic fisheries

The pelagic fisheries are the most important fisheries in terms of landed catch in the Western Central Atlantic. These include species of finfish of the families Clupeidae (sardines, menhadens and herrings), Scombridae (tunas, mackerels and bonitos), Carangidae (jacks, scads, pompanos) and Istiophoridae (billfishes), among others. Small pelagic fishes are caught mainly with purse seines and beach seines, while large and medium sized pelagics are caught with purse seines, pelagic longlines, handlines, pole and line, and surface gillnets.

5.1.1. Small pelagic fishes

The main small pelagic fishes are Gulf menhaden (*Brevoortia patronus*) and round sardinella (*Sardinella aurita*). The fishery for Gulf menhaden is an industrial purse seine fishery in waters of the northern Gulf of Mexico. The United States of America is the only country that reports landings of this species, which is used mainly for fishmeal and oil and, to a much lesser extent, for fish bait. This is the single most important fishery in the WECAFC area and reached maximum landings of around one million tonnes in 1984. Since then, landings have decreased significantly and reached 412 322 tonnes in 2020 (Figure 3). The Gulf menhaden population in the Gulf of Mexico is considered as a single stock and it is not overfished nor undergoing overfishing (SEDAR 2018a). The Gulf menhaden fishery received Marine Stewardship Council (MSC) certification in October 2019.

Traditionally, Venezuela has been the main producer of round sardinella in the Western Atlantic with more than 99 percent of total landings. The fishery is a coastal artisanal fishery operating with beach seines and purse seines. Landings are exclusively for human consumption and reached a maximum of around 200 thousand tonnes in 2004. Since then, landings have decreased substantially and reached 122 thousand tonnes in 2016 (Figure 3). No recent reports have been

received from Venezuela and landing estimates for 2017-2019 are carry-overs applied by FAO. No recent stock assessments are available and stock status is unknown.

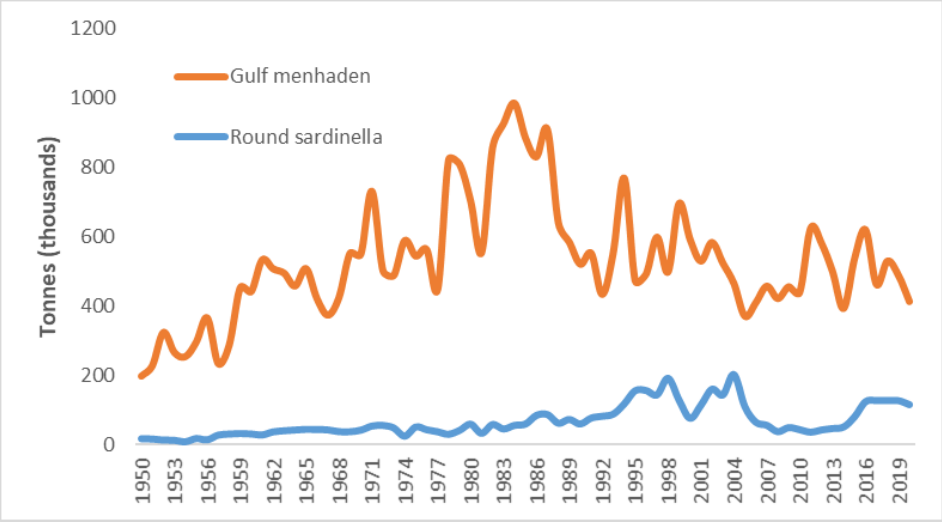

Figure 3. Reported landings of Gulf menhaden (*Brevoortia patronus*) and Round sardinella (*Sardinella aurita*) in the Western Central Atlantic (1950-2020).

In the eastern Caribbean there is a traditional fishery that targets mainly the four-wing flyingfish using surface gillnets and other accessory gears (FADs and handheld dip nets). Flyingfish are used mainly for human consumption and as bait fish. Reported landings of flyingfish peaked in 1988 around 6 000 tonnes and decreased to just over 800 tonnes in 2020 (Figure 4), with Barbados as the major producer. The recent reduction in landings has been associated with reduced catchability due to Sargassum influxes (Ramlogan *et al*. 2017; Oxenford *et al*. 2019). The population of flyingfish in the eastern Caribbean is considered a unit stock but adequate data are lacking to determine stock status (CRFM, 2019a).

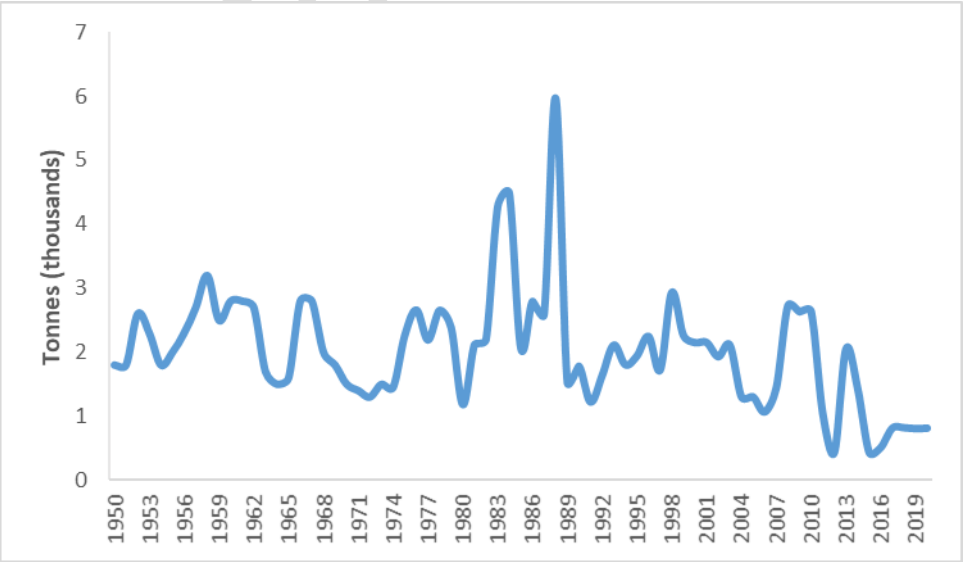

Figure 4. Reporting landings of flyingfish in the Western Central Atlantic (1950-2020).

5.1.2. *Large and medium pelagic fishes*

Large highly migratory species such as blue marlin (*Makaira nigricans*) and Atlantic sailfish (*Istiophorus albicans*) are mainly caught as bycatch of the tuna longline fisheries. However, in some countries small scale fisheries using longlines, trolling and surface gillnets also target these species. On the other hand, swordfish (*Xiphias gladius*) is targeted by a directed longline fishery.

A total of 14 countries, mainly from the eastern Caribbean, reported landings of Atlantic sailfish but main producers were Grenada and Trinidad and Tobago. Landings for this species peaked in 2006 at around 1 700 tonnes and have since declined reaching 285 tonnes in 2020 (Figure 5). Around 15 countries reported landings of blue marlin in 2020, of which France (Guadeloupe and Martinique) and Saint Lucia were the main producers. This species has shown a decreasing trend since a recent maximum in 2008 and reached about 900 tonnes in 2020 (Figure 5). A total of 15 WECAFC Member States reported swordfish landings in 2020 of which the main producers were the United States of America and Spain. Reported landings for swordfish have declined steadily since a recent maximum in 2007 of around 5 000 tonnes and attained around 1 000 tonnes in 2020 (Figure 5).

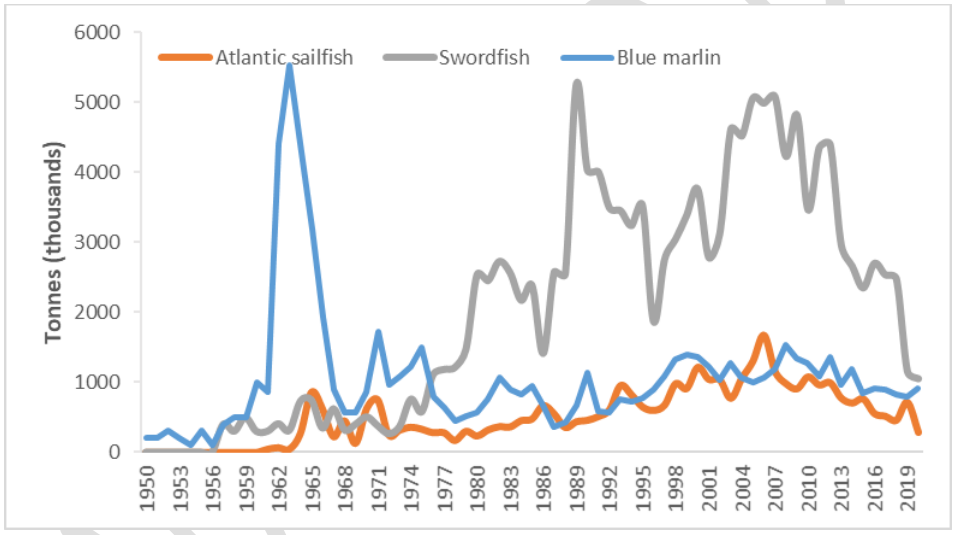

Figure 5. Landings of Blue marlin (*Makaira nigricans*), Atlantic sailfish (*Istiophorus albicans*) and swordfish (*Xiphias gladius*) from the Western Central Atlantic (1950-2020).

The International Commission for the Conservation of Atlantic Tunas (ICCAT) considers that there is a single stock of blue marlin for the Atlantic Ocean. In the most recent assessment (ICCAT, 2018) the stock was estimated to be overfished and undergoing overfishing. For Atlantic sailfish ICCAT considers there are two stocks in the Atlantic Ocean (West and East). The most recent assessment was made in 2016 and estimated that the Western Atlantic stock was not overfished nor undergoing overfishing (ICCAT, 2016a). For swordfish two stocks are considered by ICCAT: North and South Atlantic. The most recent assessment in 2017 (ICCAT, 2017) estimated that the North Atlantic stock was not overfished nor undergoing overfishing.

Tuna species are mainly exploited by longline, purse seine, and pole and line industrial fisheries in the WECAFC region. There are also semi-industrial and small-scale vessels that target tuna species using longlines, handlines and surface gillnets. Around 25 countries report landings of yellowfin tuna (*Thunnus albacares*) in the Western Central Atlantic of which Brazil, Venezuela and Mexico are the main producers. After peaking recently at about 31 thousand tonnes in 2016 reported landings decreased to about 21 thousand tonnes in 2020 (Figure 6). The increase observed since 2012 is mainly due to reported landings by Brazil which has become the major producer in the region. For bigeye tuna (*Thunnus obesus*) landings have increased significantly since 2010 and after peaking around 10 thousand tonnes in 2015 landings reached 8 149 tonnes in 2020 (Figure 6), mainly due to reports from Brazil, China, Japan, and Saint Vincent and the Grenadines. The contribution from skipjack tuna (*Katsuwonus pelamis*) has decreased significantly from a maximum of around 21 thousand tonnes in 1984 to 3 000 tonnes in 2020 (Figure 6), mainly from Brazil and Venezuela. Landings of blackfin tuna (*Thunnus atlanticus*) have also decreased significantly after peaking in 1992 at around 5 500 tonnes and attaining 993 tonnes in 2020 (Figure 6) with Cuba and Saint Lucia as major producers. Reports for albacore have shown an increasing trend since 2008, when landings were around 1 500 tonnes, reaching 4 152 tonnes in 2020 (Figure 6) with Taiwan (Province of China), Suriname and Panama as major producers.

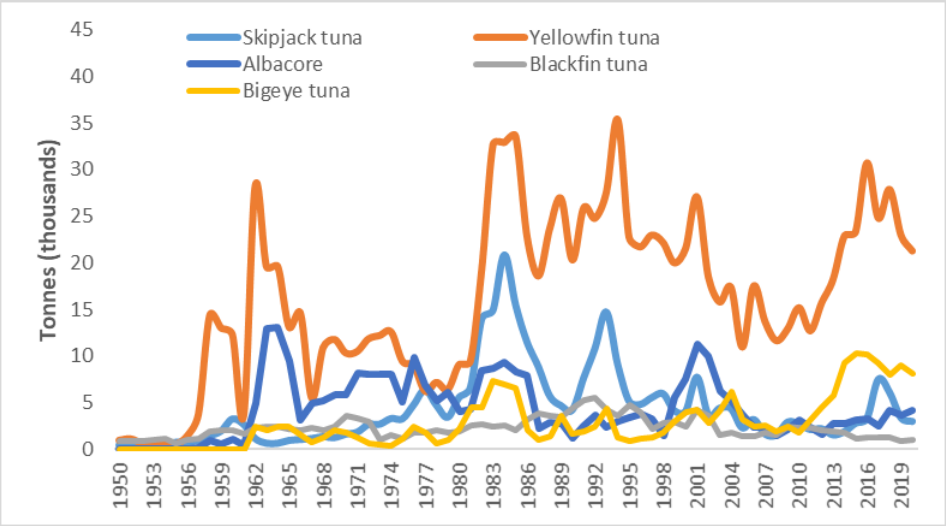

Figure 6. Reported landings of skipjack tuna (*Katsuwonus pelamis*), Albacore (*Thunnus alalunga*), bigeye tuna (*Thunnus obesus*), yellowfin tuna (*Thunnus albacares*) and blackfin tuna (*Thunnus atlanticus*) in the Western Central Atlantic (1950-2020).

For management of yellowfin tuna ICCAT considers a single Atlantic stock. Recent stock assessment indicates that the stock is neither overfished nor subject to overfishing (ICCAT, 2019). For skipjack tuna there are no recent assessments, but in 2014 the Western Atlantic stock was estimated as not overfished nor undergoing overfishing (ICCAT, 2014). For albacore the most recent stock assessment indicates that the North Atlantic stock is not overfished nor undergoing overfishing

(ICCAT, 2016b). For the Atlantic wide stock of bigeye tuna stock assessment results indicate that the stock is overfished but not undergoing overfishing (ICCAT, 2021). There are no stock assessments for blackfin tuna. However, the decreasing trend in landings in the Western Central Atlantic is a matter of concern.

Migratory coastal pelagic species are exploited commercially by semi-industrial and small-scale fisheries using mainly handlines and surface gillnets. King mackerel (*Scomberomorus cavalla*) is exploited in the Southeast United States of America, the Gulf of Mexico, the southeast Caribbean along the coasts of Venezuela, Trinidad and Tobago and the Guianas-Brazil shelf, and to a lesser extent in the eastern Caribbean, especially in Dominica. Total reported landings reached 12 820 tonnes in 2004 and have been relatively stable recently around 10 thousand tonnes and reached about 8 700 tonnes in 2020 (Figure 7). In decreasing order, the main producers are Mexico, the United States of America, Venezuela, Guyana, and Trinidad and Tobago. Atlantic Spanish mackerel (*Scomberomorus maculatus*) is exploited mainly along the United States of America southeast Atlantic coast and the entire extent of the Gulf of Mexico. The main producer for this species is Mexico which represented 83 percent of total production in 2020. Landings of this species had been increasing in recent years and peaked around 11 thousand tonnes in 2018 and then decreased to 8 500 tonnes in 2020 (Figure 7). The serra Spanish mackerel (*Scomberomorus brasiliensis*) is exploited mainly by Guyana, Trinidad and Tobago, and Venezuela. Reported data show a continuous decline from around 6 500 tonnes in 2005 to a recent stabilization around 2 000 tonnes since 2013 (Figure 7). Common dolphinfish (*Coryphaena hippurus*) is exploited throughout the Western Central Atlantic with reported landings from 20 countries. The main producers are France (Guadeloupe and Martinique), Dominica, Saint Lucia, Venezuela and Barbados. Landings show a continuous increase until 2011 when 6 464 tonnes were reported and a subsequent decline to 2 642 tonnes in 2020 (Figure 7). Reconstructed landings in Brazil for the northern portion of Area 41 show that for 2015 estimates for King mackerel were 528 tonnes, for serra Spanish mackerel 7 431 tonnes and for common dolphinfish 820 tonnes, mainly from small-scale fisheries (Freire *et al.* 2021).

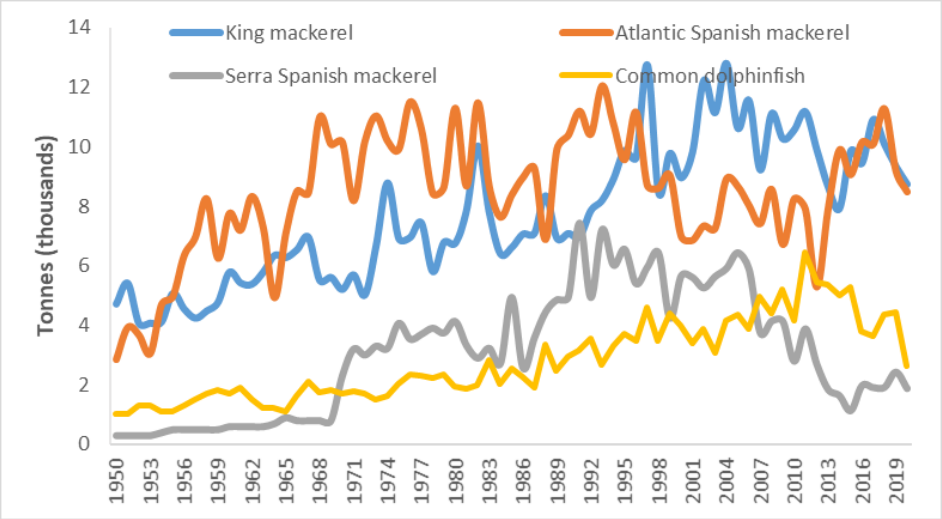

Figure 7. Reported landings of king mackerel (*Scomberomorus cavalla*), Atlantic Spanish mackerel (*Scomberomorus maculatus*), serra mackerel (*Scomberomorus brasiliensis*) and common dolphinfish (*Coryphaena hippurus*) in the Western central Atlantic (1950-2020).

King mackerel has been assessed in waters under jurisdiction of the United States of America where two stocks are considered: a USA southeast Atlantic stock and a northern Gulf of Mexico stock. The most recent assessments indicate that these stocks are neither overfished nor undergoing overfishing (SEDAR 2020a; SEDAR 2020b). In Mexican waters of the Gulf of Mexico the species is estimated to be fully exploited (DOF, 2018). For Atlantic Spanish mackerel in waters of the United States of America a two stock (Southeast Atlantic and Gulf of Mexico) hypothesis is also applied. No recent assessments are available, but the stocks are neither overfished nor subject to overfishing (SEDAR 2012; SEDAR 2013; NMFS 2021b). There are no stocks assessments available for serra Spanish mackerel. However, the recent declining trend in the fisheries landings of major producers (i.e. Trinidad and Tobago and Venezuela) is a cause for concern. There are no stock assessments for common dolphinfish in the Western Central Atlantic. Recent declines in landings in Barbados have been associated with reduced effort due to Sargassum influxes (Oxenford *et al*., 2019).

5.2. Continental shelf fisheries

The most extensive areas of continental shelf in the Western Central Atlantic and northern portion of the southwest Atlantic occur along the southeast coast of the United States of America, the Gulf of Mexico, the shelf adjacent to Honduras and Nicaragua, the northern coast of South America and along the Guianas-Brazil shelf. In these areas the main industrial fishery is the shrimp trawl fishery which mainly use Florida type double rigged trawlers. Penaeid shrimps are the target species of these highly valued fisheries, but a significant number of finfish species are caught and landed as bycatch. Additionally, particularly along the southern coast of the Gulf of Mexico and the Guianas-Brazil shelf, regionally important small-scale fisheries using bottom gillnets, bottom longlines, and handlines exploit demersal finfish resources.

5.2.1. *Finfish*

Weakfishes, drums and croakers are Members of the family Sciaenidae that are abundant and widely distributed along the continental shelves of the WECAFC area. Weakfishes nei include several species that are mainly reported by Mexico, Venezuela and French Guiana. This group reached a peak in 1995 around 20 000 tonnes and subsequently declined steadily and attained around 4 000 tonnes in 2020 (Figure 8). Sea catfishes reached a maximum in 1995 around 26 500 tonnes but have declined significantly since 2004 and reached around 5 800 tonnes in 2020 (Figure 8). The whitemouth croaker (*Micropogonias furnieri*) is reported only by Venezuela and landings peaked in the early to mid-1990s around 7 000 tonnes and in recent years landings have stabilized around 3 000 tonnes (Figure 8). The spotted weakfish (*Cynoscion nebulosus*) is reported mainly by Mexico and, to a much lesser extent, by the United States of America. Landings peaked in the late 1990s around 7 000 tonnes and have declined significantly to around 900 tonnes in 2020 (Figure 8). In the northern portion of the southwest Atlantic (FAO area 41) weakfishes and catfishes are particularly important commercial species. Reconstructed landings for weakfishes were around 26 000 tonnes and for sea catfishes around 23 000 tonnes in 2015 (Freire *et al*. 2021), highlighting the importance of this area for demersal finfish resources.

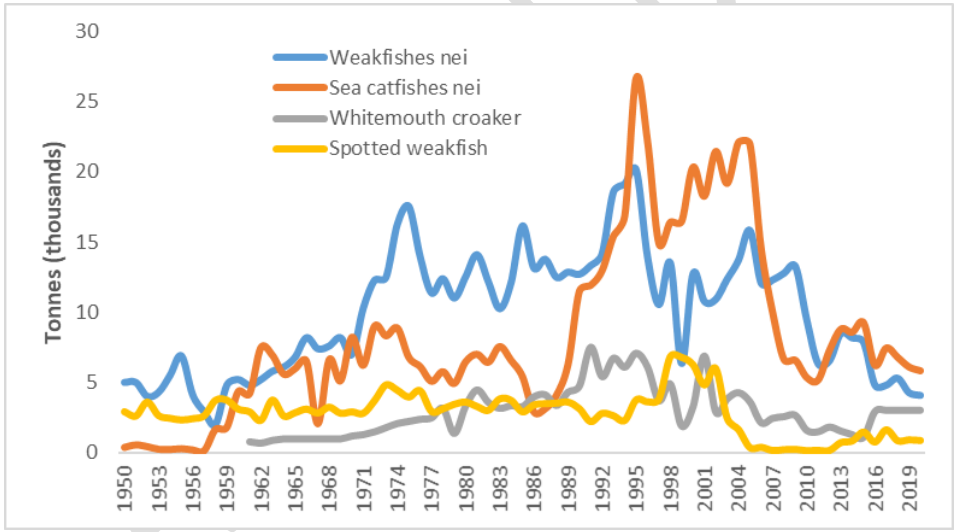

Figure 8. Reported landings of weakfishes (*Cynoscion* spp), Sea catfishes (family Ariidae), whitemouth croaker (*Micropogonias furnieri*) and spotted weakfish (Cynoscion nebulosus) in the Western central Atlantic (1950-2020).

For the above-mentioned species stock assessments have been done only for spotted weakfish in the northern Gulf of Mexico. In the State of Mississippi overfishing is not occurring (Leaf *et al.* 2019) and in the State of Louisiana the species is not overfished nor undergoing overfishing (West *et al.* 2020). However, the overall decreasing trend of the species groups presented in this section is a matter of concern.

5.2.2. Invertebrates

Different species of Penaeid shrimps are the target species in the industrial trawl fisheries of the WECAFC region. The most important fisheries are in the Gulf of Mexico and along the Guianas-Brazil shelf. Northern brown shrimp (*Farfantepenaeus aztecus*) is reported by Mexico and, mainly, the United States of America. Reported landings for this species have remained relatively stable in recent years around 60 000 tonnes but declined to around 40 000 tonnes in 2019 and 2020 (Figure 9). Northern white shrimp (*Litopenaeus setiferus*) is reported only by the United States of America and Mexico. Landings of this species show a declining trend in recent years from around 65 thousand tonnes in 2006 to 47 thousand tonnes in 2020 (Figure 9). Northern pink shrimp (*Farfantepenaeus duorarum*) is reported by the United States, Mexico and Cuba. Landings show an increasing trend in recent years from about 4 300 tonnes in 2013 to approximately 8 200 tonnes in 2020 (Figure 9). Atlantic seabob (*Xiphopenaeus kroyeri*) is reported by Guyana, Suriname, Mexico, and the United States, with Guyana and Suriname as main producers. After a sharp increase during the 1980s and 1990s, landings of Atlantic seabob reached maxima around 30 000 tonnes between 2016 and 2018, but then declined to reach around 18 400 tonnes in 2020 (Figure 9). Other penaeid shrimps are reported by 11 countries from the WECAFC area, mainly from Central America and northern South America, including the Guianas-Brazil shelf. Landings of Penaeus shrimps nei show a sharp decline from around 54 000 tonnes in 2003 to about 9 000 tonnes in 2020 (Figure 9). In the northern portion of the southwest Atlantic (FAO Area 41) penaeid prawns and Atlantic seabob are valuable fisheries. Reconstructed landings for penaeid prawns were around 5 100 tonnes and for Atlantic seabob around 3 900 tonnes in 2015 (Freire et al. 2021).

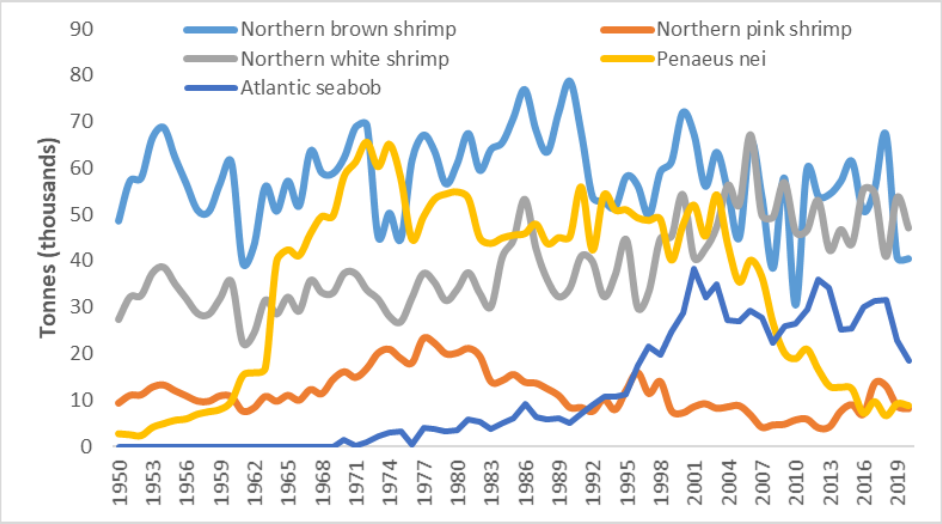

Figure 9. Reported landings of northern brown shrimp (*Farfantepenaeus aztecus*), northern white shrimp *(Litopenaeus setiferus*), Atlantic seabob (*Xiphopenaeus kroyeri*), northern pink shrimp

(Farfantepenaeus duorarum) and other penaeid shrimps in the Western Central Atlantic (1950-2020).

Northern brown shrimp (Hart 2018a), northern white shrimp (Hart 2017) and northern pink shrimp (Hart 2018b) have been assessed in the United States of America Gulf of Mexico waters. These species are not overfished nor undergoing overfishing. Separate stocks for these species in waters along the southeastern United States of America are also not overfished nor undergoing overfishing (NMFS 2021b). Atlantic seabob in Guyana and Suriname has been assessed as separate stocks (CRFM 2019b), for both countries the populations were not overfished, nor overfishing was occurring. Peixoto *et al.* (2021) assessed the fishery for southern brown shrimp in northern Brazil; their results indicate that the population was not overfished nor undergoing overfishing.

5.3. Reef associated fisheries

5.3.1. Finfish

Finfish species associated with coral reef habitats are highly appreciated and valuable food fish. Species concerned are Members of the family Lutjanidae (snappers and jobfishes) and Serranidae (groupers, seabasses and hinds), among others. These are mainly exploited by small-scale and semi-industrial fisheries using hook and line gear (demersal longlines and handlines) and traps. Some species are also caught as bycatch of the industrial shrimp trawl fisheries in the region.

Around 23 WECAFC Member States report Lutjanid species or species groups in the Western Central Atlantic. The northern red snapper (*Lutjanus campechanus*) is reported by Mexico and the United States of America. Reported landings increased since 2010 and in recent years (2016-2020) have been around 8 000 tonnes (Figure 10). Yellowtail snapper (*Ocyurus chrysurus*) is reported by 12 countries in Area 31 of which the main producers are Mexico, the United States of America, Cuba, and Nicaragua. Reported landings of yellowtail snapper follow a slightly increasing trend through the time series and reached around 4 300 tonnes in 2020 (Figure 10). Lane snapper *(Lutjanus synagris*) is reported by seven countries in the WECAFC area of which Cuba is the main producer. Landings of this species have remained stable around 2 000 tonnes in recent years (Figure 10). Other species of Lutjanids reached a maximum of around 25 000 tonnes in 1994 and afterwards declined significantly and reached about 4 000 tonnes in 2020 (Figure 10). In the northern portion of FAO Area 41 Brazilian landings of snapper species, mainly from artisanal fisheries, reached about 8 100 tonnes in 2015.

The red grouper (*Epinephelus morio*) constitutes a main portion of landings of groupers in the Western Central Atlantic. However, only the United States of America and the Dominican Republic make specific reports for this species with the United States of America accounting for 99 percent of the total. Landings in recent years have decreased from 3 112 tonnes in 2014 to 1 276

tonnes in 2020. Mexico also supports a large fishery for red grouper in the southern Gulf of Mexico. However, landings are grouped with other species in the groupers, seabasses nei denomination.

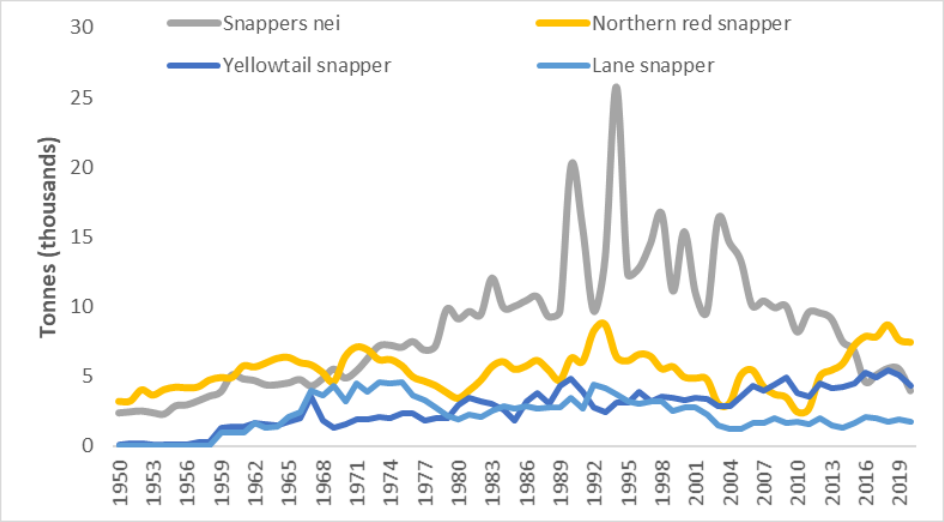

Figure 10. Reported landings of Northern red snapper (*Lutjanus campechanus*), Yellowtail snapper (*Ocyurus chrysurus*), lane snapper (*Lutjanus sy*nagris), and other snapper species in the Western Central Atlantic (1950-2020).

The northern red snapper has been assessed in the United States of America southeast Atlantic coast and in the Gulf of Mexico. The stock in the southeast coast is considered overexploited and overfished (SEDAR 2021), while the stock in the Gulf of Mexico was not overfished nor undergoing overfishing (SEDAR 2018b). Yellowtail snapper was assessed in the southeast Atlantic coast of the United States of America and the results indicated that the stock was not overfished nor subject to overfishing (SEDAR 2020c). A data limited catch only method was used to assess lane snapper in Cuban waters and the results indicated that the stock was overfished and undergoing overfishing (Alzugaray *et al*. 2019). An assessment of red grouper in the southeast coast of the United States of America indicated that the stock was overfished and undergoing overfishing (SEDAR, 2017), while for the stock in the United States of America waters of the Gulf of Mexico results indicated that the stock was overfished but that overfishing was not occurring (SEDAR, 2019). For Mexican waters of the Gulf of Mexico the stock was estimated to be overfished but was not undergoing overfishing (Echazabal-Salazar *et al.* 2021).

5.3.2. Invertebrates

The most valuable invertebrate resources exploited in reef associated habitats in the Western Central Atlantic are the Caribbean spiny lobster (*Panulirus argus*) and the Queen conch (*Lobatus gigas*). Fisheries for these species are small-scale, semi-industrial or industrial using free diving or diving with SCUBA or Hooka gear. Traps and *casitas* (artificial dwellings) are also used for the capture of Caribbean spiny lobster.

The Caribbean spiny lobster is reported by 26 WECAFC Member States and overall landings have fluctuated around 29 000 in the last 10 years of the time series. However, the data show a recent decreasing trend from about 32 400 tonnes in 2016 to around 22 600 tonnes in 2020 (Figure 11). The Bahamas, Honduras, Nicaragua, Cuba, and the Dominican Republic accounted for 77 percent of total reported landings in 2020. Landings of Caribbean spiny lobster in the northern portion of Area 41 were estimated at about 1 200 tonnes in 2015 (Freire *et al.* 2021).

Queen conch landings are reported by 25 countries in the Western Central Atlantic. Total reported landings have averaged around 32 000 tonnes for 2016-2019 and showed a decline to 25 285 tonnes in 2020 (Figure 11). Nicaragua, Belize, the Bahamas and the Dominican Republic are the main regional producers accounting for 72 percent of total regional landings in 2020.

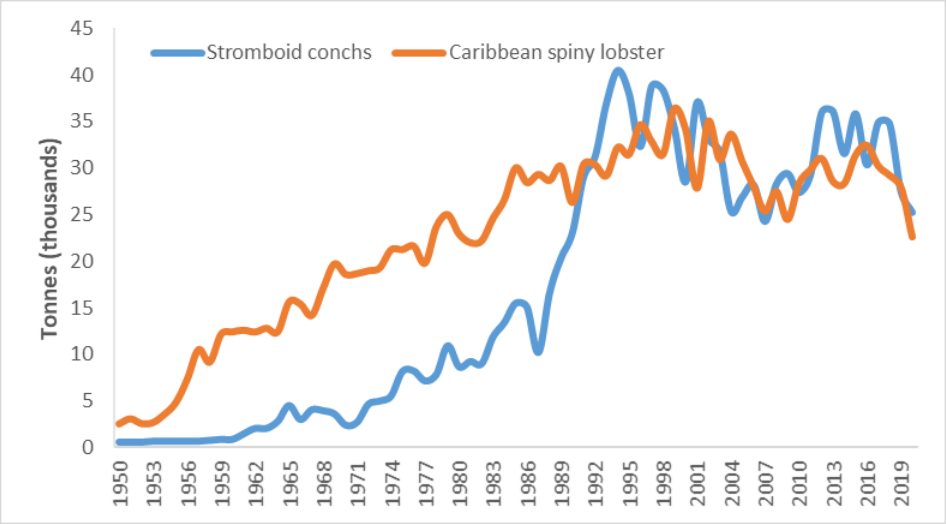

Figure 11. Reported landings of Caribbean spiny lobster (*Panulirus argus*) and Queen conch (*Lobatus gigas*) in the Western Central Atlantic (1950-2020).

Stocks assessments of Caribbean spiny lobster and Queen conch are not frequently carried out in their distribution range. Fisheries have been assessed in Puerto Rico and the United States Virgin Islands and it was estimated that stocks were not overfished, nor overfishing was occurring (SEDAR, 2019b). In Cuba the stock is estimated to be overfished but that overfishing was not occurring (Alzugaray et al. 2018). In northern and north-eastern Brazil, the stock of Caribbean spiny lobster was estimated as overfished and undergoing overfishing (Aragao and Cintra, 2018). Assessments of Queen conch are frequently done by density surveys of exploited stocks. In Jamaica the fishery for Queen conch was closed in 2019 due to low densities observed in 2018. In Nicaragua Queen conch is not considered overexploited (FAO Western Central Fishery Commission, 2020).

6. Recreational Fisheries

In the Caribbean Sea and Gulf of Mexico marine recreational fisheries are an important component of the leisure and tourism industries. However, except for the United States of America where data are systematically collected, information on the ecological, social, and economic impacts of recreational fisheries is rather limited.

In the Gulf of Mexico waters and southeast coast of the United States of America recreational fisheries generated 223 907 jobs in 2018, which represented 48 percent of all marine recreational fisheries jobs in the United States of America (NOAA, 2021). The State of Florida is where most of the recreational fisheries´ activity occurs, with more than 126 thousand jobs generated in that state alone. In 2018 the number of marine recreational fishing trips in the United States of America totalled 193.5 million, of which 68 percent corresponded to the southeast coast and Gulf of Mexico. The economic impacts associated with recreational fisheries in the southeast coast and Gulf of Mexico represented a total of USD 49.5 billion from sales (USD 25.1 billion), incomes (USD 9 billion) and value added (USD 15.4 billion) impacts.

Harvest of finfishes by marine recreational fisheries in the continental United States of America bordering FAO Area 31 are dominated by demersal species of the family Sciaenidae. For example, landings in 2019 of seatrouts and drums reached around 7 200 tonnes and 8 100 tonnes, respectively. Landings of regionally important pelagic species are also significant (Figure 12). Except for common dolphinfish, which shows a decreasing trend since 2015, most species show relatively stable harvest levels since the early 2000s. Combined landings of blackfin tuna, king mackerel, common dolphinfish, and bluefish (*Pomatomus saltatrix*) exceeded 13 thousand tonnes in 2020. Recreational landings of common dolphinfish and blackfin tuna in 2020 were greater than reported commercial landings of the same species for all countries in the Western Central Atlantic.

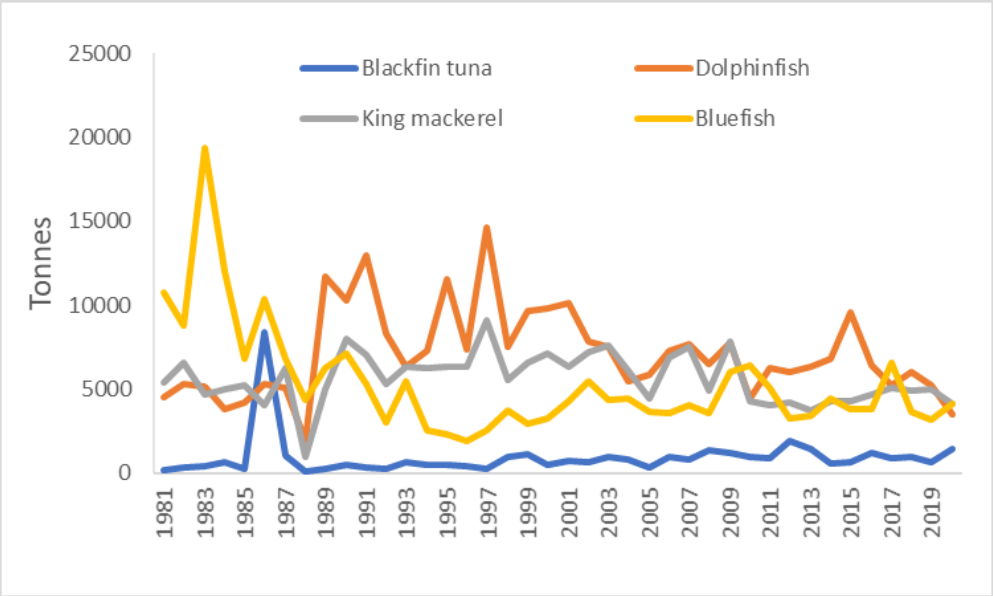

Figure 12. Marine recreational landings of blackfin tuna (*Thunnus atlanticus*), king mackerel (*Scomberomorus cavalla*), common dolphinfish (*Coryphaena hippurus*) and bluefish (*Pomatomus saltatrix*) from continental United States of America waters in the Western Central Atlantic.

In the Bahamas recreational fishing is a popular activity carried out by visitors to the islands. A significant part of recreational fishing occurs in the scenic shallow "flats" waters around the islands. Flats fishing in the Bahamas targets mainly bonefish (*Albula vulpes*). In 2018 around 31 000 anglers practiced bonefish fishing. It was estimated that this recreational activity generated USD 169 million in total economic benefits to the Bahamian economy and supported around 7 800 full-time jobs. Expenditures by flats recreational fishers accounted for around 7 percent of total tourist expenditures in the Bahamas in 2018 (Fedler, 2019).

Quintana Roo is the Mexican State with the highest affluence of tourists, having received 15 million tourists in 2019 who contributed USD 16.2 billion to the state´s economy in 2019. The flats fishery for bonefish in Quintana Roo generated close to USD 45 million in 2019 of which about USD 20 million was the direct expenditure from 6 083 anglers that visited during the 2019 fishing season (Palomo and Perez, 2021). It was also highlighted that the expenditures from anglers were higher than those of average tourists and that their activity was more sustainable than other tourist activities in the State.

In Eastern Caribbean countries recreational fishing usually takes place in deep waters from private or chartered boats. Target species of these fisheries are large pelagic fishes including marlins, Atlantic sailfish, yellowfin tuna, blackfin tuna and common dolphinfish, among others. In a recent study (OECS, 2020) in Dominica, Grenada, Saint Lucia, Saint Kitts and Nevis, and Saint Vincent and the Grenadines it was estimated that a total of 9 168 recreational fishing trips took place annually, which generated expenditures of about USD 6.8 million. Saint Lucia and Saint Kitts and Nevis accounted for 70 percent of the number of trips and 76 percent of total trip expenditures.

7. Aquaculture Production and Value

Marine and brackish water aquaculture production in the WECAFC area has varied between 50 thousand tonnes and 260 thousand tonnes over the last 20 years with a total value that has varied between USD 35 million and USD 730 million (Figure 13) for the same period. Total aquaculture production increased significantly over 15 years from the late 1980s to the mid-2000s, but then decreased and remained stable around 200 thousand tonnes until 2017. Over the last few years from 2018 to 2020 production has increased to about 260 thousand tonnes and total value reached the maximum quantities in the series. In 2020, Brazil, Colombia, Cuba, Mexico, Panama, United States of America, and Venezuela accounted for about 98 percent of total production and value (table 4).

The main species produced in terms of volume is the American cupped oyster (*Crassostrea virginica*) reported only by the United States of America. Production of American cupped oyster has been increasing since 2001 and reached 125 thousand tonnes in 2020 with a value of USD 145 million. Other species of oysters reported from the region include the mangrove cupped oyster (*Crassostrea rhizophorae*) in Cuba with a production in 2020 of around 1 150 tonnes and the Cortez oyster (*Crassostrea corteziensis*) from Mexico with a production of around 633 tonnes in 2020.

The other main species produced in the region is the whiteleg shrimp (*Litopenaeus vannamei*) reported by nine countries in the region of which Brazil, Venezuela, Cuba, and Colombia account for 94 percent of total production. Production from Brazil in the southwest Atlantic has been included as most of the shrimp farms are in northern and north-eastern Brazil within the WECAFC area. Whiteleg shrimp production in the region peaked at 141 thousand tonnes in 2003 with a total value of USD 479 million. Since then, production declined steadily and reached a minimum of 78 thousand tonnes in 2017 and then increased to 123 thousand tonnes in 2020 with an estimated value of USD 549 million. The decline of whiteleg shrimp production is related to viral infections that have plagued some shrimp farms in the region. For example, production in Belize was around 7 200 tonnes in 2014 and for 2020 production was estimated at about 500 tonnes.

Aquaculture production of finfishes is limited in the region. The most important producers are the United States of America that reported 3 244 tonnes of red drum (*Sciaenops ocellatus*) in 2020, and Panama that reported 1 000 tonnes of cobia (*Rachycentron canadum*) for the same year.

The culture of marine algae remains limited but has been increasing substantially over the last 15 years. In the eastern Caribbean, mainly from Saint Lucia, Grenada, and Saint Vincent and the Grenadines, total production reached 117 tonnes in 2020 with an estimated value of around USD 2 million.

In a recent review of the development of the aquaculture sector in Latin America and the Caribbean (Wurmann et al. 2022), the authors considered that the industry required better governance, the adoption of adequate technologies and best practices, increased efforts for environmental sustainability, and foresight to deal with climate and market changes. Additional challenges faced by SIDS included limited expertise, high production costs, poor seed supplies, and extreme and destructive weather events.

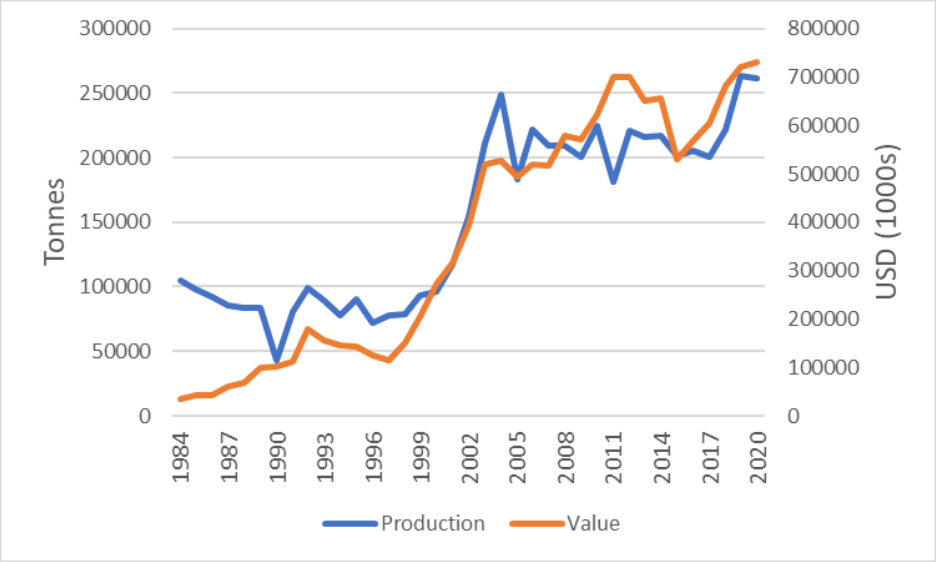

Figure 13. Marine and brackish water aquaculture production in tonnes and value in thousands of USD in the WECAFC area (1984-2020).

Table 4. Aquaculture production in tonnes and value in USD for marine and brackish water species in the WECAFC area. Values for Brazil refer to Whiteleg shrimp (*Litopenaeus vannamei*) only.

Country	Tonnes (2020)	Value in thousands of USD
The Bahamas	5	115
Belize	505	2 010
Brazil	63 170	257 205
Colombia	6 146	49 478
Cuba	5 874	17 684
Dominican Republic	775	3 358
France	75	651
Grenada	22	55
Guyana	106	875
Mexico	3 605	12 562
Panama	1 018	5 144
Saint Lucia	82	1 827
Suriname	15	108
United Kingdom	1	23
United States of America	130 412	177 068
Venezuela (Bolivarian Republic of)	49 084	202 409
Total	260 895	730 572

8. Fish Utilization and Trade

In the Western Central Atlantic about 33 percent of total production is used for fishmeal and oil, mainly from Gulf menhaden; this is higher than the world average which is around 22 percent (FAO 2020a). Other small pelagics, mainly round sardinella from Venezuela, are usually canned or sold fresh. Most of the remaining production of fish and crustaceans is consumed fresh or frozen. In

particular, landings from small scale fisheries are usually sold directly to consumers or vendors in fish markets for fresh consumption. High valued products such as Penaeid shrimps, Caribbean spiny lobster, Queen conch and, to a lesser extent, snappers and groupers are destined for export markets (e.g. United States of America, European Union) usually fresh or frozen.

WECAFC Member States are very heterogeneous in cultural, social, economic and geographical terms. For example, some of the WECAFC Member States are among the main producers and consumers of fisheries products at the global scale, while others may only produce and consume several hundred tonnes per year. The approach used in this section was to analyse global trade for most of the countries in the region, which are relatively small market states, and trade with WECAFC Member States bordering the Western Central Atlantic for the larger market countries (i.e. France, Republic of Korea, Japan, Netherlands, Spain, United Kingdom, and United States of America).

Overall, WECAFC Member States are a net importer of fisheries products. In terms of volume the region imported almost 2 billion tonnes with a value of around USD 8.1 billion. Brazil, Colombia, Japan, and the United States of America accounted for 52 percent of the weight and 60 percent of the value of imports in 2019. On the other hand, exports by WECAFC Member States totalled about 974 thousand tonnes with a value of USD 4.8 billion. Mexico, Panama, and Brazil accounted for 51 percent of export volume and 49 percent of export value in the region.

Out of 32 countries, 13 presented positive trade balances. The countries with the highest relative trade surpluses (i.e. ratio of value of exports to value of imports) were Belize, Guyana, Nicaragua, Suriname and Honduras. Countries with the lowest relative trade balance include Barbados, Saint Lucia, Saint Kitts and Nevis, Jamaica, France and the Dominican Republic.

With some exceptions, overall average prices of exports exceeded the average prices of imports, which is important in terms of food security for many of the countries in the region. However, for some SIDS that are highly dependent on tourism high valued imports (e.g. salmon, shrimps) are required to satisfy demand from this sector.

Table 5. Imports and exports in tonnes and USD for WECAFC Member States in 2019. For France, Japan, Republic of Korea, Netherlands, Spain, United Kingdom and United States of America results refer to trade with WEFAFC Member States bordering the Western Central Atlantic only. For all other Member States results refer to global trade.

Country	Imports tonnes	Imports USD (1000s)	Exports tonnes	Exports USD (1000s)
Antigua and Barbuda	2 014	9 033	95	1 488
The Bahamas	4 439	23 561	2 182	68 910
Barbados	7 652	29 226	103	305
Belize	510	724	3 262	24 791
Brazil	342 898	1 306 810	70 625	329 624

Colombia	169 831	470 638	42 037	153 640
Costa Rica	65 596	172 729	23 341	125 282
Cuba	22 433	45 074	7 382	76 130
Dominica	439	2 268	10	970
Dominican Republic	39 779	201 323	3 295	18 532
France	75 736	362 089	6 298	27 960
Grenada	1 006	5 143	832	3732
Guatemala	40 415	94 574	18 926	101 011
Guyana	3 549	4 842	22 022	95 853
Haiti	21 035	46 003	NA	NA
Honduras	11 310	22 329	46 654	222 857
Jamaica	36 433	127 128	542	9 932
Japan	298 713	1 371 194	20 623	301 374
Mexico	266 329	830 692	340 152	1 394 570
Netherlands	1 638	12 928	0	0
Nicaragua	7 764	16 995	41 857	291 576
Panama	27 109	95 120	86 568	160 573
Republic of Korea	120 398	321 930	35 122	204 092
Saint Kitts and Nevis	637	3 302	40	257
Saint Lucia	1 908	10 265	101	150
Saint Vincent and the Grenadines	557	2341	457	2941
Spain	113 756	431 212	42 694	238 965
Suriname	2 597	6 942	18 063	76 739
Trinidad and Tobago	10 928	43 767	4 928	26 333
United Kingdom	3 521	29 515	175	2 050
United States of America	202 643	1 693 151	47 276	183 722
Venezuela (Bolivarian Republic of)	12 249	45 800	29 612	130 091

9. Fisheries socioeconomics in the WECAFC region

9.1. Fish consumption

For WECAFC Member States bordering the Western Central Atlantic fish consumption is highest among some of the Caribbean islands. Particularly, Antigua and Barbuda, Saint Kitts and Nevis, Saint Lucia and the British Overseas Territories have annual consumptions greater than 34 kg per capita. On the other hand, Cuba, Haiti and the Dominican Republic, WECAFC Member States with the largest land extensions among the Caribbean islands, have the lowest consumption rates with values of 5.7 kg per capita, 6.5 kg per capita and 8.5 kg per capita, respectively.

The Central American countries have the lowest average consumption rate for the WECAFC area at less than 10 kg per capita, with Honduras (2.7 kg per capita) and Guatemala (3.2 kg per capita) presenting the lowest overall consumption rates in the region

The larger countries bordering the WECAFC area present different levels of apparent consumption ranging from a low of 7.1 kg per capita for Colombia to a maximum of 22.4 kg per capita for the United States of America.

It is important to keep in mind that in many countries of the region, particularly regarding small-scales fisheries, there is significant underreporting of fish production which leads to an unknown level of sub-estimation in fish consumption rates.

Table 6. Per capita fish consumption (kg/capita) for WECAFC Member States in 2017.

Country	**Fish available for consumption Kg/capita**
Antigua and Barbuda	55.5
The Bahamas	24.9
Barbados	43.0
Belize	14.0
Brazil	9.1
Colombia	7.1
Costa Rica	18.5
Cuba	5.7
Dominica	28.1
Dominican Republic	8.5
France[4]	10.8
Grenada	27.1
Guatemala	3.2
Guyana	25.3
Haiti	6.5
Honduras	2.7
Jamaica	25.5
Japan	45.8
Mexico	14.7
Netherlands[5]	33.0
Nicaragua	6.9
Panama	14.4
Republic of Korea	57.2
Saint Kitts and Nevis	39.7
Saint Lucia	34.1
Saint Vincent and the Grenadines	19.6
Spain	42.5
Suriname	17.0
Trinidad and Tobago	23.9

[4] Average value of French Guiana, Guadeloupe and Martinique

[5] Value is average of consumption in Aruba, Bonaire/St. Eustatius and Curacao

United Kingdom[6]	36.8
United States of America	22.4
Venezuela (Bolivarian Republic of)	9.8

9.2. Employment

Table 7 provides an estimate of the number of fishers operating in the WECAFC area. For many countries it was not possible to separate the number of fishers operating in small-scale and industrial fisheries. The number of fishers in Brazil is likely one of the largest in the region, however specific data for north and north-eastern Brazil was not available. Without Brazil, the total estimate of fishers is equal to 402 673 of which Colombia, Haiti, Jamaica, Mexico, the United States of America, and Venezuela account for 79 percent.

Table 7. Estimated number of small-scale, industrial, and total fishers in the WECAFC area.

Country	Small-scale	Industrial	Total
Antigua and Barbuda	2 149	0	2 149
The Bahamas	NA	NA	10 000
Barbados	NA	NA	2 200
Belize	2 200	0	2 200
Colombia	NA	NA	40 000
Costa Rica	700	NA	700
Cuba	NA	NA	5 874
Dominica	912	0	912
Dominican Republic	8 400	NA	8 400
Grenada	NA	NA	2 552
Guatemala	3 680	134	3 814
Guyana	NA	NA	8 175
Haiti	46 000	0	46 000
Honduras	5 588	4 356	9 944
Jamaica	NA	NA	25 274
Mexico	NA	NA	94 410
Netherlands[7]	2 195	NA	2 195
Nicaragua	7 804	1 849	9 653
Panama	734	NA	734
Saint Kitts and Nevis	777	0	777
Saint Lucia	NA	NA	3364
Saint Vincent and the Grenadines	1 142	NA	1 142
Suriname	NA	NA	4 500
Trinidad and Tobago	NA	NA	3 347

[6] Value is average of consumption in Bermuda, British Virgin Islands, Cayman Islands, and Turks and Caicos Islands

[7] Estimate is for number of fishers in Aruba, Curaçao and Bonaire

United Kingdom[8]	2 760	NA	2 760
United States of America	NA	NA	29 832
Venezuela (Bolivarian Republic of)	NA	NA	81 765

9.3. Fisheries contribution to GDP

Table 8 presents data on the human population, per capita Gross Domestic Product, percent contribution of fisheries to GDP and per capita fish production for Member States bordering the WECAFC area. Very few countries in the region have fisheries percent GDP contributions above one percent. These include Belize, Grenada, Guyana, Nicaragua, and Suriname. These are countries that have export driven fisheries for high value products such as penaeid shrimps and Caribbean spiny lobster. Some of these countries (Guyana, Nicaragua, and Suriname) also show some of the highest values of per capita fish production.

It is important to keep in mind that fisheries contribution to GDP is significantly underestimated as it only considers the ex-vessel or ex-farm price of fisheries products and does not account for the contribution along the complete value chains.

Table 8. Human population, per capita Gross Domestic Product (GDP), percent contribution of fisheries to GDP, and per capita fish production for WECAFC Member States bordering the Western Atlantic. For countries that also have boundaries with the Pacific Ocean, Northeast or Southwest Atlantic Ocean, population estimates refer only to States, departments or provinces bordering the WECAFC area.

Country	Population	GDP per capita in USD	% GDP Fisheries	Per capita fish production
Antigua and Barbuda	95 430	16 727	0.92	33.2
The Bahamas	381 750	32 218	0.67	26.6
Barbados	286 230	17 746	0.15	5.2
Belize	375 770	4 885	3.00	12.1
Brazil	49 998 821	8 921	0.50	9.7
Colombia	10 711 255	6 650	0.20	1.0
Costa Rica	460 083	12 027	0.07	1.4
Cuba	11 339 250	8 822	NA	1.5
Dominica	71 460	7 691	NA	11.0
Dominican Republic	10 513 100	7 650	0.30	1.2
France	1 038 090	NA	NA	7.9
Grenada	110 870	10 486	1.50	23.7
Guatemala	440 495	4 549	0.22	0.7
Guyana	775 220	4 901	1.04	49.5
Haiti	10 982 370	835	NA	1.4
Jamaica	2 920 850	5 354	NA	4.2

[8] Estimate is for number of fishers for Bermuda, Cayman Islands, and Turks and Caicos Islands

Mexico	18 732 743	9 695	0.10	13.3
Netherlands	296 751	24 977	NA	3.5
Nicaragua	960 199	2 029	1.10	28.8
Panama	998 823	15 575	0.60	3.9
Saint Kitts and Nevis	52 050	19 275	0.50	12.6
Saint Lucia	180 950	10 566	0.80	10.2
Saint Vincent and the Grenadines	109 830	7 361	NA	16.0
Suriname	570 500	6 004	2.20	64.2
Trinidad and Tobago	1 384 060	17 130	0.06	9.4
United Kingdom	254 082	44 183	NA	13.4
United States of America	93 196 728	65 280	NA	7.1
Venezuela (Bolivarian Republic of)	29 402 480	7 212	NA	7.5

9.4. Safety at sea and decent work in the WECAFC region

Fishing is one of the most dangerous occupations in the world. Worldwide the number of people employed in fisheries has been increasing and as a result so have increased the number of deaths. There is also a significant number of fishers that suffer injuries and work-related illnesses.

Safety at sea and on-board working conditions may also be related to fisheries management decisions or the lack of. For example, as stocks are overfished in coastal waters this may lead fishers to going out further offshore and extend their time at sea, which increases the probabilities of work-related accidents, especially in small scale fisheries. Also, restrictions on fishing time or season can induce the race to fish which may increase the probabilities of accidents at sea. Furthermore, for many small-scale and industrial fishers' health and accident insurance are frequently lacking.

In the eastern Caribbean the GEF funded and FAO executed Climate Change Adaptation in the Eastern Caribbean Fisheries Sector (CC4FISH) Project has been supporting fisheries administrations, small-scale fishers and their organizations on safety at sea in Antigua and Barbuda, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Trinidad and Tobago. A total of 1 200 fishers have received training, among others, in safety at sea and engine repair, and 1 100 VHF radios have been provided as well as the radio repeater systems in four of the project countries. The project also supported the publication of the "Safety at sea for small-scale fishers in the Caribbean"[9], also available in Spanish[10], which is an illustrated and simply written

[9] https://www.fao.org/3/ca8626en/ca8626en.pdf
[10] https://www.fao.org/3/ca5772es/ca5772es.pdf

manual mainly for small-scale fishers but that also includes tips for captain and crew of larger vessels.

9.4.1. The Caribbean spiny lobster fishery in Nicaragua and Honduras

In the Caribbean spiny lobster fishery of Nicaragua and Honduras SCUBA (Self-Contained Underwater Breathing Apparatus) diving, Hooka (surface compressor and hose breathing system) diving, traps and free diving are used as the main fishing modes for this species. For example, in Nicaragua the fisheries value chain for spiny lobster involves around 9 200 persons of which about 2 300 are diver fishers belonging mainly to the Miskito indigenous people. From 1990 to 2016 approximately 1 100 diving accidents were registered from which 528 fishers remained with severe disabilities, while the rest suffered less severe sequels. During the three-year period from 2011 to 2014 a total of 14 diver fishers died from decompression sickness (FAO, 2020b). The government of Nicaragua with support from the government of Mexico and the FAO introduced collapsible traps and artificial shelters (i.e. casitas) on the Caribbean coast of Nicaragua which have had growing acceptance in the artisanal and industrial sectors, as they offer the opportunity to reduce direct and indirect production costs as well as diving accidents (FAO, 2020b).

Some actions that have been recently proposed (Beltrán-Turriago, 2021) to deal with safety issues and working conditions in dive fisheries of the WECAFC area include: 1) design or review legal and policy frameworks; 2) promote awareness raising and training in safe diving; 3) design multilingual (including indigenous languages) practical guides on safe diving; 3) design smartphone applications for safe diving; 4) support training in hyperbaric medicine; and 5) promote involvement of social workers to support fishers and their communities.

9.4.2. Working conditions in the shrimp and groundfish fisheries of the Guianas-Brazil shelf.

Within the context of the GEF funded FAO CLME+ subproject on shrimp and groundfish of the North Brazil Shelf Large Marine Ecosystem and assessment of decent work of the shrimp and groundfish fisheries of Guyana, Suriname, and Trinidad and Tobago was carried out (Lout, 2020).

The subregion has made progress to advance decent work. Guyana, Suriname, and Trinidad and Tobago have all made committed efforts to address forced and child labour, discrimination, and association and collective bargaining by ratifying many of the fundamental International Labour Organization (ILO) conventions, including Nos. 29, 105, 138, 182, 87, 98, 100, and 111. Despite these commitments, there is a shared challenge of implementation of such instruments at the domestic level and within the sector. Fisheries laws and regulations are frequently outdated, and generally lack any mention of social issues or policies focused on labour or associated rights. Exclusion of these important dimensions has resulted in few advancements on social improvements in the sector.

The assessment identified the most pressing concerns related to decent work in the shrimp and groundfish fisheries: widespread IUU fishing, inadequate occupational safety and health standards, and limited stakeholder participation and collaborative management. The lack of social protection and food security were also identified as critical issues. IUU fishing was linked to other concerns like safety and stakeholder participation. Similarly, fishers and fish workers lacking legal status are typically excluded from the decision-making processes.

Fisheries management and laws are almost exclusively focused on environmental issues and outcomes. There is an overall poor understanding of labour rights in the sector, as well as limited awareness around human rights. The significant role played by the shrimp and groundfish fisheries in the region's employment and food and livelihood security requires fisheries management that also prioritizes social well-being and justice.

10. Challenges for the fisheries and aquaculture sectors

10.1. Illegal, unreported and unregulated (IUU) fishing

The 4th Meeting of the -Regional Working Group on Illegal, Unreported and Unregulated (IUU) Fishing took place virtually on 8-9 September 2020 (FAO 2021a). During the meeting the WECAFC Secretariat shared the findings of the assessment of Member States readiness to implement the Regional Plan of Action on IUU (RPOA-IUU). Member States indicated high priority for the implementation of most of the measures, but that they were primarily not ready for the implementation of measures at the regional level. Member States indicated that they were either very ready to implement measures associated with the policy and legal framework or that they have already started this process. In reviewing the responses to operations and monitoring, control, and surveillance (MCS) there was greater variability among Member States in their readiness to address these measures. Members indicated that the top two needs were budgetary and financial assistance, as well as training and capacity development. The results indicated that on average PSMA Parties were readier to accomplish the measures in comparison to the other WECAFC Member States.

In 2017, FAO launched a global capacity development programme to support developing coastal States and Small Island Developing States (SIDS) in developing capacity to adopt and implement the provisions of the PSMA and complementary international instruments and tools to combat IUU fishing. The programme represents one component of assistance that is being provided to developing States in accordance with Part 6 of the PSMA, and contributes to the achievement of SDG 14, and in particular, SDG 14.4 which calls for ending overfishing, IUU fishing and destructive fishing practices by 2020.

The table below shows the information on support provided to WECAFC Member States through the global capacity development programme (FAO 2020c). Additional support has been provided through other activities such as projects. For example, an introductory, online workshop on effective fisheries MCS to combat IUU fishing was delivered by FAO over three half-day sessions, from 23-25 March 2021. The workshop brought together 200 participants from various national agencies of Brazil, Guyana, Suriname and Trinidad and Tobago – including fisheries, coastguard, customs, police, and navy, among others.

Table 9. Capacity development support for WECAFC Member States for the implementation of the PSMA and complementary instruments (2016-2020)

			In-country assistance		International training	
Country	**PSMA Party**	**National Strategy and Road Map**	**Policy/Legislation**	**MCS Enforcement**	**Legal**	**Port Inspection**
Bahamas	X	X	X	X		
Brazil				X		
Colombia		X	X			
Costa Rica	X	X	X		X	X
Cuba	X	X			X	
Dominica	X	X				
Dominican Republic		X	X	X		
Guyana	X	X	X	X		
Jamaica		X	X	X		
Panama	X	X	X	X	X	X
Saint Vincent and the Grenadines	X	X	X	X	X	
Suriname		X		X		
Trinidad and Tobago	X	X	X	X		

10.2. Sargassum influx in the WECAFC area

Every year since 2011, except for 2013, the Western Central Atlantic has received massive influxes of floating sargassum seaweed originating from the tropical equatorial Atlantic Ocean (Wang et al. 2019). The 2018 influx has been the most massive so far, but significant amounts of sargassum also reached the Caribbean Sea and Gulf of Mexico during 2019 and 2021[11].

[11] Near real time monitoring of sargassum influxes is available at University of South Florida (USF) Satellite-based Sargassum Watch System (SaWS) https://optics.marine.usf.edu/projects/SaWS.html

At sea sargassum serves as a pelagic habitat for many species of invertebrates and fishes. However, stranding events on coastlines may have significant negative impacts on socio-economic activities, such as tourism and fisheries, as well as negative ecological impacts on coastal habitats such as coral reefs, mangroves, and seagrass beds. Decomposing sargassum mats may produce local anoxia events which may result in mortality of fish and invertebrates, as well as hinder access of sea turtles to their traditional nesting sites.

Sargassum influxes have affected the fisheries sector in different ways. At sea sargassum may damage vessel engines (propellers and water intakes), hinder navigation and cause damage to fishing gears. Access to ports and beaches may also be affected limiting access to landings sites and fish markets.

Sargassum influxes also represent an opportunity as there is potential for different uses including agriculture, bioenergy, bioplastics, bioremediation and purification, construction, and cosmetics, among others (Desrochers *et al*. 2020). However, potential value chains need to be assessed as well as the harvesting, storage, production, and distribution logistics of derived products.

Guidance for policy makers and other stakeholders may be found in FAO (2021b), UNEP-CEP (2021) and the Sargassum Information Hub[12]

10.3. Coastal and Marine Pollution

The Caribbean Environmental Programme (UNEP-CEP) recently published the report on the State of the Cartagena convention area (UNEP-CEP, 2019). The convention area covers four large marine ecosystems: Southeast US continental shelf, Gulf of Mexico, Caribbean Sea and the northern portion of the North Brazil shelf. The convention is the only regional legally binding agreement for the protection, sustainable development, and use of the region's coastal and marine resources.

The report uses water quality data sets from several countries and territories to produce an assessment of the impact of land-based pollution on the marine environment. Eight water quality indicators were assessed: dissolved inorganic nitrogen (DIN), dissolved inorganic phosphorus (DIP), chlorophyll-a, dissolved oxygen, turbidity, pH, and Escherichia coli and Enterococcus species.

For all the indicators except dissolved oxygen and pH, nearly all the countries/territories had sampling sites that showed poor conditions, which indicates acute pollution of the marine environment.

For E. coli and Enterococcus bacteria, all the countries and territories showed a large proportion of sampling sites indicating faecal contamination. The impact was lower in the dry season

[12] https://sargassumhub.org/the-hub/

due to reduced runoff. However, there was a significant increase during the wet season because of intensification of run-off from land.

The occurrence of harmful algal blooms (HABs) has increased in the wider Caribbean region in recent years. The most evident effects of HABs are mass mortalities of marine fauna such as fish and sea turtles, and reduction in the quality of recreational and commercial fishing areas.

There is documented evidence in the region that the occurrence of HABs, low oxygen zones, and coral reef degradation are linked to pollution from nutrients and domestic wastewater. These effects can be exacerbated by increasing sea surface temperatures, storms, and hurricanes.

Land-based pollution has an important effect on ecologically and economically valuable marine habitats particularly coral reefs, mangroves and seagrass beds. Many cases have been documented where nutrients, sewage, and sediments have contributed to coral reef degradation and loss of live coral cover.

In 2015, about 495 tonnes of mercury (amounting to about 22% of global emissions) were emitted to the atmosphere by countries in the Americas, with South America accounting for over 80%, mainly from artisanal and small-scale gold mining activities. The bioaccumulation and biomagnification of mercury in the marine food chain, and seafood consumption is a major pathway for exposure of humans to mercury compounds.

10.4. Marine Litter and Plastic

In the assessment of the Cartagena convention area (UNEP-CEP, 2019) it was estimated that in 2015 the wider Caribbean population generated 79 million tonnes of solid waste, which was projected to increase to 84 million tonnes in 2020. About 1.3 million tonnes of plastics were introduced to coastal waters of the wider Caribbean in 2015. The highest volume of municipal waste is produced in the Gulf of Mexico and the area of the Greater Antilles, while the highest volume of mismanaged plastic waste is produced in the Greater Antilles. In the eastern Caribbean solid waste estimates generated by residents and tourists amounted to 663 000 tonnes and 49 000 tonnes, respectively.

The wider Caribbean is among the regions with the highest concentrations of floating microplastics and macroplastics (UNEP-CEP, 2019). Microplastic adsorbs organic pollutants from the surrounding seawater and when ingested, can deliver harmful chemicals to marine fauna and humans. A recent review (Orona-Navar, 2022) on microplastics in Latin America and the Caribbean identified 11 studies of microplastic ingestion by dozens of commercially important marine and estuarine fish species in the WECAFC area.

Bans of single-use plastic bags and polystyrene foam products have spread around the Caribbean region. However, solid waste management improvements continue to be a major challenge for the countries (Clayton *et al*. 2021).

10.5. Status of coral reefs

Coral reefs in the Caribbean cover 26 397 km^2, which represents 10.2 percent of global coral reef cover (Souter *et al.* 2021). In 1983 the estimated average live hard coral cover for the entire Caribbean region was 18 percent, which already represented a significant reduction from the 35 percent for the period between 1970-1983. The subsequent trend suggests continued decline to 16.5 percent in 1999 and then to 15.9 percent in 2019.

Estimates of the average algal cover in the Caribbean region prior to 2000 are highly uncertain given data coverage limitations. However, since 2003, the average algal cover within the region increased and reached 52.4 percent in 2019.

At least three factors have negatively impacted Caribbean coral reefs during the last five decades: 1). White-Band-Disease in the 1970s and 1980s which caused populations collapses of corals (*Acropora palmata* and *Acropora cervicornis*) in shallow coastal environments of the Caribbean; 2) Pathogen induced mass mortalities of the herbivorous long-spined sea urchin (*Diadema antillarum*) populations between 1983 and 1984; and 3) the massive coral bleaching event that affected the entire Caribbean in 2005.

Herbivorous fish (e.g. parrotfishes) and long-spined sea urchins helped to control algal population growth, but overfishing of parrotfishes and the sea urchin disease reduced their numbers and hence, their ability to help control algal overgrowth. As a result, the Caribbean region has been experiencing a shift from coral-dominated to algal-dominated reefs. Differences among Caribbean countries in the application and availability of fisheries management tools, as well as in fisheries enforcement, have impacts on coral reef health and resilience. More frequent and more intense coral bleaching events as well as hurricanes continue to threaten Caribbean reefs. Also, recently Caribbean coral reefs have faced new emerging threats such as invasive lionfish, Sargassum influxes and the emergence and spread of the novel, highly virulent Stony Coral Tissue Loss Disease (SCTLD).

SCTLD was first observed in Florida in 2014 and affects at least 34 species of stony corals in the Caribbean. By 2021 the disease had been confirmed in 19 countries and territories across the Caribbean region. Prevalence rates of this disease are very high and most infected coral colonies die. Finally, increases in the frequency and intensity of disturbances such as bleaching and hurricanes compounded by chronic water pollution may be impacting the long-term recovery capacity of Caribbean reefs.

Finally, in a recent study (Bove et al. 2022), the long-term spatiotemporal trends in ocean temperature across the Greater Caribbean were quantified over a 150-year period (1871-2020), and specifically on Caribbean coral reefs, to provide a synthesis of the impacts of ocean warming on coral reef ecosystems. Results indicate that regional warming of coral reefs began in the early 20th Century, but for some ecoregions significant warming was detected in the latter half of the 19th Century. Since the 1980s Caribbean reefs have warmed by 0.18°C per decade, ranging from 0.17°C per decade on Bahamian reefs to 0.26°C per decade on reefs in the Southern and Eastern Caribbean. The study also shows that the frequency and duration of marine heatwaves has been increasing in the Caribbean region. In the early 1980s on average there was one heatwave per year, whereas now there are 5 heatwaves per year. Increased sea surface temperatures and other stressors (e.g. fishing, coastal pollution) acting upon coral reefs have caused pronounced changes in the function and structure of these important and fragile marine habitats.

10.6. Impacts of COVID 19 pandemic on fisheries and aquaculture

COVID-19 has caused one of the largest known economic contractions, estimated globally at −4.3 per cent reduction in per capita GDP in 2020[13]. However, the impact varied regionally and the WECAFC area was particularly affected. Except for Guyana, which was the only country in the region to experience growth due to a developing oil economy, reductions in per capita GDP ranged from -3.6 percent for Saint Vincent and the Grenadines to -20.8 percent in Antigua and Barbuda. The SIDS were the most impacted with an average reduction of -13.3 percent, followed by the mainland Latin American countries with a contraction of -5.7 percent, and finally the United States of America with a reduction of -3.7 percent.

The COVID-19 pandemic significantly impacted marine fisheries and aquaculture throughout the world. The initial lockdown of airports, ports, markets and borders and the cessation of shipping and air freight, stopped or significantly restricted fishing and post-harvest activities. As mentioned in section 5 above fisheries landings in the WECAFC region showed a significant decline from 2019 to 2020. To avoid biases that may arise from FAO trend estimates or carry-overs in the FAO database, if only countries that directly reported data to FAO are considered the reduction in fisheries landings for the Western Central Atlantic is around 12 percent. From a total of 22 countries in this subset 18 showed reductions and 4 showed increments, albeit rather small for the latter.

Marine aquaculture also saw disruptions in supplies, market demand and employment. The WECAFC area had been experiencing sustained growth in marine and brackish water aquaculture from 2016 to 2019 but showed a small decline of about 2 000 tonnes in 2020. However, for the two main species the situation is rather different as American cupped oyster showed a significant

[13] https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG

decrease of about 23 thousand tonnes, while whiteleg shrimp showed an increase of about 20 thousand tonnes. Hence, overall the impact of COVID 19 on marine and brackish water aquaculture in the region was rather limited.

Currently, information on the impact of the pandemic on fish trade at the regional level is not available. However, information on seafood exports from the United States of America showed a decline by 18 percent in value in the period from January 2020 to July 2020. On the other hand, the total value of seafood imports declined 4% from January 2020 to June 2020 on average when compared to the 2015-2019 baseline period (NMFS 2021c).

Regarding recreational fisheries, charter boats revenues in the continental WECAFC area of the United States of America decreased around 24 percent (USD 142 million) from January to June when compared to the same period for 2017-2019.

Surveys conducted in Puerto Rico indicated that 96 percent of commercial fishers reported that COVID 19 had impacted their operations from January to June 2020. For fishers reporting losses the average revenue decline was 65 percent. For seafood dealers and processors reporting losses revenue loss was 56 percent on average. For recreational fisheries revenue loss for the same period was around 85 percent in Puerto Rico and around 77 percent in the US Virgin Islands.

In May 2020 the CRFM Secretariat conducted a questionnaire-based rapid assessment of the impacts of the COVID-19 pandemic on fisheries production, fisher livelihoods, and food security, among others (CRFM 2020). The questionnaire was addressed to fisheries departments and divisions, as well as to fishers. Fifteen Member States responded to the questionnaires: Anguilla, Antigua and Barbuda, The Bahamas, Barbados, Belize, Grenada, Guyana, Jamaica, Montserrat, St. Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, and Turks and Caicos Islands.

Overall, the most frequently identified effects of the pandemic were reduced trade, reduced production, and decreased access to fish by consumers. The most frequently identified objectives of government interventions were general safety and security, maintaining livelihoods, maintaining local fish supply and supply of fish products for export.

Fishers were considered as essential workers in twelve CRFM Member States. Seven Member States estimated that from 70 percent to 85 percent of fishers operated during the period and three Member States indicated that only 10 percent to 30 percent of fishers were operating. Finally, four Member States estimated that all fishers were operating during the period.

Overall, practically all Member States indicated a decrease in local demand for fish by restaurants, hotels, wholesale retailers, and processors and exporters. However, an increase in demand by households was noted by eight Member States.

Fisher respondents indicated that there had been a decrease of 50 percent or more in income during the last three months in comparison to the same time period the year before. The main economic challenges being experienced by fishers were the inability to meet living expenses and reduced income.

10.7. Extreme Events

10.7.1. Hurricanes

The 2019 Atlantic hurricane season was the fourth consecutive above average and damaging season. Two storms became Category 5 hurricanes. Hurricane Dorian, the most intense tropical cyclone of the season, proved to be the costliest natural disaster in the history of the Bahamas. The 2020 Atlantic hurricane season was the most active Atlantic hurricane season on record. Of the 30 named storms, 14 developed into hurricanes of which seven intensified into major hurricanes. The 2021 Atlantic hurricane season was the third most active Atlantic hurricane season on record producing 21 named storms.

The total estimated damage from Dorian in Bahamian fisheries amounted to USD 11 million. The total damage to fish processing facilities was estimated to be USD 5 million. Within the facilities a total of USD 2 million in inventory was damaged. The damage to vessels amounted to USD 2 million, while the damage to outboard engines was close to USD 400 000. Finally, fishing gear lost or damaged totalled USD 2 million. To estimate the losses to fisheries the yearly total catch was broken down to monthly amounts, considering the Caribbean spiny lobster and stone crab season, and assuming an eight-month recovery period. The losses in fisheries were estimated to be USD 7 million and represented 65 percent of the total losses in agriculture and fisheries (ECLAC and IDB, 2021).

Hurricanes Laura, Delta, Zeta, and Ida, which swept through Louisiana during various points in 2020 and 2021, resulted in an estimated USD 579 million in losses to the State's fisheries infrastructure, revenues, and biological resources, according to a study by the Louisiana Department of Wildlife and Fisheries, Louisiana State University (LSU) and Louisiana Sea Grant. Wind was the primary driver of impact for all four storms, accounting for 85 percent of the damage to vessels, 80 percent for dealers, 80 percent for processors, 89 percent for charters, and 54 percent for marinas. (Caffey et al. 2022).

Damages to the fisheries sector of Honduras by tropical storm Eta and Hurricane Iota were estimated at Honduran Lempiras (HNL) 5.6 million and losses were estimated HNL 289 million. It is estimated that the Honduran economy would contract an additional 0.8 percent points due to effects of these natural disasters (BID and CEPAL, 2021).

10.7.2. La Soufriere Volcano

On 9th April 2021, La Soufrière volcano erupted explosively for the first time in over 40 years. Subsequent multiple eruptions were reported. The eruption resulted in heavy ashfall in the surrounding areas, causing people to flee to different parts of St. Vincent and to the neighbouring islands of St. Lucia and Barbados. The last explosive eruption occurred on April 22nd, 2021. The volcano alert level was lowered from red to orange in May 2021, from orange to yellow in September 2021, and finally from yellow to green in March 2022.

The fishery sector in the red (very high hazard), orange (high hazard) and yellow (moderate hazard) zones were significantly impacted. Approximately 800 fishers were affected, with 278 having to be relocated. Due to prior advice provided to fishers by the Ministry of Agriculture, Forestry, Fisheries, Rural Transformation, Industry and Labour (MAFFRIL) many were able to protect their vessels from the effects of the volcanic eruption. Reports indicate that 11 vessels with their engines and other equipment were damaged. The Volcanic activity destroyed fishing villages and turtle nesting beaches at Sandy Bay and Owia on the Windward side of the island and Rose bank, Chateaubelair, Fitz Hughes and Richmond on the Leeward side. These are prominent fishing villages located within proximity to the La Soufriere volcano (UNDP 2021).

The damage and loss for the fisheries sector was estimated at Eastern Caribbean Dollars (XCD) 5.73 million, with XCD 0.72 million representing damages and XCD 5 013 million representing losses. Additionally, the export of fisheries products was temporarily interrupted due to the closure of the airport as well as the fisheries centre in the red zone. The estimated damages and losses of the fisheries sector represented around 2.5 percent of total losses and damages of the agricultural, forestry, apiculture, livestock, and fisheries sectors combined (UNDP 2021).

11. Conclusions and Recommendations

In 2020, landings of marine fisheries in the Western Central Atlantic (FAO fishing area 31) were 1.25 million tonnes, following a declining trend since 2016 and far below the maximum of 2.5 million tonnes reported in 1984. Thus, WECAFC reported landings account for about 1.4 percent of total world capture fisheries. However, a substantial underreporting of catches, especially by small-scale fisheries, must be considered. Additionally, improved collection and reporting of landings is required particularly regarding the northern part of FAO Area 41 (southwestern Atlantic) to have a more accurate estimate of fisheries production in the WECAFC area.

Marine recreational fisheries are an important and growing component of the tourism and leisure industries in the WECAFC area. However, except for the United States of America, there is limited information on the socio-economic impacts of these fisheries.

Marine and brackish water aquaculture production is still rather limited with an estimate of 261 thousand tonnes with a value around USD 730 million, which is less than 1 percent of total world aquaculture production and value. Factors identified that were required for improved aquaculture production included better governance, the adoption of adequate technologies and best practices, increased efforts for environmental sustainability, and foresight to deal with climate and market changes. SIDS faced additional challenges such as limited expertise, high production costs and extreme and destructive weather events.

WECAFC Member States are a net importer of fisheries products. In terms of volume the region imported almost 2 billion tonnes with a value of around USD 8.1 billion, while exports represented around 974 thousand tonnes with a value of USD 4.8 billion.

For WECAFC Member States bordering the Western Tropical Atlantic fish consumption is highest among some of the Caribbean islands, such as Antigua and Barbuda, Saint Kitts and Nevis, Saint Lucia and the British Overseas Territories where per capita consumption exceeds 34 kg. However, overall fish consumption is below the world average.

For most countries in the region fisheries and aquaculture represents a small fraction of the national economies. Only Belize, Grenada, Guyana, Nicaragua and Suriname showed fisheries contribution to GDP above 1 percent. However, overall contribution is grossly underestimated as it is based only on ex-vessel prices and does not account for the contribution along the different value chains.

Fishing is a very dangerous occupation and frequently decent working conditions are also lacking. Safety at sea issues in the eastern Caribbean are being addressed through training and provision of basic equipment to hundreds of small-scale fishers. Advances have also been made in addressing safety at sea and working conditions for the lobster diving fisheries in Honduras and Nicaragua, which is likely the most dangerous fishery in the WECAFC area, as well as in assessing working conditions in the shrimp and groundfish fisheries of the Guianas-Brazil shelf.

The fisheries sector in the WECAFC area is facing numerous challenges including IUU fishing, sargassum influxes, coastal and marine pollution, including marine litter and plastics, deteriorating coral reef habitats, extreme events such as hurricanes and volcanic eruptions, and the COVID 19 pandemic.

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